Lincoln University

Christchurch New Zealand

Public Understandings of Biotechnology in New Zealand: Factors Affecting Acceptability Rankings of Five Selected Biotechnologies

Lesley M. Hunt
John R. Fairweather
and
Fiona J. Coyle

Research Report No. 266
December 2003

AERU

LINCOLN UNIVERSITY
Te Whare Wānaka O Aoraki
PO BOX 84, LINCOLN UNIVERSITY, CANTERBURY 8150, NEW ZEALAND

Research to improve decisions and outcomes in agribusiness, resource, environmental, and social issues.

The Agribusiness and Economics Research Unit (AERU) operates from Lincoln University providing research expertise for a wide range of organisations. AERU research focuses on agribusiness, resource, environment, and social issues.

Founded as the Agricultural Economics Research Unit in 1962 the AERU has evolved to become an independent, major source of business and economic research expertise.

The Agribusiness and Economics Research Unit (AERU) has five main areas of focus.
These areas are trade and environment; economic development; business and sustainability, non-market valuation, and social research.

Research clients include Government Departments, both within New Zealand and from other countries, international agencies, New Zealand companies and organisations, individuals and farmers.

Two publication series are supported from the AERU Research Reports and Discussion Papers.

DISCLAIMER

A summary of AERU Research Reports, beginning with #235, are available at the AERU website www.lincoln.ac.nz/story9430.html?

Printed copies of AERU Research Reports are available from the Secretary.

Studies in Innovation and Change

Public Understandings of Biotechnology in New Zealand: Factors Affecting Acceptability Rankings of Five Selected Biotechnologies

Lesley M. Hunt
John R. Fairweather
and
Fiona J. Coyle

December 2003

Research Report No. 266

Agribusiness and Economics Research Unit
P O Box 84
Lincoln University
Canterbury
New Zealand

Ph: (64) (3) 325 2811
Fax: (64) (3) 325 3847

ISSN 1170-7682
ISBN 0-909042-48-9

Contents

List of Tables

Preface

Biotechnology is the use of living organisms to make products and solve problems. In New Zealand, it has made national headlines through public controversies over genetically modified corn, cloned sheep and the transplantation of animal cells into human bodies. Whilst scientists and government bodies make decisions regarding the applicability and ethical standards of such research, the public are sometimes not given full attention in this decision-making process. This report presents the findings of a series of focus groups across New Zealand that concentrated on public perceptions of novel biotechnologies. It focuses specifically on how and why focus group members ranked the acceptability of five selected biotechnologies. A parallel report focuses on the role of nature, the 'clean green' image and spirituality in determining the acceptability of a series of recent innovations.

Professor Caroline Saunders
Director, AERU

Acknowledgements

This research was funded by the Foundation for Research Science and Technology in New Zealand. It is part of the programme, *The Fate of Biotechnology: Why Do Some of the Public Reject Novel Scientific Technologies?* (LINX0204) led by Dr John Fairweather. It would not have been possible without the help of a number of school Parent Teachers Associations, Friends of the School groups and individuals throughout the country. Dr Fiona Coyle, Post-doctoral Fellow, was responsible for the design and implementation of the focus group study that this research uses as its source of data.

Summary

In a study of public perceptions about biotechnology eleven focus groups were conducted throughout New Zealand. In the course of each focus group the participants were asked to rank for acceptability five different exemplars of biotechnology:

- A treatment of sheep to reduce their methane emission.
- A throat lozenge which placed beneficial bacteria in the mouth.
- A potato that was genetically modified by the addition of a synthetic toad gene to resist potato rot.
- The use of stem cells from embryos to treat Alzheimer's Disease.
- The use of a genetically modified bacterium to break down DDT residue in the soil.

This report focuses on the factors that participants considered when making their acceptability ranking decisions.

The resultant factors have been grouped into six broad themes:

- Risks and related issues
- Naturalness and sense of place – what is natural and where do humans fit in the natural world?
- Participants' personal experience of this biotechnology and related knowledge.
- Did this biotechnology offer choice?
- The connotations of certain words.
- The participants' use of the words 'we' and 'they'.

The first theme 'Risks and related issues' includes a number of factors, the first four of which are related to risk:

- Provisos that the focus group participants made when saying that a biotechnology was acceptable to them
- Participants' fears
- Participants' distrust of the motivations and knowledge of those promoting biotechnology
- Participants' need for more information
- The benefits participants saw in the biotechnology
- Micro-macro aspects of the biotechnology – would it affect a lot of people or a few people?
- Pragmatic attitudes and the simplicity of the biotechnology
- The ways in which the biotechnology challenged the ethics of the participants.

The report outlines how the participants' reactions to each biotechnological exemplar manifest different aspects of each theme and then draws together the common factors across all biotechnologies. This process demonstrates the importance of considering the acceptability of biotechnologies on a case by case basis because each exemplar exposed different facets of the generic themes. The report concludes by briefly discussing how these factors fit within the wider context of a New Zealand national identity.

Chapter 1
Introduction, Research Objectives and Method

1.1 Introduction

This report is a compilation of the factors that participants in focus groups from all around New Zealand took into account when ranking the acceptability of the particular biotechnology exemplars presented to them.[1] Participants expressed wise, profound and grounded statements. Cronin and Marchant (2002: 38) have said of New Zealanders, the "public is not inherently incapable of grappling with complex science". The *Public Perceptions of Agricultural Biotechnologies in Europe* (PABE) Report (Marris, Wynne, Simmons and Weldon, 2001) draws attention to similar incorrect assumptions by decision makers about public responses to genetically modified organisms, in the five European countries in which their focus group research was conducted. The public perceptions raised in this report may not be those expected if one had been following controversial issues about biotechnology raised in the media or by NGOs. Consequently, it is important to emphasise the voices of the New Zealand public and these voices need to be heard in the current debate about biotechnology in our country.

This programme was granted funding in response to a demand for additional information on public perceptions of the risks of biotechnology. The Foundaton for Research, Science and Technology (FRST) identified the need for research into the key socio-economic impacts of biotechnology. More specifically, the Foundation recognized how important it was to identify relevant factors in determining the public perceptions of technological risk. These factors are associated with the full range of biotechnologies including medical, environmental and food applications. The public perception of technological risk is of critical importance in the future development of biotechnology in New Zealand. Consequently, there is a need for tools to assist in the analysis of perceived technological risk.

The aim of the overall programme, titled *The Fate of Biotechnology. Why do the public reject novel biotechnologies?*, is to improve decision-making, policy-making and communication by key government agencies and science providers regarding the development and application of biotechnology in New Zealand. More specifically, the objectives of the overall programme are to:

- Identify perceived effects of biotechnology and document the perception of risks associated with personal and general use of biotechnology.
- Determine the relative importance of the key perceptions of risks.
- Determine the social and cultural factors that underlie the identified risk perceptions, including international comparisons.
- Model the trade impacts of various scenarios of risk perception relating to new technology uptake.
- Synthesise results into a socio-economic risk-assessment decision aid in order to assist end user decision-making and communication.

Phase one of the research focuses on the first three objectives. As a result, this project assesses the public perception of the risks involved with new agricultural, environmental and

[1] Note that this does not cover the Māori perspective. This work is being carried out within the same FRST programme by Dr Mere Roberts.

medical biotechnologies. During a series of eleven focus groups of ten to twelve people each, participants were asked to discuss their perceptions of the impacts of pertinent examples of biotechnologies such as genetically modified organisms, cloning, xenotransplantation and stem cell research.

The information gleaned from the objectives addressed in this report will be combined with results from other objectives with the aim of improving decision-making, policy-making and communication by key government agencies, with regards to the development and application of biotechnology in New Zealand. This outcome aims to benefit New Zealand by providing an improved understanding of social and community issues surrounding new technological advances. It will also lead to the development of a risk assessment model that addresses New Zealand-specific concerns and will provide underpinning knowledge and information in order to contribute to effective regulatory systems.

The current definition of biotechnology espoused by the New Zealand Ministry of Research, Science and Technology (MoRST) (2003: 2, 37) has been adapted for use in this study:

> Biotechnology is a broad term for a group of technologies that are based on applying biological processes. It involves the use of living things or their derivatives to solve problems and make products.

In this report the words genetically engineered (GE) and genetically modified (GM) are used interchangeably as practiced by the Royal Commission on Genetic Modification (RCGM, 2001: 5). The abbreviation GMOs refers to genetically modified organisms.

This chapter concludes by describing the focus group method of data collection that was used in this part of the programme, the way that collected data was analysed, and finishes by reflecting on some of the issues that arose during this time.

1.2 Method

1.2.1 Focus Groups

Focus groups are regarded as a most appropriate way to gather information about people's "experiences, wishes and concerns" (Kitzinger and Barbour, 1999: 4 cited in Marris et al., 2001: 20). They provide a place for interaction to happen in a way which demonstrates the nature of perception as processual, making meaning, and linking relevant objects and experiences. As a result the quotes in this report are not only of single voices but are often of exchanges between several participants in the focus groups. It also must be remembered that quotations have come out of a particular interaction. The use of focus groups enables the researcher and the reader to follow the connections and relationships participants make in relation to particular biotechnologies.

The process followed in this study is fully described in the companion report, *Public Understandings of Biotechnology in New Zealand: Nature, Clean Green Image and Spirituality* (Coyle, Maslin, Fairweather & Hunt, 2003). What follows is a brief summary. Focus group participants were recruited from around New Zealand by contacting school parent teachers associations (PTAs). They were provided with an information sheet and a list of criteria for a 'representative' sample of people from the local area. As an incentive, PTAs were offered $200, and participants paid $50 for their time (2-3 hours). The first group was

held in a hotel, but this approach was too formal, and subsequent meetings were held in the evening in school staff rooms.

The research was conducted in two phases. The first phase comprised of two focus groups in Christchurch and Dunedin in the South Island of New Zealand, completed during December 2002. Participants' comments and the themes that arose from them were then used to construct a framework for phase two, which involved groups in Christchurch, Dunedin, Nelson, Waimate, Waipukurau, Wellington and Auckland. The three focus groups in Auckland encompassed Western Europeans, Pacific Islanders and Asians. Phase two was conducted from February to June, 2003.

The interactions in all eleven focus groups were recorded by both a note-taker and a tape recorder. Participants were asked to fill out a short demographic questionnaire and signed consent forms which assured them that the confidentiality of their conversations would be protected as their names would not be used in any quotes. In the demographic questionnaire, respondents were asked to indicate: their name, age, sex, marital status, number of children, nationality, ethnicity, place of birth, employment status, occupation, income and highest educational qualification. A profile of the 117 New Zealanders who participated in the eleven focus groups conducted nationwide is available in the companion report (Coyle et al., 2003). The number of participants in each focus group varied from ten to twelve people.

Participants in the first two groups were presented with a series of exemplars of recent developments in environmental, agricultural and medical biotechnologies pertaining specifically to New Zealand. Comments and themes that arose from these two exploratory groups were re-shaped into a focus group guide for the second phase of the study. First the participants were asked how they would like to see New Zealand in twenty years time. Then they were asked what the word 'biotechnology' meant to them and were presented with the MoRST definition as outlined earlier. After this introductory stage participants were presented with five examples of new biotechnologies, listed below.

EXEMPLARS

- Methane from sheep's stomach = greenhouse gas → device in stomach releases bacterium → slows down methane production.
- Bacteria from human saliva → throat lozenge → fights harmful infections.
- Potato → synthetic toad gene → antibiotic protects against soft rot.
- Stem cells (5 day old embryo) → person with Alzheimer's → some reversal of condition.
- GM bacterium → helps clean up NZ soil from a toxin produced when DDT breaks down.

These examples had either been recently introduced (BLIS throat guard), existed under controlled experimental conditions (GE potatoes, GM bacterium, device for methane reduction in a sheep's stomach) or were currently in the early stages of experimentation (embryonic stem cell research). Participants were given ranking sheets and asked to rank the biotechnologies on a scale of 1-5, one being most acceptable and five being least acceptable. They were also asked to write a few notes on their reasoning, in preparation for discussion. Participants were then asked to justify their rankings, a lengthy process that took up half of

the time allotted. This structured approach allowed all participants to have a voice, in contrast with a more open call for discussion. The sheets were then collected and, at a later point, examined to provide useful additional data. It is the analysis of the data gathered from this part of the focus groups which provided this report as opposed to the report of Coyle et al. (2003) that provides an overall analysis of the focus group material.

The second half of the phase two focus groups was more informal, and varied according to the time remaining, the social mix of the group and previous experiences. It focused primarily on two themes identified from the other groups – nature and safety/risk. Participants were introduced to a series of summary statements made by members of the pilot focus groups, and asked to make comments about what people meant by these statements and to what extent they were in agreement. Finally, participants discussed more novel biotechnologies such as xenotransplantation, genetic testing, and cloning, and were questioned about their relative naturalness and risk/safety. The focus groups concluded with two competing statements about the future of biotechnology in New Zealand, based on comments from the first phase.

1.2.3 Data Analysis

The recordings of approximately thirty hours of focus groups were transcribed verbatim. Emergent themes from the transcriptions were coded using the qualitative data analysis package, NVivo. These general themes, relating to the factors that played a part in the acceptability of the exemplars, have been used to structure the sections of the results chapters in this report. The next five chapters relate to each exemplar and are followed by a chapter generalising the analysis across exemplars. Quantitative data collected on sheets from the focus participants when they assigned acceptability rankings to each exemplar, were placed in tables, which can be seen singularly in each appropriate chapter. These tables are all gathered together in Appendix I to provide the reader with easier comparisons.

1.2.4 A Reflective Critique

Whilst the focus groups were formatted in a similar fashion, this was adjusted for each group and strongly dependent upon the allotted time and the group coherence/sociability. This meant that the focus group guide evolved as the discussion groups continued. Indeed, following each session, the moderator and note-taker had a de-briefing about issues such as those listed below:

- Personal involvement in the issues – what role should the discussion leaders take? Should they simply listen, with minimal involvement? Should they correct misinformation? Should they seek to educate the public? How involved should they get when participants' enthusiasm is catching? How much prompting should occur when participants are unresponsive? In the end, participants were given only limited information about the biotechnologies used in the exemplars so that the researchers could focus on the connections, knowledge and so on that participants drew on which they regarded as relevant.

Comment [G1]: Page: 39 Please note that I am inserting apostrophes. Please ask if you need guidance.

- Nelson, as a choice of city, was an addition to the initial six locales selected for focus groups. We chose it due to its reputation as a 'green' and 'environmentally active' city, yet perhaps due to the method of recruiting participants through PTAs, the resultant mix of people were quite unexpected. Rather than encountering a number of

anti-GE protestors as we had imagined, the group was quite subdued, even initially cautious as to our intent. What was most surprising, was that two anti-greens were among the group, and only were willing to provide any opinions after deciding that the group was a "safe space" in which to speak.

- There were problems in recruiting Asian participants. Five schools did not wish to host a focus group, relevant reasons primarily being due to language issues with new immigrants who spoke very little English. Eventually, an informal contact at Auckland University was used to recruit a variety of participants. However, as she noted, no Japanese people were willing to participate, even with a financial incentive, and after trying, she was warned against recruiting Koreans, because nobody would be confident enough in their language capabilities to participate. Whilst predominantly Chinese, the range of Asian participants still covered Indonesia, India and Sri Lanka. Furthermore, two translators were present. The major attribute of this focus group was that some of these participants were well-educated, often scientifically. This, however, led to an interesting and informative debate.

- A focus group based at a school in Onehunga gave the Pacific Island participants an opportunity to present to us their perspective on biotechnology. During the same period of this study Dr Mere Roberts of Auckland University was carrying out a similar study with Maori participants as part of same *Fate of Biotechnology* programme.

This study is about perceptions and not about behaviour. It does not pretend to predict what people would actually do as citizens and consumers when confronted with certain situations, for example, the growing of a genetically modified plant by their neighbour, or the choice of purchasing a biotechnology product.

Focus groups are an extremely valuable tool for conducting explorative social research. The process allows the researcher to a come closer to understanding how participants think and why they think that way. The flexibility of the focus group is crucial for its success, as it allows the researcher to explore unanticipated topics and delve deeper into comments made by participants. Meanwhile the spontaneous and interactive elements of the groups encourage a level of naturalness to the discussion providing valuable insights for the researcher. Many of the criticisms leveled at focus groups relate to the lack of generalisablity and the pitfalls of the data analysis but the very issues that make the process vulnerable also offer its greatest strength as an exploratory tool.

Chapter 2
Context and Literature

2.1 Introduction

This chapter is divided into two parts. The first considers the context of this research - what are New Zealanders likely to know about biotechnology from the media coverage and other sources on particular issues. Some of this material is taken from the companion report (Coyle et al., 2003) because we consider it to provide important context here, and to make it easier for the reader. The second part of the chapter summarises the factors that other researchers (both in New Zealand and internationally) have found to influence the public perception of biotechnology.

2.2 Historical and Contemporary Issues Framing the Debate About Biotechnology

Over the past fifteen years certain issues and controversies, which may explain the attitudes of New Zealanders or provide a background to their understandings of the use of biotechnology and research, have featured in the public media. These have been both international and local and sometimes something stimulated by an international event has led on to interest in a local biotechnology development. This section summarises some of the most influential of these issues which could have impacted on the knowledge focus group participants brought to bear in their ranking for acceptability of the five different exemplars. It must be noted that the link between controversy and public perception is a contested one (see Marris et al., 2001: 36-39).

2.2.1 Use of DDT

After the war DDT was introduced to New Zealand as it was found to be a useful insecticide in the horticultural industry. It was not until the 1950s that mixing it with superphosphate agricultural fertiliser was found to provide a way of getting it deep enough into the soil to kill grass grub larvae, one of the major pests in New Zealand's ryegrass based, pastoral agriculture and it became widely used. In 1961 a shipload of New Zealand export beef was refused entry into the US because of the level of insecticide residues. From that time on the agricultural industry sought to reduce the amounts of DDT used and regulations were introduced for withholding periods on stock consumption of pasture where it had been applied. Its use on pastoral land was finally banned in 1970 and all use was banned in 1989 (Hunt, 2004).

Because DDT breaks down to DDE in the soil and persists in this form a lot of New Zealand farmland remains contaminated and this has been an issue in the expanding dairy industry which has strict controls over the DDT levels permitted in its exported dairy products. DDT is fat soluble and is therefore found in animal fats if animals have eaten DDT contaminated soil. It is not found in plant tissue. So its levels in animals can be managed with good pasture management. This means that dairy cows excrete the highest levels of DDT when they come into milk after calving in the spring, after their drying off period over the winter. Thus wintering over crops or pasture grown on land free of DDT is at a high premium.

Grass grubs are also common in domestic lawns. So far no-one has found a successful way of managing this pest, hence most New Zealanders are aware of the DDT story to some extent.

As well, many would be familiar with Rachel Carson's book, *Silent Spring* (1962) which first drew public attention to the misuse of DDT and its persistence in the food chain.

2.2.2 Transgenic Sheep

Dolly - An International Issue that has led to a National Problem

Perhaps because of New Zealand's strong association with sheep, Dolly the sheep, the first mammal cloned in 1996 from an adult stem cell, by the Scotland based firm PPL Therapeutics, gained wide press coverage in New Zealand. As a result many people would also be familiar with Dolly's early demise after suffering from premature aging, in particular progressive lung disease and arthritis (Royal Society of New Zealand (RSNZ) News, 15 Feb. 2003). New Zealand scientists cloned their first sheep in 1997 at the Ruakura campus of AgResearch in Hamilton (RSNZ News, 15 March 1997).

PPL Therapuetics' New Zealand Story: Transgenic Sheep

The story that follows provides material from the media that New Zealanders may be familiar with and as well illustrates two other points as a side issue. It shows, firstly, how many variations can develop in media communication, and secondly, the difficulties of funding biotechnology development.

The interest in Dolly was picked up again in 1998 when the same company, PPL Therapeutics, sought permission to breed milking sheep in New Zealand which had been genetically modified by the addition of human genetic material in order to produce milk containing a human protein with the potential to treat emphysema, cystic fibrosis, and atopic dermatitis. New Zealand sheep and New Zealand as a country were chosen for this research and production because New Zealand is free of diseases such as mad cow disease and scrapie. There is a concern that these diseases may be passed on to humans from animals.

In 1995 the first PPL Therapeutics application to genetically modify sheep was refused. This was believed to be because "public concern about genetically modified organisms could close down a large chunk of New Zealand research if we didn't get a proper public understanding and good quality risk-management procedures in place, to reassure people" (Simon Upton, Environment Minister in 1995, RSNZ News, 22 June 2003).

By 1998 PPL Therapeutics had bred 40 to 50 transgenic rams held in containment. They had been born under permission obtained from "the Environment Ministry's interim assessment group in 1996" (RSNZ News, 9 Dec. 1998). In contrast a later report (RSNZ News 11 Dec. 1998) said that the sheep would be produced from semen imported from Scotland. The ERMA statement released at the time the application was granted (23 March, 1999) said that a number of New Zealand sheep were taken to Scotland and bred from using this gene. Semen from a ram in this flock was imported back into New Zealand and would be used to produce two flocks of up to 5,000 milking ewes. At the time the application was successful the Māori Advisory Committee said that "some Maori found insertion of human genetic material into other species offensive and abhorrent …" (RSNZ News, 20 June 2003).

More recent developments have illustrated another risk involved in the development of commercially based biotechnology. PPL Therapeutics has become financially troubled and has decided to discontinue this research programme (RSNZ News, 23 June 2003). Its parent company Bayer Biological Products, a US pharmaceutical company, has decided to focus on

a rival drug treatment for the same condition (RSNZ News, 19 June 2003). [2] This has raised concerns about the possibility that the disposal of these sheep (up to 3,000 – see later) may mean they end up in the food chain in some way or other. The Environmental and Risk Management Agency (ERMA) has stated that there were strict enough controls in place for this not to happen (The Press, 23 June 2003) and the Environmental Minister said that the Ministry of Agriculture and Forestry (MAF) and ERMA would ensure that conditions were complied with (RSNZ News, 25 June 2003).

Were these sheep cloned and/or transgenic? How many are there at present (June 2003)? One report stated that PPL was going to milk cloned ewes later this year (RSNZ News, 24 June 2003). In 1997 it was reported that a researcher was "collecting cells from lambs to establish a cell line … for cloning whole flocks of sheep" (RSNZ News, 22 June 2003(1)). The press release from ERMA at the time the application was successful (23 March 1999) said that cloning was not involved. According to differing reports there were more than 2,000 sheep (Radio NZ News, 23 June 2003), less than 3,000 (TV One News, 6pm, 23 June 2003), 4,000 – 1,000 of which are transgenic (RSNZ News 24 June 2003) and so on.

There were also differing views about the success or otherwise of the treatment. Robert Mann said that medical trials had shown limited success (RSNZ News, 22 June 2003(1) and 11 Dec. 1998). Jeanette Fitzsimons, co-leader if the Green Party said that it was "poor science" that "put the cart before the horse" (RSNZ News, 22 June 2003(2)). The Māori Advisory Committee felt that such a treatment would be too expensive to be used widely and as such would be unlikely to be used by indigenous people, and that the incidence of cystic fibrosis was too low for it to be of great help to humankind (RSNZ News, 22 June 2003(1)).

2.2.3 Monarch Butterflies and GE Corn

Headlines such as "Greenpeace urges watchdog to reject butterfly-killing GE maize" (RSNZ News, 10 August 1999) led to fears that Bt corn, genetically engineered to produce its own insect control, was killing the larvae of monarch butterflies, which fed on milkweed plants found in the corn fields of the mid-western USA, through eating pollen dust on these plants (RSNZ News, 20 May 1999). This argument was used against an application to grow GE maize in New Zealand to supply seed to France. "About 12 protestors gathered outside the hearing … wearing monarch butterfly wings and handing out leaflets criticising the genetic modification of food" (RSNZ News, 10 August 1999). "The application was approved subject to strict containment conditions …" (RSNZ News, 23 September 1999). These fears were allayed by further research which showed flaws in the initial laboratory research that had used ground up corn as well as pollen to feed larvae (RSNZ News, 10 September 2001). Later researchers suggested further risk was posed to the butterflies by the anthers of the corn flower (RSNZ News, 13 September 2001).

'Corngate'

In the week prior to the General Election in July 2002, Nicky Hager's book, "Seeds of Distrust", was published by a Green Party candidate, Craig Potton. Hager claimed that some GE corn had been planted in the Hawkes Bay and that this had been covered up by the Government, hence the name 'Corngate' that this incident has acquired. The New Zealand

[2] According to a report in *Nature* (Hogan, 2003: 907) what has happened is that PPL Therapeutics decided not to put itself further into debt to build "a commercial scale plant for purifying protein from the milk". Bayer was to collaborate with PPL Therapeutics to run clinical trials for the product but wanted assurance that there would be commercial quantities of the product available after the trials.

Prime Minister, Helen Clark's reaction to this when presented with this information without warning by John Campbell on the TV3 network news, stirred up much controversy and probably damaged Labour's election campaign and Campbell's future career. Seed certified as GE-free had been planted and seed from the crop had been sold, mainly to the European Union (RSNZ News, 11 July 2002).

In the ensuing period many different scientists and the Minister of Science, Research and Technology took the opportunity to try to explain and educate the general public via the television, radio and press media, in the complexities of risk management and the measurement of GE contamination of seed. An inquiry into the Government's actions at the time of the alleged discovery, started in February 2003. It has still not been officially decided whether the seed was contaminated or not.

2.2.4 Potatoes and Toads

In September 1998, the Green Party announced Crop and Food Research's intention to try to make potatoes resistant to soft rot bacteria by introducing DNA from toads (RSNZ News, 27 Sept. 1998) via an existing soil bacterium (RSNZ News, 12 Nov. 1998). It was also made clear later by the chief researcher, Tony Conner, that "the genes used were not actually from toads or silkworm larvae. Rather, they were similar, artificial genes" (RSNZ News, 11 March 1999). Approval for trials was given by ERMA in late December, 1998 ((RSNZ News, 24 Dec. 1998). It was these potatoes that featured in the national news in March 1999 when the research trial was destroyed by a group calling itself the 'Wild Greens', a wing of the Green Party. In sabotaging the trial the containment conditions of the trial were breached (RSNZ News, 11 March. 1999). In January 2002, there was a similar destruction of potatoes growing in a greenhouse at Crop and Food Research at Lincoln (RSNZ News, 11 Jan. 2002).

Interestingly, at the time these trials were approved the application for the use of DNA from silkworm to prevent damage to potatoes by tuber moths has not received the same publicity.

2.2.5 The New Zealand Debate About Informed Consent

The issue of 'informed' consent has had wide coverage in the New Zealand press since 1987 when Sandra Coney and Phillida Bunkle wrote a magazine article titled 'The Unfortunate Experiment'. This told the story of 'Ruth' (a pseudonym) who had unknowingly been part of an experiment on the treatment of cervical cancer, started at the National Women's Hospital in Auckland in 1996 by G.H. Green (Coney, 1993: 10; Coney, 1988). As a result of this experiment many women died because they had not received the treatment which could have saved their lives. This led to a Government sponsored inquiry and the resultant Cartwright Report (1988) (as it has become known) made many recommendations including a tightening up of informed consent procedures. The National Cervical Screening Programme was one of the recommendations of this report. It has had problems since its inception and frequently features in the news.

Storage of Hearts at Green Lane Hospital

Hearts retained from post mortems of babies and children were kept for research purposes at Green Lane Hospital since 1950. Parental or caregiver consent was never given because it was not seen as an issue (RSNZ News, 27 Feb. 2002). When this was discovered in 2002 it caused such a furore that the hospital went to great lengths to return the hearts to surviving relatives, many of whom did not have know the hearts were removed in the first place.

Using Stem Cells and Embryos for Research

Embryonic stem cells have the ability to grow into any kind of tissue in the human body. The main issue for scientists is to learn how to guide them to develop in a particular way. Hence these cells have the potential for treating Parkinson's and Alzheimer's Diseases and diabetes by forming insulin producing pancreatic cells, and heart and other muscle cells. Stem cells taken from adults are believed to be less flexible (RSNZ News, 10 August 2001).

Many countries have developed guidelines for stem cell research. For example, in Canada, scientists can use embryos left over from infertility treatment or abortions, whereas in the USA scientists are only allowed to work with existing stem cell lines. The United Kingdom allows the cloning of embryos specifically for research. In New Zealand the Hazardous Substances and New Organisms (HSNO) Amendment Bill has had an addition which restricts germ cell line gene therapy – the genetic engineering of eggs, sperm or early embryos so that altered genes can be passed on to future generations (RSNZ News, 20 Dec. 2001), but so far it has no legislation about research using stem cells. Two researchers at the Faculty of Medical and Health Sciences, University of Auckland, Richard Faull and Bronwyn Connor, are studying whether stem cells can be removed from a person and regenerated in some way, then returned to the person. Such treatment may help sufferers from Alzheimer's and other brain diseases, and spinal chord injuries (University of Auckland, 2003).

One of the British scientists who helped clone Dolly has said that he plans to create new stem cell lines from 40 to 100 embryos from fertility clinics by the end of 2003, for sale and for use in his own research. He is based in Singapore with the company ES Cell International (RSNZ News, 31 October, 2002).

2.2.6 Methane Production by Livestock and Global Warming

The New Zealand Government has made a commitment to the Kyoto protocol to lower New Zealand's contribution to greenhouse gases. As a result the Government announced in June 2003 that it would levy farmers nine cents per sheep and 72 cents for cattle processed at meat works. Milk solids would also be levied to cover dairy cattle emissions. This money would contribute to research on how to lower green house gases. Other industries will be taxed for emissions in 2007. This proposed tax has become popularly known as the 'FART tax'[3] even though methane emission occurs in ruminants mainly through burping.

Farmers were not happy about this proposal. They argued that rural New Zealanders will be paying for something that should be paid for by all New Zealanders and everyone would be affected (RSNZ News, 19&24 June 2003). Farmers threatened civil disobedience if the Government did not change its policy (RSNZ News, 7 July 2003). It has since been decided that farmers contribute enough to research into global warming and the tax will not be instituted.

So far this chapter has described some of the issues reported in the media in New Zealand that are likely to have informed public opinion about biotechnology. The rest of this chapter summarises the factors that others, both in New Zealand and outside New Zealand, have found to be relevant to the decisions that people make about biotechnology.

[3] An acronym for 'Farmers Against Ridiculous Taxes'.

2.3 Factors Influencing Attitudes to Biotechnology from the Literature

The perceptions people have about biotechnology, particularly genetic modification have been widely researched. Many of these relate to perceived risks associated with biotechnology. The growth of the awareness of risk was coined by Ulrich Beck (1992) with his notion of the 'risk society' and this preoccupation with risk has continued to emphasise the uncertainty of contemporary life.

This review will frequently refer to the results from the Public Perception of Agricultural Biotechnologies in Europe (PABE) Report (Marris, Wynne, Simmons and Weldon, 2001) funded by the Commission of European Communities.[4] This is because one of the main purposes of this study was to provide a New Zealand comparison to its findings. These researchers studied "perceptions of agricultural GMOs among members of the public using focus groups" in five different European Member States (UK, France, Italy, Germany, Spain) and investigated what views "*key stakeholders* in the GMO debate" held of the public (ibid.). (This latter dimension is not part of the current New Zealand research and this research focuses on biotechnology not agricultural GMOs in particular.) Marris et al. (2001: 13) expected that attitudes of their European publics would range across cultural, economic, historic and religious factors.

This review will also refer to some Australian research carried out on consumer knowledge of and attitudes to genetic engineering using focus groups in Queensland in 1995 and a national survey in 1996-7 (Norton, 1998; Norton et al., 1998).

In New Zealand since the early 1990s there has been a growing interest and controversy surrounding biotechnology, particularly genetic engineering. The Independent Biotechnology Advisory Council (IBAC) was formed in 1999 by the New Zealand Government to "stimulate dialogue and enhance public understanding of biotechnology, and to provide advice to Government on various aspects of biotechnology" (Mackay, Nicolson and Brinsdon, 2000). IBAC published a booklet which sought the views of the public and produced a report titled *The Biotechnology Question*, of the results of this 'consultation'. In 2001, the Report of the Royal Commission on Genetic Modification (RCGM, 2001) was released with its overarching synthesis of the many diverse views presented to the Royal Commission by a wide range of New Zealanders and interest and stakeholder groups. Gamble, Muggleston, Hedderley, Parminter and Richardson-Harman (2000) conducted both focus groups (six) and a survey[5] of New Zealanders and their perceptions of genetic engineering following this up by two more surveys in 2001 before and after the Royal Commission (Gamble and Gunson, 2002). At the other end of the scale, Cronin and Marchant (2002) carried out a study to compare the difference between expert and lay assessment of risk by interviewing 15 people who were representatives of anti-GE groups, Māori, general public, GM scientists, and elected representatives.

The factors that have become apparent across the literature will be covered under the headings perceptions of risk, living organisms and nature, enduse, gender issues, ambivalence, sense of alienation and uncertainty.

[4] A very thorough summary of the international literature on consumers' attitudes to genetic engineering before 1998, can be found in Norton (1998: 174–181).
[5] 908 responses from a sample of 1600.

2.3.1 Perceptions of Risk

People are very concerned about the consequences of biotechnology (Cronin and Marchant (2002: 7). De Cheveigne (2002) in her study of the linguistics of the 'Eurobarometer',[6] found that the word 'risk' did not arise spontaneously. Participants were more likely to use the word 'danger' especially with respect to food, eugenics and 'artificiality'. Another key word was 'fear'. Risks were not material phenomenon but drawn from social, political and ethical issues. Gamble et al. (2000) found New Zealanders were more likely to feel negatively than positively about GE. This section will cover different factors involved in risk perception: risk magnitude, risk qualities, the problem of trust in institutions, information wanted by the public, perceptions of the public by dominant institutions, technology as a whole social experience and projection.

Risk Magnitudes

The public paid more attention to the consequences of risk (impact on the environment and public health) than did the 'experts' and decision-makers, while the 'experts' focused on the low probability of risk (e.g., Sandman, 1993; Wynne, 1992). Raynor (1992) made the observation that the public do not expect life to be risk free. Taylor, Green & Cooper (2003: 21) suggest that it is the decision makers who demand "certainty, unconditional explanations and precise estimates of risk".[7]

Risk Qualities

There were many different dimensions of risk. Was the exposure to risk voluntary or involuntary? Were risks balanced by benefits? What was most feared? Did familiarity with a biotechnology affect perceptions?

Voluntariness

In New Zealand there was a perceived lack of choice and control over GM food because of the lack of labelling and regulations about labelling (Gamble et al., 2000; Mackay et al., 2000: 3; RCGM, 2001: 230-237). Other literature documents concerns the public has about the degree of individual and collective control over risk. There are issues of consent. Is the way that collective consent is obtained acceptable to those who bear its consequences? (Raynor, 1992).[8]

Risk/Benefit Distribution, Equity Issues, Social Fairness

Questions were raised over who would receive the benefits of genetic modification. Would they only be for the rich? (Cronin and Marchant, 2002: 23-4). Would such technologies just "reinforce the existing patterns of capital ownership", as the Māori Congress argued at the Royal Commission? In New Zealand a potential negative impact would be carried by the poorer members of the community (especially Māori) because they would have no choice but to buy cheaper GM food (RCGM, 2001: 100-101). Frewer et al. (1994) found that the UK public wanted information about risks and benefits. Biotechnology companies and food manufacturers were seen as the recipients of the benefits of genetic modification and it was the consumers and the environment that would end up paying for it (Marris et al., 2003: 53). Similarly, Raynor (1992) asks, is the way liability apportioned acceptable to those who would bear the consequences? Liability arose as an issue at the Royal Commission (RCGM, 2001:

[6] The 'Eurobarometer' is a quantitative survey regularly undertaken throughout Europe to measure attitudes to different genetic engineering applications.
[7] 'Precise' and 'estimate' would seem to be contradictory!
[8] The words 'consent' and 'choice' do not appear in the index of the Royal Commission's Report.

310-327). Most of those who supported genetic modification at the Royal Commission did so because they felt it would bring an economic advantage to New Zealand (ibid.: 42).

The US Food and Drug Administration (USFDA, 2000) found that people in the USA knew little about biotechnology and perceived its benefits rather than its dangers. In Australia Norton (1998: 179) found that in general the public perceived the risks of genetic engineering to outweigh the benefits (52 percent of sample).

Genetic modification aroused concerns about "oligopolistic ownership, technical opaqueness, and potentially irreversible side effects and unknowns" which were different from that used in the assessment of technology such as IT (Grove-White et al., 2000).

Gamble et al. (2000) found that more New Zealanders disagreed than agreed with the flow-on benefits of GM which the survey had categorised as increased product choice, environmental solutions, reduced price, improved standard of living of self, family and future generations,[9] better quality food, improved health.

Fear/Dread/Safety/Catastrophic Potential

The Royal Commission found that submissions had two main sources of anxiety about genetic modification – the potential impact on human health and on the environment, with the concern about the latter being particularly high (RCGM, 2001: 55). Respondents in many studies were concerned about potentially irreversible side effects and unknowns, e.g., Grove-White et al. (2000) and RCGM (2001: 55). There was a worry about GE causing a problem ten or twenty years on which would then have to be fixed as well, e.g., Norton (1998: 180-1).

In New Zealand focus groups conducted by Gamble et al. (2000) also found an apprehension about the short and long-term impact on health and the environment. In the survey they also conducted, risks were seen as unknown with possible long-term consequences to human and environmental health. This had also been found earlier in the IBAC study (Mackay et al., 2000: 3). Cronin and Marchant (2002: 24) found there was a diverse range of viewpoints across all interviewees on GM food production becoming a risk to the ecosystem. Medical therapies were seen as more targeted while environmental interventions could impact on a whole population (Marris et al., 2003: 53). Living organisms are part of complex chains and this interdependence has enormous implications when one part of a chain is changed through genetic modification. There were concerns about the lack of containment of such organisms, their impact on humans through consumption and on farming practice. Laboratory experiments were not seen as replicating 'real' life (ibid.: 51) and therefore could not predict what would happen outside the laboratory. This finding was similar to those found in New Zealand where the degree of containment was a factor in acceptability with lab work and plant field tests with controls being seen as more acceptable than field tests in which plants or animals were released without controls (Cronin and Marchant, 2002: 21; RCGM, 2001: 42-3, 51-60). IBAC found that containment issues related to both unknown risks and the inability to control GMOs (awareness of past disasters) and biosecurity issues – the loss of biodiversity and the threat to the natural order (also RCGM, 2001: 58-60). Respondents felt GM was a risk to New Zealand's clean and green image and environment (Mackay et al., 2000: 3, 10, 15-25; also RCGM, 2001: 94-96). The Royal Commission was presented with extensive arguments about New Zealand's organic agricultural economy and the influence the release of GM crops could have on that (ibid: 97-99).

[9] Also RCGM (2001: 191).

Zwick (2000) found that Germans were concerned about the potential for abuse in biotechnology, for example, in cloning, eugenics and experiments deliberately releasing GMOs.

Familiarity
The level of familiarity with a technology played a part in people's perceptions according to Cronin and Marchant's (2002: 7) perusal of the literature as did its visibility (Slovic, 2000).

The Problem of Public Trust in Institutions
A UK study on public attitudes to GMOs, gathered from focus groups conducted in 1996, showed that:

- Respondents' knowledge was grounded in experience they viewed as relevant
- Such knowledge included observations of the behaviour of regulators and stakeholders such as scientific and industrial institutions (Marris et al., 2001: 19).

Out of such public awareness has risen the question: are institutions worthy of trust? (Raynor, 1992). As early as 1980 Brian Wynne said, "… at the heart of risk perceptions and risk conflicts was not the issue of technical risk magnitudes but rather trust in institutions". Slovic (1993) confirms this: "If trust is lacking, no form or process of communication will be satisfactory." Trust is easily broken (Cronin and Marchant, 2002: 7-8). Trust is a two-way issue – it has a mutuality about it which appears to be absent in institutional and decision-makers understanding of their public interactions.

Responses from both focus groups and a survey in the IBAC study found concerns about these issues: corporate control, a lack of trust in big corporations and the scientific community, "research is a business rather than for the betterment of society", a lack of accountability and honesty of those involved in biotechnology, companies and researchers who have not been willing to recognise mistakes and have not been good at predicting negative impacts, and their limited focus. One of the major risks was seen to be centralisation of power with large corporations and their perceived lack of integrity. This could result in "monopolies[10] and a concentration of power over seed and life" (Mackay et al., 2000: 3, 10, 15-25). Participants and submissions to the Royal Commission questioned the motives of such companies feeling they were driven by profit rather than being motivated by doing good for society (RCGM, 2001: 63). "Not one person spoke in support of business" (Mackay et al., 2000: 23). "Research is being driven solely by industry, and this was seen as a significant risk" (ibid.: 10) as this could lead to more targeted, short-term, profit driven research (Marris et al., 2001: 62). In New Zealand, IBAC found that people were against the ownership of genes, and had issues with cloning, using embryos, etc. (Mackay et al., 2000).

Participants in the PABE study frequently made comments about "tasteless tomatoes" under the assumption that this was because they were genetically modified when they were not (Marris et al., 2001: 49). They were aware of their ignorance about GM technology but felt that somehow the promoters of GMOs were responsible for this because they had not been providing consumers with appropriate or comprehensible information. Concerns about GMOs were not related to participants' incorrect technical knowledge but to their experiences of plants, animals and humans outside the lab. In particular, they frequently raised issues about the behaviour of institutions and linked this to the way the BSE outbreak was managed in the UK, coco-cola contamination, the use of pesticides among others. To them this

[10] Or "oligopolies" (Grove-White et al., 2000).

illustrated how institutions behaved in "fallible" ways and they felt that these institutions had not learnt from these experiences so could not be expected to behave any better as far as GMOs were concerned (ibid.: 49-50). In other words they did not expect honesty and openness from regulatory or commercial bodies (ibid.: 65). In New Zealand, Gamble et al. (2000) found there was a concern about big business also dominating the distribution of information and the making of policy and regulations.

What participants in the PABE study drew from these observations of institutions was:

- It is impossible to anticipate harmful or beneficial impacts.
- This is not admitted.
- Preventative action is always delayed. Decision makers only act when they have no choice.
- Regulations are not adhered to. (They are often unrealistic for those who have to implement them.)
- Decision makers only tell what decision have been made, not how or why, or possible consequences.
- Important decisions are made by those 'above' us and we have no control over them. Decision makers are not accountable.
- They suspect that economic interests dominate – particularly the interests of 'big' companies.
- Innovations in the primary sector encourage intensification and industrialisation (Marris et al., 2001: 50).

Public Perceptions of Key Actors

In the PABE study it was observed that there were two sides to the public perception of scientists. In the first, science is "neutral and autonomous from society" and in the second, science is "part of society and influenced by contingent factors". The first perception implies that scientists and their knowledge is neutral and the responsibility for misuse lies with others. The second perception acknowledges that scientists are 'normal' human beings dependent on funding and institutions for their work (Marris et al., 2001: 62). The latter viewpoint is supported in New Zealand by Cronin and Marchant (2002: 28) who found that people thought that though scientists were motivated by research, they were also motivated by financial incentives, personal ambition and institutional issues. The link between science funding, commercial interest and distrust in the integrity of scientists was raised at the Royal Commission (RCGM, 2001: 64-65).

The PABE report says there was a lack of awareness by the public of present regulations for GMOs and anyway rules were usually broken. Consumer and environmental non-governmental organisations (NGOs) were seen as no more trustworthy than other institutions as they had their own interests to promote (Marris et al., 2001: 63). In New Zealand the perception was that anti-GE groups were motivated by a concern for the environment and for people, to protect New Zealand and by a wish to proceed with caution (Cronin and Marchant, 2002: 29). In Europe, commercial firms were seen as the "main driving force" for GMOs with the big multinationals being solely profit driven to the extent that if they said they had other objectives the public saw them as even more untrustworthy (Marris et al., 2001: 64).

Information Wanted by the Public

Marris et al. (2001: 19) would title this section "definitions of the issue made by dominant institutions" because it describes what information the public want and therefore it must be assumed that this is not the information the public are getting.

The general feeling people had of not being informed was found to be a dissatisfaction with the quality of information provided. They wanted better labelling of products (Marris et al., 2001: 65; Norton et al., 1998) as this was related to personal choice and control, and wanted information from neutral sources or a variety of sources. Lack of information was seen as intentional (Marris et al., 2001: 65). Grove-White et al. (2000) talk of "technical opaqueness". The debate in New Zealand was perceived to be two-sided by respondents in Cronin and Marchant's study (2002: 40) with both sides espousing the rhetoric of "if you knew what I know, you'd believe what I believe" (ibid.: 41). This leaves the public caught in the middle and its members tend to 'tune out' which means that certain things do not get to be discussed (ibid.: 40). "Opportunities for true talking and listening are limited – and tend to disappear in political set play" (ibid.: 41).

Key questions the focus group participants in the PABE study wanted answers to were:

- Why do we need GMOs?[11] What are their benefits?
- Who will benefit from their use?
- Who decided they should be developed and how?
- Why were we not better informed about their use in our food, *before* their arrival on the market?
- Why were we not given an effective choice about whether or not to buy and consume these products?
- Do regulatory authorities have sufficient powers and resources to effectively counter-balance large companies who wish to develop these products?
- Can controls imposed by regulatory authorities be applied effectively?
- Have the risks been seriously assessed? By whom? How?
- Have potential long-term consequences been assessed? How?
- How have irreducible uncertainties and unavoidable domains of ignorance been taken into account in decision-making?
- What plans exist for remedial action if and when unforeseen harmful impacts occur?
- Who will be responsible in the case of unforeseen harm? How will they be held to account? (Marris et al., 2001: 48)

Most people had a high awareness of GE but admitted that they did not understand it (Gamble et al., 2000: 1). In their discussion Cronin and Marchant (2002: 38) said that they found people "self-effacing" about their knowledge of biotechnology. A common response was, "I don't know enough," but in fact people had well informed responses and reasons. Cronin and Marchant felt that a "distinction should be made between understanding the scientific process of GM and appreciation of the wider issues raised by technology and its potential effects" (i.e., the "public is not inherently incapable of grappling with complex science"). The public wish to be better informed but scientists were not actively involved in communicating their science within their own communities.

As is apparent from this section, the information the public wants relates to the concerns about risk discussed earlier in this chapter.

[11] Questioning the need also arises in the Royal Commission Report (RCGM, 2001: 62-63).

Perceptions of the Public by the Dominant Institutions
Grove-White et al. (2000) carried out interviews with stakeholders, and focus groups with members of the public, on access to information about new technologies. They decided that public concern about new technologies arose out of a perception of the public's inadequate knowledge and the denial by industry and Government of uncertainty and ignorance (ibid., 7).

The PABE report writers developed ten dominant so-called 'myths' of the public held by stakeholders and proceed to show them to be incorrect (hence the use of the word 'myth') (Marris et al., 2001: 75-90). Certainly some of them may be present in New Zealand stakeholders but the only research to demonstrate this partially is that of Cronin and Marchant (2002: 27-8) who found that people were cautious about trusting scientists and similarly the scientists did not trust the public because they felt that they did not understand GM and made decisions for the wrong reasons.[12] Industry viewed human beings as consumers (of products and services) in a one way market model of something that is a complex human interaction (Grove-White et al., 2000).

Technology as a Whole Social Experience and Projection
There were several references to how people related biotechnologies to the experiences and knowledge they had already had. For example, Gamble et al. (2000) in focus groups on attitudes to GM food, found that New Zealanders associated GE with pesticides and additives in food. In America, the US Food and Drug Administration Department (USFDA) found that a major worry was for long-term health problems not identified by current scientific knowledge. This was related to public awareness of the use of pesticides, growth hormones and antibiotics (USFDA, 2000).

2.3.2 Living Organisms and 'Nature'

Participants were aware of the "complexity and interdependency of ecological systems" which contrasted with the perceptions held by scientists and GMO promoters, of the public as ignorant when they express concern about transferring genes across human, animal and plant boundaries (Marris et al., 2003: 52). One submission presented to the RCGM stated one of the sources for humans' sense of difference from the rest of 'nature':

> Our religious tradition teaches us that we are much more than mere chemicals … Humans, cannot then, in the Christian view, be reduced to their genes, in a genetic reductionism. Humans are not merely the reaction of their genes with the material environment (Richard Davis in RCGM, 2001: 22).

Natural selection was seen as a way of maintaining some balance in nature (Marris et al., 2003: 51).

Moral Character of Risk
Some submissions to the Royal Commission were totally opposed to genetic modification on cultural, ethical or spiritual grounds (RCGM, 2001: 43). GE was seen as interfering with nature, playing God, or unethical (Macer, 1994). Those who believed in God found genetic engineering of plants and animals less acceptable than those who did not believe in God in an Australian survey (Norton, 1998: 181). The unknown or unpredictable aspect of biotechnology was related to the perception that people were "tinkering" or "upsetting the

[12] Cronin and Marchant (2000: 48-54) did not have questions about business stakeholders in their interviews.

natural balance of nature" (Mackay et al., 2000: 11). GE and biotech innovations were perceived by members of the public as "unnatural" and an inappropriate intervention in "nature" (Gaskell, 2000; Shaw, 2002; Straughan, 1992). The implication is that 'natural' is good, unnatural is bad, and interference tampers with natural processes (Boulter, 1997: 244). In a survey it was found that the public perceived GE food as unnatural (Gamble et al., 2000). GMOs were viewed as 'unnatural' and genetic modification was regarded as "qualitatively different from any previously used technique" (Marris et al., 2003: 65) as it was producing things that would not have existed otherwise though for some they were seen as the logical next "step in the human history of manipulating Nature" (ibid.: 66). (This ambivalence about the development of biotechnology is developed later.)

Cronin and Marchant (2002: 19-20) found that the most acceptable biotechnologies in the ten GM examples they offered interviewees, were those moving genes within a species. The examples were less acceptable the further the distance between species. Interviewees, including scientists, did not generally hold black and white opinions (ibid.: 19, 39). Cronin and Marchant also identified a "yuck" factor (ibid: 19). There were different attitudes to research focused on humans and animals compared to plants and micro-organisms (Norton, 1998: 179; Norton et al., 1998). The former was viewed as unnatural, harmful and dangerous whereas the latter was "beneficial, progressive and necessary" (Frewer, Howard & Shephard, 1997).

Alternatives to Biotechnology

An alternative to this expansion of biotechnology could be a focus on prevention rather than cure and as a result placing more emphasis on lifestyle (slowing down, a greater attention being paid to social relationships, a closer connection to the natural environment). There could be a "more equitable distribution of profits". Hence overall, there would be "a redefinition of progress" (Marris et al., 2003: 66).

2.3.3 End Use

Medical and Food Applications of GMOs

End use was important. If something helped human health or cleaned up pollution then it was more acceptable than increasing the shelf life of a product or making a fish grow faster (Cronin and Marchant, 2002: 19). Medical uses were seen as the most acceptable as long as there were no side effects, the benefits were 'real', there was a "good reason" for it, and there were controls. There was a general concern about what goes into our bodies,[13] and the question of who was reaping the benefit (Cronin and Marchant, 2002: 24). Over 68 percent of the Royal Commission's written submissions found the use of GM in food unacceptable (RCGM, 2001: 188) and 69 percent in a survey carried out by the Royal Commission thought that "genetically modified processed food" had "more disadvantages then advantages" (ibid: 190). In comparison there was found to be wide acceptance of GM in the prevention, diagnosis and treatment of disease (ibid.: 239-240).

The PABE researchers also found that there were more positive perceptions of medical than food applications of GMOs in Europe. These were attributed to much more than personal benefits, and the contrast was made between buying a food and taking medication. The latter is to do with curing or managing disease, saving life. Often there are no alternatives, whereas

[13] This as well as the long-term impact of GE food on present and future generations was a concern of focus groups in Queensland and a national Australian survey (Norton, 1998: 178-180).

the former involves choice, and a surplus which could be used in poorer countries. Need was to do with societal need rather than personal benefit (Marris et al., 2003: 52).

Certain assumptions were made about medical therapies. Participants in the PABE study felt that information was provided on these as compared with no information for food. Such information was usually from a trusted source. Medicines were presumed to be well tested and to have passed through various regulatory procedures, but it was felt that GM food had come on to the market too quickly for thorough testing to have taken place. It was thought that medicines were monitored after their commercialisation. Food was not (Marris et al., 2003: 54). The use of medicines was linked to traceability, the provision of information and labelling (ibid.: 55).[14]

Motivations

Participants in the PABE study thought that agricultural genetic modification was aimed at producing commodities of low price and low quality and demand for them was created by the manipulation of consumers. GM medicine on the other hand was of high price and quality, and though produced in a competitive and profit driven environment, was regarded as acceptable because its development was responding to human need (Marris et al., 2001: 55).

However, this did not mean that all medical GMOs were regarded as 'ideal'. Participants discriminated on the basis of:

- The reason for the genetic modification.
- The type of organism to be modified. (There was no concern for micro-organisms but increasingly for plants, animals, and humans.)
- The source of the different gene. (There was more concern about gene transfer across 'kingdoms'.)
- The history of use – it was more acceptable if already in use.
- Containment.

It was felt that GM should only be used if there was no alternative (Marris et al., 2001: 57-8).

In a Spanish study it was found that there was a reluctance to have genetic engineering applied to food production even though it was assumed to be beneficial to humanity (Lujan and Moreno, 1994). In contrast, in New Zealand the genetic modification of food was seen as unlikely to relieve hunger in the world because there was already enough food but the distribution was inequitable (Mackay et al., 2000: 19). In the PABE study participants were sceptical about statements that said GM crops would lessen world hunger and poverty (Marris et al., 2001: 52, 58). They could not see any need for GM food unless there was a threat of extinction (ibid.: 52).

2.3.4 Gender Issues

Napolitano and Ogunseitan (1999) found men more supportive than women of GE techniques as a socially beneficial field of research in a survey[15] carried out to establish perceptions about the use of GE to manipulate the outcome of human reproduction. New Zealanders, Gamble et al. (2000: 3) found men more supportive of GE in food production, and women

[14] The Royal Commission noted that "confusion exists over differences in the regulation of dietary supplements, food and medicine" (RCGM, 2001: 239, 257-263).
[15] It in not clear which country this relates to because the information was taken from the abstract.

more concerned than men about food safety (Gamble and Gunson, 2002: 9). Norton found that women thought the genetic engineering of plants and animals was less acceptable than men, and were less likely to see it as having any benefits (Norton, 1998: 181). However, other research has not supported such gender differences (e.g., Frewer, Shepherd and Aaron., 1998: 391, in the UK).

2.3.5 Ambivalence

The PABE researchers noted that participants expressed ambivalence about GMOs seeing both the positive and negative possibilities (Marris et al., 2001: 68-9), discriminated between them, but did not have hard line opinions. Sometimes one person would express opposing opinions within the same utterance (ibid.: 47). Health and the environment were seen as linked and so there was an ambivalence about food as it was necessary but was both a source of pleasure and risk (ibid.: 67) or as Hugh Campbell said at the Royal Commission, "humans have an "ongoing ambiguous and paradoxical relationship" " with food (RCGM, 2001: 193).

Ambivalence and Anxiety About Socio Technical Change

European participants felt *ambivalence* (Bauman, 1991)[16] about the way society was changing because they were aware of both the good and bad elements of change (Marris et al., 2001: 70). Some participants in the IBAC research viewed the fear of "upsetting the balance of nature" as limiting progress (Mackay et al., 2000: 11). According to Marris et al. members of society are also experiencing *ontological insecurity* (Giddens, 1990: 92-100; 1991: 243) because of the instability of social identity in a time of rapid social change and this is "giving rise to diffuse … anxiety" (Marris et al., 2001: 70). If this is so then the response to biotechnology can be seen as part of a greater issue of living in contemporary society.

The Royal Commission on Genetic Modification demonstrated some awareness of this by emphasising the shared values that the Commissioners felt were held by New Zealanders: the unquiness of Aotearoa New Zealand, the uniqueness of our cultural heritage, a concern for environmental sustainability, an awareness that we are part of a global family, the importance of having freedom of choice, and the importance of participation in a democracy (RCGM, 2001: 11-12). The Commissioners were concerned that any decisions about GM should be made within this framework.

2.3.6 Sense of Alienation

There was a perception among PABE participants that social and technological change was speeding up (Marris et al., 2001: 67) and they were powerless to affect this change. The driving force for this change was the seeking of economic gain over environmental and social concerns. There was some acknowledgement by participants that they played a part in this by, for example, buying out of season fruit (ibid.: 69). However, this has led to a feeling of a "sense of alienation", a "lack of agency", and a "lack of control in the life-world". Decisions affecting everyday life were being taken by distant institutions which were not open to influence by and not accountable to ordinary people. Political elections were not an adequate way of dealing with this (ibid.). Lyn Frewer in her submission to the Royal Commission suggested that one of the causes for the lack of public confidence in GM had been the exclusion of the public from the debate about it (RCGM, 2001: 193-4).

[16] See also The individualized society (Bauman, 2001), Community: seeking safety in an insecure world (Bauman, 2001) and Society under siege (Bauman, 2002).

The authors of the PABE Report felt that the attitude to institutional behaviour would be better described as sceptical rather than a lack of trust.[17] Participants related to the food system as consumers not citizens and saw the only way they could exercise power was by 'not buying' a product. (But this power was dependent on labelling.) This was linked by the authors to how much a market ideology has pervaded all levels of society. Such an ideology is regarded as unsatisfactory but people see no alternative (Marris et al., 2001: 69-70).

Similar perceptions were found in other countries. In Sweden, GMOs were part of a wider debate on human agency, everyday epistemology and trust. Participants answered questions with questions, for example, can we trust the information we receive? (Adelsward, 2001). In the UK risks were related to a perceived lack of control over new technologies (Frewer et al., 1994). In America there was a "degree of technological fatalism; the belief that ordinary people can't have much influence over the spread of new technologies …" (USFDA, 2000: 4).

2.3.7 Uncertainty

> … there is an inherent unknowability, as well as unpredictability, concerning ecosystems and the societies with which they are linked. There is therefore, an inherent unknowability and unpredictability to sustaining the foundations for functioning systems of people and nature … (Holling, 1998).[18]

Uncertainty was a dominant theme and the authors of the PABE Report felt that it would be more accurate to talk about 'public perceptions of uncertainty' rather than 'public perceptions of risk'. This centred about a concern for the long-term or possible chronic impacts of biotechnology. Uncertainty was seen as a "fact of life" supported by past experience. Hence, the denial of uncertainties by officials and stakeholders was unconvincing. The perception by stakeholders that the public demanded zero risk was demonstrated to be incorrect. Participants wanted to see long-term monitoring and contingency plans in place should things go wrong (Marris et al., 2001: 59-60).

This acknowledgement of uncertainty led to the question of need for the biotechnology (see the questions raised earlier). Did the need justify the uncertainty? Hence the divide between ethical issues and risk becomes fuzzy (Marris et al., 2001: 61, 92).

2.3.8 Key Policy Implications

According to the PABE authors there is a need for cultural change in institutions. There should be a commitment to practice and governance rather than public relations and communication exercises (Marris et al., 2001: 91). The public are already aware of the uncertainty and ignorance that surrounds the potential long-term impacts of GM biotechnologies so an acknowledgement that science does not have all the answers would lead

[17] This implies this attitude is more like a distancing tactic indicating that people are divorcing themselves from such behaviour thus demonstrating that their behaviour is not like that (Cohen and Taylor, 1992; Goffman, 1959, 1961).

[18] Holling is a leading ecologist who sees "ecological science as capable of bridging gaps between two very different scientific ways of seeing the world. One way is well represented by advances in molecular biology and genetic engineering. It is an analytical stream of biology that is essentially experimental, a science of parts, reductionist, and disciplinary in character. The second stream is integrative, broad and explorative, characterised by evolutionary biology. Its premise is that "knowledge of the system we deal with is always incomplete. Surprise is inevitable." " (Cited in Green, 2001: 35.)

to increased institutional trust and better science. The public need to know what the cost of the uncertainty is. For example, it needs answers to questions such as: Why are you doing this? Who does it serve/benefit? (ibid.: 92) What are the alternatives? (ibid.: 94). The objectives of public participation would be to "open up expert knowledge to reflexive questions about its own framing …" (ibid.: 93).

Gallopin, Funtowicz, O'Connor and Ravetz (2001: 228) propose that a model for research into complex biological systems should: "involve policy makers and stakeholders in the initial problem characterisation", "clearly distinguish between the knowledge base (including scientific uncertainties) and the political decisions (incorporating social values)", "consider the possible repertoire of behaviour of the whole system as broadly as possible" therefore preparing "for novelty, structural change and surprise", and "value the information generated by the responses of the system to policies and human actions".

New Zealanders, Cronin and Marchant (2002), see two important elements as needed in the future: ways of instituting social debate, and a different framing of issues. These elements may not just relate to science but to other issues in our society (ibid.: 41). Two crucial issues involving ethics and the future seem to be overlooked as the debate focuses on specifics. "What kind of world do we want? How can the benefits be shared?" (ibid.: 42).[19]

The IBAC report felt that there were particular issues to be faced in New Zealand. The first is the need to have a consideration for Māori perspectives. There is a necessity for a shared philosophical and ethical framework to guide biotechnology development. Finally, what roles are ERMA and the Australian and New Zealand Food Association (ANZFA) to play in regulation (Mackay et al., 2000: 3, 15-25)? There were a lot of 'exercise caution' and 'slow down' type responses (Mackay et al., 2000: 8) and the question of whether New Zealand should go wholly into organic food production or allow the production of GM food (Mackay et al., 2000: 8, 11; also RCGM, 2001: 87-9).

2.4 Discussion and Summary

This chapter has described some historical and contemporary issues that may have influenced the debate about biotechnology in New Zealand. It has then gone on to identify the factors found to influence people's perceptions of biotechnology from a broad sample of the literature, with particular emphasis on recent research in Europe (the PABE Report), in Australia, and New Zealand. People's perceptions of risk were found mainly to centre around certain perceived qualities of risk such as how much choice was able to be exercised over the use of a biotechnology, what was the benefit compared to the risk, and the anxiety about potential negative impacts on health and the environment. Many of these perceptions were related to issues to do with the level of trust in, or rather a scepticism about, both commercial and public institutions involved in decision-making about biotechnology, and the information that the public was given compared with the information they would like to have. The quality of information was often related to the perceptions that such decision-makers had of the public. In addition there were factors of an ethical, cultural and moral character associated with attitudes to living organisms and nature. The end use of a biotechnology played an important part in its acceptability, with a greater acceptance of genetic modification in medical applications than in food. Some writers have commented on the ambivalent feelings that are prevalent about biotechnology, the lack of power that people are experiencing over its

[19] Cronin and Marchant did not have questions in their study about the role of business or regulators/Government in GM and its communication, only scientists.

use and how these factors relate to living in a world filled with uncertainty. As has been emphasised in a discussion paper released by the Parliamentary Commissioner for the Environment, policy and decision-making takes place in an environment complicated by:

- *uncertainty* (for example, uncertainty about cause and effect relationships, and outcomes)
- *dispute (for example, conflicting opinions, beliefs, interests, values, and paradigms)*
- *distrust (for example, lack of trust in science, decision-making processes, and decision makers)*
- *poor communication (for example, leading to a lack of awareness of the issues) (Taylor et al., 2003: 8).*

It is suggested that there is a need to find ways of helping people to participate in this contemporary society as more than consumers. As Gerrard (2000: 435) said of the BSE crisis in Britain, the debate needs to be re-democratised "so that values other than purely scientific and technological ones can be injected into the deliberating process".

> Many, perhaps most, significant disputes about the use of science and technology in society centre on issues of ethics, equity, and justice, and how to choose the most prudent collective course of action … not necessarily on the science itself (Priest, 2001: 126-7).[20]

[20] Cited in Taylor et al., 2003: 52.

Chapter 3
Themes from the Methane Reduction Device for Sheep Exemplar

3.1 Introduction

The next six chapters present an analysis of the data collected from the focus groups in this study. Chapters three to seven relate to one of the five exemplars raised for group discussion and acceptability ranking. Chapter eight gathers together the findings into elements common across all the exemplars. Six generic themes have been used to help categorise the common factors that play a part in the acceptability of a biotechnology. The use of these themes gives each of the five chapters a common structure, even though this structure emerged in practice out of the individual analysis of each exemplar.

The first and by far the largest theme relates to all the issues to do with the impact of the particular biotechnology in the exemplar. This theme covers:

1) the broad area of risk, including approval of the biotechnology with certain provisos, fears[21] that participants had about it, areas of distrust, and what further information they would like to have;
2) the perceived benefits of the biotechnology;
3) the micro and macro perceptions and their relationship to ranking;
4) the pragmatic, 'if it works, is simple and does not cost too much, then use it' approach; and
5) ethical issues.

The second theme is to do with participants' views on nature and naturalness, of everything having its place in the world. These views were usually employed to argue against the use of a biotechnology. The third theme describes how participants' personal knowledge and experiences affect their decision making and the way they make these biotechnologies meaningful to them in their everyday lives. The fourth theme is partially related to this and outlines how particular words and their associations in our culture impacted on participants' rankings. The fifth theme underlies most of the others and relates to the freedom of choice in the use of biotechnology. Some participants were very happy for a biotechnology to be used as long as they did not have to use it or it was not being used anywhere near them. Thus this theme incorporates what has become known as the NIMBY or 'not-in-my-back-yard' syndrome.[22]

Overlaying all of these themes is the issue of power and responsibility, the sixth theme. Who do participants feel are making the decisions about the development and use of biotechnology and what are their motives? What do they themselves feel they have ownership of and what is the responsibility of others? Some of the factors above touch on these issues but they were addressed further by reflecting on who participants might mean when they used the words 'we' and 'they'.

[21] By 'fear' we mean some acknowledged anxiety or apprehension.
[22] This expression is usually used in the situation where homeowners do not want some institution such as a prison based in their residential area.

3.2 Background and Ratings of the Exemplar

EXEMPLAR

- Methane from sheep's stomach = greenhouse gas → device in stomach releases bacterium → slows down methane production.

Methane is produced by sheep in their first stomach and is mainly emitted by belching.[23] Sheep are the major source of methane in New Zealand. It is one of the major greenhouse gases contributing to global warming. This exemplar proposed that a device, a plastic device containing bacteria, is inserted into a sheep's stomach to slow down the methane-producing bacteria and reduce the amount of produced.

New Zealand has long been associated with sheep. This association was implicit in the majority of the responses to this exemplar with many references to animal welfare. The dichotomous nature of this concern for sheep emerged as questions were raised about the effect of this biotechnology on sheep meat. There is an inherent tension between the concern for animal welfare and the instrumental use of animals for food (Macnaghten, 2001). As can be seen from Table 1, there was an almost equal division between those who found the technology acceptable and those who found it not acceptable.[24] Most of those who found it acceptable had the proviso 'as long as there was no harm to the sheep'. It is worth noting that the rural communities (Waimate and Waipukurau) were not favourably disposed towards this exemplar and that this was usually to do with factors other than animal welfare issues.

Table 1
Acceptability Rankings for Exemplar 1, Methane Reduction Device for Sheep [25]

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	1	5	1	2	1	0	10
Auckland 2	3	1	2	1	3	1	11
Auckland 3	1	3	1	3	2	0	10
Christchurch 1	7	2	3	0	0	0	12
Christchurch 2	2	1	3	3	1	0	10
Dunedin 1	1	4	6	1	0	0	12
Dunedin 2	1	1	2	4	1	0	9
Nelson	7	0	2	0	1	0	10
Waimate	2	0	2	4	3	0	11
Waipukurau	0	1	2	2	5	0	10
Wellington	5	1	2	3	1	0	12
Total	30 (26%)	19 (16%)	26 (22%)	23 (20%)	18 (15%)	1 (1%)	117

[23] In spite of the acronym FART used by Farmers Against Ridiculous Taxes.
[24] Appendix I contains all the tables of the acceptability rankings for each exemplar for easier comparison.
[25] When participants were asked to rank the five exemplars there was frequently some confusion over whether they were ranking relative acceptability across all exemplars, or outright acceptability for each individual exemplar. This is apparent in the rankings tables (Tables 1,2 5, 6 and 7) where there is not an even distribution over the 'one' to 'five' rankings either in each focus group or across all groups. However, the tables are still a useful record and can be taken as broad indication of the acceptability of different exemplars although the central ranking of 'three' may not indicate 'ambivalence' and the 'four' and 'five' rankings may just mean still acceptable but less acceptable than other exemplars rather than 'not acceptable'.

3.3 Assessing the Impact of the Biotechnology: Risks and Related Issues

3.3.1 Provisos: "I would accept this as long as …"

Many participants found this exemplar acceptable as long as certain conditions to do with sheep welfare and the impact of the technology on meat quality, were met, as the flowing quotes illustrate.

> Female A: I'll rank it this as long as the sheep's not in pain ... can't just say, oh, it's just another sheep. Instead it's just another sheep five million times!
> Male: Provided no harm to the meat or the sheep.
> Female B: Yes, that's what I put.
> Male: I also gave it a 'four' [acceptable rank][26] if there is damage to the sheep. (laughter)
> Female B: It can only be a 'one' if there's no harmful effects (Christchurch 2).

> So as long as it doesn't affect the health of the sheep or the condition of the sheep, the ability of the sheep to digest its food, then it's alright (Male, Nelson).

3.3.2 Fears

Frequently participants feared that the biotechnology in this exemplar would harm sheep. This was often expressed by the participant putting themselves into the place of the sheep. Interestingly an Auckland group of Asian participants had the most concern for sheep welfare. A young man in this group said:

> Oh well, really a simple logic, right? It's like, how many sheep – couple million sheep? Yeah, right. Couple million with a device in their stomach. It's not very comfortable I presume … I mean who came up with this ridiculous idea? Seriously. This is animal cruelty (Male, Auckland 3).

Very few people had any realistic notion of just how many sheep there are in New Zealand. (The suggestions ranged from two million to five million.) The group of Pacific Islanders did not mention this aspect. Sheep appear to be part of the New Zealand image sold to immigrants whereas Pacific Islanders residing in New Zealand, often live in an urban environment (and are probably restricted in their travel outside the city) and sheep are not part of the fauna of the Pacific Islands.

Many participants identified themselves with how a sheep would feel. One man said, "The sheep look sad" (Dunedin 1) and a woman said: "I sure as hell wouldn't like something shoved … down my throat (laughter) or up the rear end, and have to carry that around for the rest of my life" (Waipukurau). A similar thing was said in two other groups.

This led on to the feeling that sheep would have no choice and therefore need humans to take their side, act as their advocates. The women were particular eloquent about this. One said, "Poor old sheep can't talk for itself"(Christchurch 2) and another:

[26] Square brackets in quotations indicate that words have been added to help the reader. Not in this quote but in others, spoken language may not make grammatical sense.

> I think sheep cannot talk. We cannot understand what they say. (Laughter) Yeah, the discomfort – I think when you are using a device like this, unless you are very sure because it's an animal. If it's a human you can say, "Oh, I'm having a problem" (Female, Auckland 3).

Participants were concerned that this biotechnology would increase on-farm costs and that this would be reflected in an increased market price for sheep meat, reducing exports. They also were worried that such a technology, if not used by other countries could give New Zealand a negative (or a positive) image and impact on the sale of New Zealand products.

Another issue for participants was the 'problem-solution-problem' scenario. Could this biotechnology cause other problems in future? If a biotechnology that is a living organism can be contained then it is easier to reverse its impact:

> One can argue that it might be difficult to contain. Once there's something wrong in the stomach, you know, it goes on to the meat chain and the supermarkets and people eat it, you know. So it's not quite localised in a way and it's difficult to contain the damage (Male, Auckland 3).

Participants most frequently asked these questions for this exemplar:

- Will it affect the 'dung–soil–food' chain?
- Could the bacteria mutate?
- What would be the effect of reducing methane?
- Can it be contained?

3.3.3 Distrust: Challenging the Motivations and Knowledge of Stakeholders

There was a pervading distrust of Government and in this exemplar participants took issue with the Government's signing of the Kyoto Protocol, an international agreement to limit climate change. They doubted whether New Zealand actually contributed much to global warming, as the following quotes illustrate.

> Participant A: Don't we have to come to the initial problem and say, "What is the problem?" How much of this gas is being produced by New Zealand?
> Participant B: You're dead right.
> Participant C: It's only [about] point two of a percent.
> Participant D: It's absolutely absurd.
> Participant E: One factory shut down in Russia or America could solve our problem.
> Participant F: I gave it a 'four' [acceptability rank] actually because I didn't think it was that important (Waimate).

> You've got to look at … the grand scheme of things. By how much would it reduce the overall methane production? Is our contribution through cows and sheep doing their business – is that a serious factor or is that just our little token of what we can put into the world and say, this is what we are doing (Female, Nelson).

With a biotechnology such as this there is always going to be the question of the assignment of costs and a good case would have to be made for farmers paying for something that supposedly benefits the country and the world. Some participants were not impressed by the Government attempting to charge farmers and instead felt let down by what they saw as a lack of support for agriculture: "… we're supposed to be supporting farmers. They're supposed to

be the backbone of this country" (Female, Waipukurau). Judging by the responses of participants in these focus groups the merit of the Kyoto Protocol cannot be assumed. If the Government wants popular support it needs to make its arguments for global warming more widely understood and accepted (see next section). There were always those who thought that any new biotechnology was driven by "… somebody [who] wants to make a few dollars" (Male, Waimate).

A general feeling of the focus group participants was that scientists have not thought of the things that they are concerned about. This suspicion lurked underneath most questions and is developed further in the next section.

3.3.4 The Need For More Information

Participants wanted information about both the biotechnology and the particular problem the biotechnology supposedly addressed. For example:

> The effect of bacterium on lamb and sheep consumers. You know, will they be ingesting that? Also their by-product, dung into the ground – bacteria. So I mean, what is the impact environmentally of that? I guess for myself I'd like to know what the expected methane savings are actually going to be. I think to undertake something and not know what the benefits or the outcome of the results you're looking for [is wrong]. I would want to know. But also what are the alternatives in grass types and sheep breeding? So that perhaps you could have a breed of sheep or a type of grass for feeding that they produce less methane too (Female, Wellington).

These questions were followed up by a concern about the impact of the biotechnology and whether there were alternatives. Some felt that other issues were more important. Overall the number of questions that people asked and what they asked them about indicated a feeling that they were not happy with the information provided – both by the facilitator and in terms of what they already knew. It was not the sort of information they wanted or there was not enough of it. The former was a construct of the research because the input from the facilitator was deliberately kept at a minimum to find out participants' initial reactions to the exemplar and what sort of information people in general would want to know.

In this instance participants tended to want information about the whole greenhouse debate – the 'macro' facts as exemplified by these most frequently asked questions:

- What is methane?
- What is New Zealand's contribution to greenhouse gases compared to other countries?
- What about other greenhouse gases? Should we be reducing them rather than methane?

In Waipukurau one male participant suggested, "It must be more than sheep" that contribute to greenhouse gases, to which another man replied, "Motorcars – what the hell are they doing?" (Waipukurau). Another man wanted to know how much human beings contribute to greenhouse gases:

> One of the things I'd be very interested to know is, in terms of calculating, for the Kyoto Protocol, taking into account all the animals we have in New Zealand that produce gas, was it actually taken into account that humans produce gas on the planet?

> Because I mean, there are X number of million people in Asia and Europe, who give off probably just as much gas as our sheep (Male, Dunedin).

The argument about how much a small country like New Zealand could be responsible for greenhouse gas emissions when compared with other countries is further exemplified in this discussion in the Nelson group:

> Male A: Yeah, I've got it third as well. It just seems such a small thing compared to the US and those sort of places. They haven't signed to the Kyoto Protocol thing. I don't see it as a big priority really. Compared to the US our greenhouse emissions are just minimal really. I know overall we are contributing to it but there are other ways we can do it other than sheep and cows … just not that big a deal compared to the US – till they do something about it … 'Cos we signed up to this thing. Again, who's going to pay for it? That's the big question. It seems such a small thing [and] a lot of money to spend in doing it. It's just going to kill the project really.
> Male B: It's not a small thing is it? What sort of a percentage reduction would you get?
> …
> Male C: I don't think you should rule it out just because another country – the US is much bigger politically – don't dispute that. But I don't think you should say, well they haven't done anything so we're not going to do anything either. It's not a lot of work (Nelson).

The participants wanted to know both micro and macro facts about this biotechnology, e.g.:

- How much will it reduce methane emissions?
- What was the device made of?
- How is it to be used?
- How will you know whether it's working?
- How does the device reduce methane?

Then they wanted to know about the specific impacts of this biotechnology, e.g.:

- What is the effect on sheep of the insertion of the device, of the device being inside the sheep, of the reduction of methane production in this way?
- Will it affect taste, quality and texture of the meat?
- How will it affect us when we eat it?
- What will it cost?
- Are there any environmental impacts?
- What else could happen as a result? What will it lead on to?
- Will there be any economic impact on exports?

Participants believed there was a need for alternative research on methane production in animals, e.g.:

- Are there cheaper or more natural ways of dealing with this problem?
- Are there relationships between methane production and animal breed, stock feed/pasture type and fertilisers?
- Should the cause be dealt with rather than ameliorating the problem?
- Could the bacteria be administered to the animals by spraying it on pasture? (Suggested in Christchurch 1)

It was thought there should be research into other areas of green house gas production. The same amount of effort, research and money could go into reducing car exhaust emissions, for example. There was a belief that such research would effect a greater reduction in poisonous gases and greenhouse gases than this biotechnology.

Some felt that other areas of agricultural research such as that on facial eczema, flystrike, and the developing immunity to sprays dealing with these problems, should be given a higher priority than this research. A participant was aware of New Zealand's limited resources and hence the importance of prioritising: "We're obviously a smaller country here and we're limited to what we can play around with" (Male, Waimate).

3.3.5 Benefits: People and Environment

Despite the need for more information and so on, there was a strong feeling that something does need to be done about greenhouse gases and that this was a long-term issue. Participants felt that this biotechnology had these positive aspects:

- It could bring a long-term benefit.
- It benefits people and the environment. The benefit is global.
- Humans benefit by something being done to animals.
- It looks as if it is cost effective.
- It is reversible.
- It is practical and simple (see below).

3.3.6 Pragmatism and Simplicity: How Much Does It Cost?

Each group contained at least one pragmatic person who would say, " I just thought if it works, why not?" (Male, Wellington), particularly if the biotechnology appeared to be simple and affordable. This exemplar drew out some of the pragmatic issues of implementing a biotechnology and those in farming communities took this up more markedly as they were aware of the cost of the biotechnology in farmer-time as well as in money. There were those who were all for simplicity: "Because – it would be a bit of a hassle putting it in – but beside that point … basically if it does that without affecting the sheep it struck me as quite a simple solution for the problem ..."(Male, Waimate). Others thought the "hassle" mentioned above would be just too much:

> … there's enough difficulty drenching sheep and playing around. You've got 1,000s of them to do for one person. The economics of it – sheep have a short life span ... I just think it would be totally unrealistic unless it was a particularly cheap and particularly simple operation (Male, Nelson).

The cost to farmers was a worry, not only in money terms but in time and possible sheep mortality as a result of the insertion of the device. As this woman said, "I mean that just seems totally unrealistic to me. The cost of it would be totally prohibitive ... I mean we've got 2,000 sheep. Distorted. You'd probably have to withhold them for so long and oh …" (Waipukurau).

This also involved the issue of who was to pay, would the cost be passed on, and how would this cost impact on the sale of exported meat? If the use of this biotechnology became compulsory because of a Government initiative to satisfy the Kyoto Protocol and it resulted in

a global benefit why should farmers pay? There was some debate about how even if the Government did fund such a device it was the farmers who would end up paying for it one way or the other. One person asked, "… are the Auckland jaffas going to pay for it?" (laughter) (Male, Nelson), while another realised that there were further possible economic impacts: "All I see is the export amount prices going up and that means overseas consumers won't buy so much if it gets too expensive" (Female, Wellington).

3.3.7 Judging By the 'Size' of the Problem: The Macro Versus Micro Arguments

This exemplar presented participants with the question, what harm is acceptable at a micro level (e.g., harm to a certain percentage of sheep) compared to a global benefit from a biotechnology? For some participants it was important that a technology should bring a global benefit but for others this posed the greatest risk so they wanted biotechnologies that could be safely contained and limited in impact to individuals. Others asked whether this biotechnology 'solved' an everyday issue for them personally or was it something that may affect their health? Participants ranked an exemplar as more or less acceptable if it impacted on them personally. The man who said, "It's not a concern I have as a daily concern" (Christchurch 2) was one of the latter. The emphasis on research into human complaints may be more or less important than environmental issues: "I just thought it would make the least difference to my life … I was more interested in things that were going to help medically" (Female, Dunedin 2). Environmental issues seemed to be more often invisible to people, whereas medical issues were more 'real' and present. If a biotechnology promised to save lives then it deserved a higher ranking: "I think that anything that can save lives has to be good" (Male, Auckland 2).

3.3.8 Ethical Issues: Blame and Justice

As mentioned earlier there was a strong suspicion that the whole greenhouse gas debate was being stirred up for political ends, so people were torn between wanting to 'help' the global environment and wondering how big an issue it really was. And, if it was a 'real' problem, then who had created the problem in the first place? Was it really fair to do something 'nasty' to sheep making it seem as if it was their fault?

There was a perception that political problems are not 'real'. Was this just to be a token effort? As a result participants wanted to know why New Zealand signed the Kyoto Protocol. "… it happened by silly politicians" (Male, Waipukurau), "The whole fuss is ridiculous over it" (Male, Waimate) and it is "…a lazy way out by the Government" (Male, Dunedin 2) were three of the comments.[27] There was also a justice issue. If the USA has not signed the Protocol, why should New Zealand?

Some participants felt that is was unfair for sheep to bear the brunt for the solution to what was really a problem created by human society: "Because the greenhouse effect is increasing already – can't just blame it on the sheep" (Male, Waipukurau). Therefore, humans should bear the burden of 'cleaning it up'. "I mean, if it's a significant benefit, then there's there may be a reason to do it, but I agree with Y, it's something that humans could be taking as well, and I mean if everybody does it" (agreement and laughter) (Male, Dunedin 1). One even felt that a solution was impossible anyway because humans are 'sinful' (Female,

[27] Note that these mirror the recent arguments of farmers resisting the imposition of methane tax for research.

Wellington). Others expressed the opinion that methane production by sheep was 'normal'. Why blame them for doing what comes naturally? A participant summed it up:

> My question is, why do we need to bother suppressing a natural process of an animal to counterbalance a problem we've caused in industry? I ranked it 'five' personally because I can't see why we need to go sticking things down the sheep's throats because we've buggered up industry in the last 100 years (Male, Auckland 1).

This first theme has been about issues that have arisen about the impact of this biotechnology. The major issue for participants was how important an issue was it anyway. To accept that it was an important issue they had to trust Government and science because it was more difficult to know personally the reality of global warming. Yet they were aware that if it was a real issue it was very important and doing something about it could help the world.

3.4 Sense of Place: Perceptions of Nature and Natural

This exemplar brought to the fore the discussion of whether humans should try to change what are seen as 'natural' processes, and if we do then how should we do it and what would be the consequences.

There were many comments made by participants about methane production by animals being a 'natural' part of their digestion process and to change it would be to interfere with something that should not be interfered with. One man said, "… it's a natural occurrence so let it be" (Male, Waipukurau) and another felt that "You're interrupting their natural digestive process" (Male: Auckland 3). In contrast to this idea of humans affecting the process of nature, a woman said, "I'm natural. If I do it therefore it's natural" (Female, Waimate), and the discussion in her group covered how we modify our diet so why not modify that of animals.

> Female: Well you know yourself, if you suffer from gas it's something you've eaten. So you don't eat it or you modify what you're eating. You change your diet. Same thing for animals … You modify the diet.
> Male A: They're producing it all the time. It's part of their natural –
> Male B: Regardless of what you feed them. Ruminants are still producing gas.
> Female: But you can lower the gas, can't you? (Waimate)

It all comes back to the debate about whether we humans are part of nature or apart from it.

Some participants made a very subtle distinction between allowing a 'natural' process to continue and absorbing the result of that process or suppressing a natural process. There was a fear that suppressing something natural leads on to other problems.

Another side to the 'natural' argument is about what we put into our bodies (and therefore those of animals) and what impact that has. Participants made these points:

- The device is not made of a natural substance.
- It is inserting something foreign into a sheep, something that does not 'belong'.
- The whole idea is unnatural.
- The device will still be there when animal is killed.

There was a fear that putting something into a body that did not naturally 'belong' there would have negative consequences: "… this is not natural. This is artificial. Sometimes if you use artificial methods sometimes the cancer will grow – [the] probability's there" (Male, Auckland 3).

Participants expressed a great concern for sheep welfare. Such concerns were never expressed for plants. Some people believed that animals have feelings and therefore are 'closer' to humans than plants: "I put 'three' because if the potato [other exemplar] had feelings it would be easier for me … when you come to a sheep it's right – a bit more [like us] …" (Female, Christchurch 2).

3.5 The Role of Personal Knowledge and Experience

Some participants had taken a personal interest in this subject. They had read or heard about it and built up knowledge about it. As one woman said, "I've read about methane. They've been doing a study for a long time. I have read about it and I think of all the studies that have been made it is something that's extremely [important]" (Christchurch 2). This knowledge might have been quite specific to the exemplar or it might have been something that could be drawn on that was indirectly related. For example, one man related the chance of a bacteria mutating to the SARS virus:

> But in the sense that well, it's [bacteria] appearance can be changed and one can see the SARS virus right now. It changed from one bacteria to another and it caused quite a lot of harm to human beings. And if that bacteria mutates, well, we don't know what's going to happen to the environment or the animal (Auckland 3).

Participants' knowledge was not neccessarily 'correct'! Participants used their knowledge to help them decide what was important. This is one participant's summary of this exemplar. The first part is a reasonable account but the extrapolation at the end is dubious:

> What I'm saying is, there is actually a government tax which was quite seriously being talked about … called "fart tax", but (laughter) in actual fact it was gonna be a levy on farmers based on the number of sheep that they ran. And it was designed to – and the whole concept of triple bottom line accounting, of trying to take a tax so that the corrective measures could be put in place. So, basically the farmers are destroying the environment by their sheep producing methane, which destroys the ozone layer and err, the idea is that the tax is used to plant pretty trees somewhere to counter that (Male, Christchurch 1).

Some people had personal experience of farms and farming. Farmers know about drenching sheep and other animal health procedures, so for some of them using this technology was no different from other things they already practised, as this interaction describes:

> Male A: Just chuck in down their mouth and press a button. Next one.
> Male B: Fires it down their throat.
> Discussion: Spring loaded, press the trigger etc. (Waipukurau).

Others involved in farming were concerned about the cost and used their past experience to conclude that it would be farmers who ended up having to pay for the implementation of such a biotechnology. (See earlier section on 'Pragmatism and Simplicity'.)

3.6 The Need for Choice

It has already been mentioned that sheep would not have a choice about the use of this biotechnology, but there is a parallel here as farmers may also be facing a situation in which they have no choice as far as instituting farm practices to reduce greenhouse gas emission (and indirectly to this exemplar, paying taxes for research). It may become a regulatory requirement.

Some participants liked this exemplar because it would be the sheep receiving the 'treatment' rather than them! "… rather the sheep take the damn thing rather than me take the damn thing" (laughs) (Male, Wellington). Others thought it was a good idea but did not want to be the one inserting the device into a sheep: "You'd like to see it done but you wouldn't want to do it!" (Waimate).

3.7 Words and Their Connotations

The words used when a biotechnology is first presented can have an immediate and lasting effect on people.

> I gave it a 'four' mainly because of that word 'device'. If it was just like drench or anything like that, that they do all the time then that's fine. If you're putting liquid down - but actually putting a device into their stomach … (Female, Christchurch).

This effect is articulated as strongly positive or strongly negative. As another example, participants appeared to feel very positive about 'sheep', and as already discussed, expressed a great concern for their well-being, which often related to people's experience of farming. Urbanites had some strange and romantic understandings of what goes on, on a farm!

3.8 'We' and 'They': Setting Up Oppositions and Responsibilities

In this exemplar when participants used the words 'we' and 'they' to whom were they referring? What did participants personally identify themselves as having power over and what was ascribed to others? Where did they see themselves as powerless? What is reified?[28] (In the following quotes the square brackets contain our suggestions about what 'we' and 'they' might refer to.)

Participants strongly identified with farmers in this exemplar. They took ownership as if they themselves were the farmers. A woman said, "I saw on TV how uncomfortable overseas buyers are when we [identification with farmers] do something to our [farmers] animals …" (Waipukurau). A man spoke as if he himself would be inserting this device, and had personally caused the problem addressed by this biotechnology, when he said, "I ranked it 'five' personally because I can't see why we [identification with farmers] need to go sticking things down the sheep's throats because we've [society or farmers] buggered up industry in the last 100 years" (Auckland 1).

[28] In this exemplar the people who used 'they' most were the facilitator and one of the note-takers. In this way they may have unconsciously affected the attributions of the participants.

Similarly, participants identified themselves with agricultural scientists and demonstrated consciousness of their world-quality research. (This quote also uses 'they' for Government in a negative sense).

> In my original statement I said I believe we [identification with farmers and scientists] should be leading the world in agricultural products 'cos I believe this is our [farmers and scientists'] expertise … and I think this is the lazy way out by the Government, and even all world-wide governments. They [Governments] are inclined to fight this thing and they [Governments] know it's all man made and here they [Governments] are trying to pick on animals to do this. And I do not know … how this is going to effect animals. And I think it's just lazy governments frightened to make a decision. So they [Governments] come up with this idea. To me, I don't believe if we [nation/farmers] are going to lead the world in exporting sheep and cattle and everything else that we [farmers] should be interfering with them like this (Male, Wellington).

At other times scientists were observed as a neutral 'they'.

3.9 Discussion and Summary

Two main issues arose in this exemplar. The first issue was to do with sheep and the acceptability or not of the things that farmers and researchers do to sheep and the impact of that on people or the environment. For example, these questions arose. Would the sheep be harmed by this biotechnology? Would this biotechnology affect sheep meat and hence those who ate it? The second issue was to do with the impact of the Kyoto Protocol and who would end up paying for the support Government has given to it.

The importance of sheep as part of the sense of place that is New Zealand cannot be underestimated. Sheep are not only part of our vision of what New Zealand 'looks like' – white sheep on green pastures – but also they are part of our wealth, through their by-products – sheep meat as food for export, and wool for clothing and furnishings. The threat from greenhouse gases is much more intangible and it is difficult for people to work out how much of a real problem it is. How can people balance the reality, and the mythical/iconic nature of sheep against the intangible and possibly political nature of greenhouse gases?

Chapter 4
Themes from the Throat Lozenge Exemplar

4.1 Introduction

EXEMPLAR
- Bacteria from human saliva → throat lozenge → fights harmful infections.

In this exemplar a beneficial bacteria found in the saliva of some people has been formulated into a throat lozenge. A protein produced by this bacterium fights a more harmful form of bacteria that can cause throat infections, rheumatic fever, and rheumatic heart disease. This product is already on the market. It was the most acceptable exemplar presented to participants in all the focus groups.

Table 2
Acceptability Rankings for Exemplar 2, the Throat Lozenge

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	4	2	3	1	0	0	10
Auckland 2	4	1	3	0	3	0	11
Auckland 3	5	3	2	0	0	0	10
Christchurch 1	3	3	5	1	0	0	12
Christchurch 2	6	2	1	0	1	0	10
Dunedin 1	5	4	1	1	1	0	12
Dunedin 2	6	3	0	0	0	0	9
Nelson	4	3	1	0	2	0	10
Waimate	3	4	1	2	1	0	11
Waipukurau	5	2	2	1	0	0	10
Wellington	5	3	2	1	1	0	12
Total	50 (43%)	30 (26%)	21 (18%)	7 (6%)	9 (8%)	0 (0%)	117

4.2 Assessing the Impact of the Biotechnology: Risks and Related Issues

4.2.1 Provisos and Fears: "I would accept this as long as …"

Participants accepted this exemplar "… as long as there was robust screening of the research in place" (Female, Wellington) and "… presuming there's no side effects" (Male, Christchurch 2). It was feared that the use of this throat lozenge could create further problems which would then have to be solved: "And they often have side effects. If you take one sometimes you have to take another pill to counteract the first" (Female, Wellington). These problems included:

1) The possibility of cross infection through impurities in the product: "… but it doesn't say here whether they are going to go through the saliva and check whether the saliva isn't carrying an infection" (Female, Wellington).

2) The fear that the bacteria could be transferred from one person to another (Female, Nelson).
3) The fear that the bacteria could change once it was inside a body rather than in the lab:

> … when the bacteria is inside my body it is different and it might change … I would have ranked it 1 if you could say, no, it's tested and not a pathogen but you cannot give a guarantee. No human can give a guarantee that a bacterium will never change (Female, Auckland 3).

4) The fear that there would be problems with long-term use.
5) The use of such a remedy could promote the 'quick-fix' culture, which, though useful on a day-to-day basis, could cause a loss of people's local or folk "… knowledge to actually keep their immune system up". Such a remedy would mean that there was a focus on the effect not the cause of sore throats. The speaker above continued later: "… we're not looking at the causes of where things come from. We're actually solving what's actually been caused, instead of going back to what's actually causing it" (Female, Waimate).
6) This lozenge could be misused when there was no medical diagnosis, promoting a false sense of security.

> One of the things I put down was I queried the real benefits. That is we'd have a symptomatic treatment of a sore throat as a strep infection, which kind of seems overkill, which it may not be. I mean strep throat is only really established when you swab it and culture it and identify it … The other thing too is the false sense of security in populations that are at risk of rheumatic fever … who look at this or perhaps listen to what is said about it who say, "Oh, I've got a sore throat. I'm going to take this and I'll be OK," when in fact they could be in the at risk population that would benefit from screening and culturing the sore throat and early intervention treatment to prevent things like that … yeah I don't think it's as good as perhaps it could be (Female, Wellington).

4.2.2 Distrust: Who Can be Trusted?

As this exemplar was already a commercial product the question of trust arose about product promotion. There were those who thought it must be safe to use because:

> Male: It is actually on the market so therefore it's got Health Department approval has it?
> Participant C: Well it must have. I've read about it.
> Participant D: Are there things on the market that don't have?
> Participant: It's available at chemists so I assume – yeah (Nelson).

Some talked about who they would ask about this lozenge and who would be trustworthy. They were aware of the fallibility of pharmacists and researchers: "I think I would consult the pharmacy. How much faith do you have in that pharmacist trying to promote a new product? So, you've got that dilemma as well" (Wellington).

> Male: If they [pharmacists] said this is the best product for this job, well yes, I'd say, "Hey, I'd buy it because it's a proven thing". And the medical people say this is the best product. I wouldn't care what it's made of … (laughter).
> Participant A: They said that about thalidomide ...
> Male: I know. That's why we're human beings. There's no way you're going to be right all the time (Wellington).

Participants often discussed the issues they had with people and companies making a profit, at infrequent times indicating that profit was not always perceived as 'bad'.

> Male A: I think at the end of the day and everybody would possibly agree here, this word biotechnology - in today's world there's a word called money - big money associated. And a lot of these ideas come through, not necessarily out of a genuine well-being. Well that's how they are portrayed - but it's big money behind it that's pushing it. I mean this lozenge thing didn't get off the ground until Mr Paterson [founder of the BLIS company which manufactures these lozenges] bankrolled it.
> Male B: But somebody had to have an idea first.
> Male A: Yeah, somebody's got to have the idea and the person who has the idea doesn't always get rewarded for the idea.
> Male B: No, never has, but somebody eventually has to say here is something that is an economic proposition and unless we pick it up and run with it we won't progress.
> Male C: Someone sometime has to actually invest money in developing this stuff. Now there is a risk in this. Of all the things that money gets poured into in medical research, my guess is that very few of them actually pay off and therefore to get people to put money in, to get the developments and the advances there must be a potential financial benefit to them, otherwise … nothing would happen … The dollar gains are huge and they must be because the dollars invested are huge and it's no good looking badly at the people who are making millions out of it because they've invested millions into it. And -
> Male D: At the end of the day Johnny's happy because he hasn't got a sore throat anymore. He doesn't care whether he's paid $10 and somebody's made a heap out of it. It was the sore throat he was worried about …
> Male E: He wasn't worried about what was in it either ...
> Male D: I think you should come and fix my tractor because you've got a social conscience and you're philosophically opposed to making money out of using your skills and your acquired knowledge.
> Male F: I think there's a fair reward (Waimate).

The other issue that this exemplar brought to the surface was about labelling – could labelling be trusted? Participants wanted to know "… how it's processed, how they get it, and what they do with it?" (Female, Christchurch 2), and "what else do they put in it? … Some more chemicals in it? So they put more chemicals in it to make it up to last longer" (Female, Dunedin 1). One participant worked in a pharmacy and commented that the label did not state that the bacteria had been developed from human saliva.

4.2.3 Benefits

Most participants thought the benefits of this lozenge overwhelmed any risk concerns: "I just find it's difficult to rebut this and I can't see anything wrong with it so far with my limited knowledge. So, yeah, it's just hard to envisage any adverse effects" (Male, Auckland 3). To participants sore throats were a common illness so relieving them, increasing resistance, and reducing their incidence, the spread of germs, the use of antibiotics, and the possibility of serious complications from sore throats, made this exemplar very acceptable. They could not see how this technology could harm anyone, particularly because it was seen as a 'natural' product because "the bacteria is taken from the human body" (Female, Auckland 3) and it is "similar to a vaccine and we accept those" (Female, Christchurch 2) (see Theme B). They saw it as 'contained' within the human body so less likely to have unintended consequences.

Another facet of the benefit argument was that the development of this technology has not involved hurting any person or animal as this participant said, "It's not like it's hurting

anybody … it's not like taking an embryo of an aborted foetus or anything like that, you know?" (Female, Auckland 2).

4.2.4 Pragmatism, Simplicity and Convenience

One man summed up the pragmatic approach: "If it helps people why not? Heal quicker and feel better. Why not?" (Male, Waipukurau). A feeling that this lozenge was "… already out there. There's not a lot we can do about it" (Male, Waimate) gave it an inevitability, so now "It's not worth spending time on it. It's there for us so we're going to use it so what other developments are going take place?" (Male, Waimate).

Others realised its convenience because of the pressured lifestyle that people lead nowadays:

> I would actually find it convenient. Even though I do use herbs and things at home but if you're working 14 hours a day and you're gone at 6 in the morning I don't have time to make the tea and drink it. A lot of it's our lifestyle and how busy we are (Female, Waipukurau).

And the need to be at work: "… so there is a place for this - a quick fix person that's going to be destroyed in their life if they can't get their income that day …" (Female, Waimate). Others liked it for its simplicity: "… it would be a great asset in any school and office environment where these things are a problem. It works simply, doesn't cost much and has powerful effects and that's good" (Male, Nelson).

4.2.5 Judging by the 'Size' of the Problem: The Macro Versus Micro Arguments

Some participants used a hierarchy of acceptability based either on the potential of a biotechnology to have a large, global impact or an impact at the individual level in society. In the Waimate group where the discussion reached both high and low levels of humour, one man succinctly summed up this micro-macro issue when he said, "The question is whether sucking lollies is better than farting!" Something that was seen in a macro way rather than a micro way could imply it was more or less acceptable.

To some participants the fact that "It's a thing that happens in everyday life" (Male, Waipukurau) and " 'Cos it affects more people than anything else" (Auckland 2) could make this lozenge biotechnology more or less acceptable. For example, a common response was along the lines of : "It's only a sore throat, you know" (Male, Waimate). Participants felt that there were more important problems around such as "… something to do with heart disease or something like that" (Male, Waimate). Another person said:

> I ranked them in order of importance and I thought it was least important of them all.[29] I am a person who suffers from chronic sore throats and I've got a doctor who won't give me any antibiotics or anything and he said, it will never kill you! (Female, Nelson).

One other person realised that "it's quite a big breakthrough because throat infections do cause a lot of serious health problems" (Female, Christchurch 2).

Some participants felt that a biotechnology needed to benefit society on a global scale:

[29] Note that this person said they ranked the exemplars in order of 'importance' not 'acceptability' as they were asked to do by the focus group facilitator.

> Well I find it less acceptable because you're tampering with something that has quite a limited impact of benefit to society. I mean if you're going to mess around with this sort of thing you might as well make sure that it's got huge potential to deliver huge benefits globally or nationally (Male, Wellington).

4.3 Sense of Place: Perceptions of Nature and Natural

This exemplar, the throat lozenge, provoked great discussions about 'naturalness'. There were many different perceptions about what is and is not natural, and about 'interference' with the 'natural'. The issues that arose from participants' perspectives were to do with these questions. Is it 'natural' to build on a quality some people have, in this case a particular bacteria in their saliva, for the benefit of a wider population? Is this a question about survival of the fittest?

What is natural? For some participants in the focus groups there was the idea that 'nature' should just be left to run its course – nature itself would sort problems out in time: "I don't see why we can't just give all our trouble to God …" (Female, Wellington). This is an implied principle of 'no interference'.

To some other participants 'natural' meant something that occurs 'naturally', or was already 'in nature'. Sore throats were 'normal' and therefore 'natural', and in this case "the bacterium is already there - existed for many years and doesn't cause any harm" (Male, Auckland 3). It was perceived to not cause any harm "… because the bacteria is taken from the human body then I guess to a certain extent the risks are lesser" (Female, Auckland 3), and therefore "it doesn't interfere with any other things" (Female, Dunedin 2).

The word 'interfere' was explicitly used in three ways in connection with 'natural' in this exemplar. One was as in the paragraph above – if something is natural then it will not 'interfere' with other 'natural' processes, giving the idea of not disrupting, or of blending in with what normally happens in the human body. There was the suggestion that natural methods would build up the immune system: "I always have natural healthy methods 'cos I think that creates a more immune person" (Female, Waipukurau). This perspective implies that if a remedy is not 'natural' then something negative will come from its use.

The second sense of 'interfere' was related to how not everybody had this particular bacteria in their saliva so it was interference to give it to a person who did not naturally have it. The following is an excerpt from the discussion in the Waimate focus group:

> Male A: It's just giving somebody a bit of my spit.
> Female: But it's not natural spit.
> Male A: But I think it is because they've probably taken it from human saliva and -
> Male B: Probably everyone has it. Some just produce more than others -
> Male C: Some people don't have it and that's the problem.

Others disagreed and felt this biotechnology was "just enhancing a natural human process" (Auckland 1), a 'survival of the fittest' type strategy to help others who are not so 'fit':

> And I just felt that it's using something natural and building on something natural and building on the strengths of individuals, when we are all different ... Seems like we're using the strongest of our race to help the rest of humans. And I think that's good (Female, Waipukurau).

It would be accelerating something that was going to happen in any case: "I mean naturally it's going to spread through the population anyway … by mediating the transfer it's just speeding it up. Yeah, it's a good thing" (Female, Nelson).

The third sense in which 'interfere' was used was in terms of the product, the throat lozenge. Was it a 'natural' product? It was produced from something that is 'natural', a bacteria in human saliva:

> It's not GE, and it's a modification of what's already existing. Somebody's used something that's existing, like turning on the drought resistance gene in ryegrass for example. You've just turned on something that's already available and used that … (Male, Waimate).

But were the lozenges 'unnatural'? To formulate this bacterial product in such a way that it could be placed in lozenges and survive on a shop shelf meant that it had been subject to 'unnatural' processes such as culturing and fermentation to produce the bacteria in commercial quantities: "But I don't see that as natural because I think that people have interfered with it. So when I think natural I think I would go down to the organic place and I'll ask for the organically grown herbs" (Female, Waipukurau), and, "It isn't a natural thing because they have artificially cultured it …" (Male, Auckland 3). And things had been added to it to prolong its life: "So they put more chemicals in it to make it up to last longer?" (Female, Dunedin 1). As is apparent in some of the quotes already made, 'natural' remedies were considered by some to be plant-based and/or organic. In other words they were not bacteria, living or manufactured.

> But I still guarantee, crystallised ginger is fantastic [laughter] … you put [it] in your food and you part cook it. And it's still fresh inside you when you eat it … so it's got natural antibiotics inside you. You're putting something natural inside of your body, rather than putting more chemical in it (Female, Waipukurau).

One person was aware that this argument might not bear scrutiny because he did not really know what was in the so-called natural remedies he already took: "I just take menthol and eucalyptus now. I don't know where that's come from. I don't know how that's been changed, so, what's the difference? It could have been genetically engineered" (Male, Dunedin 1). (This quotation also demonstrates the limitations of labelling.)

Another aspect of 'naturalness' was that this lozenge was seen as acceptable because it was passing something from one human to another: "it was already existent in some humans so I didn't see it as bad bringing it into other humans, because it's already there" (Female, Dunedin 2) and *not* from an animal to a human: "I just basically said it's great if it's developed from humans for humans, you know, as opposed from animals" (Male, Waipukurau). It was not perceived to be crossing any boundaries. This perspective also produced a sense of the species hierarchy, as one person said, "I mean, it's from another human. It's not out of a pig or a toad!" (laughter) (Male, Dunedin 1), with the additional implication that something that benefited humans was more important than any thing else. "… keep the human people as healthy as possible first. All the others [exemplars] are to do with - not people" (Male, Dunedin 2).

Interesting discussion arose from people's knowledge of vaccination and blood transfusions. Some felt that vaccinations were natural:

> It's basically a recognised means by which we can fight bacteria. Again, we've been doing it for years, using one bacteria to fight another, using … vaccinations … It's a similar sort of thing. I wouldn't have any problems with that (Male, Nelson).

For others adding something in this way was unnatural:

> You know you get the 'flu injected into you for winter. I think that's very unnatural. Why are we injecting (laughs) the 'flu in your system to build up your cells to fight against it? Why are you asking to have something put into you that isn't already there? (Female, Waipukurau).

Other people related this lozenge to transplants or blood transfusions:

> … if there's anything about putting something from another human being in your body, you're looking at blood. Blood that flows around that person's whole body in every orifice. You know, and we don't have any objection to that at all. I have no problem with bacteria from human saliva. Because I think our body, our body is so amazing at providing everything we need. You know… everyone's got bacteria. In fact, if you don't have bacteria, you'd be dead. Because it's the bacteria that protects you from your environment and what you put into your stomach ... I think it's another way science has discovered (Female, Dunedin 1).

Someone pointed out that 'sharing' saliva is an acceptable practice within intimate relationships: "I mean, the strange thing about this is there are probably people in the world who live with partners who are providing them with this kind of protection" (laughter) (Male, Dunedin 1).

The themes emerging from this section are summarised in Tables 3 and 4.

Table 3
Summary of Themes from Focus Group Participants Regarding Naturalness in Remedies/Dietary Supplements

A remedy/dietary supplement is:	
Natural if:	**Unnatural if:**
• It is made from a bodily product that everybody has got	• It is made from a body product that some have and it is given to those who do not have it
• It already exists	• It has been 'made'/manufactured
• It is organic	• It is not organic
• It is made from plants – plant based e.g., ginger, herbal teas	• It is made from animals and is still alive
• There has been no 'interference', i.e., it is not manufactured, it has no additives	• It has been formulated to last in a saleable form i.e., fermented, cultured, manufactured, has additives
• Humans have not 'interfered' with it – it has been left to God/nature/natural selection	
• It is a human-to-human exchange e.g., blood transfusions	• The response is, "Ugh!" Saliva to 'spit'. Not normally exchanged except in special situations.
(Vaccinations provide a challenge to this categorisation)	

Table 4
Summary of Participants' Views on Naturalness

Natural will:	Unnatural will:
• Not interfere with the body's natural processes	• Make you sick, produce cancers
• Create a healthy immune system	
• Look after itself	• Cause other problems

4.4 The Role of Personal Knowledge and Experience

Participants were able to speak of their own experience of sore throats. For example, a man from Waipukurau said, "Can't stand having a sore throat. Hate it" (laughter) while another from Waimate remembered, "Back when I was a kid there was nothing that would solve the problem. You just had to put up with it". One woman mentioned how "Throat lozenges currently are so awful, I thought it might be a plan worth investigating" (Female, Waipukurau).

Participants spoke of the healing power of saliva – dogs' saliva was mentioned twice – but others were rather dubious about this:

> Male: … if you have a cut on your leg and a dog licks it that heals twice as quick ...
> Particpant A: When I was a child if we had cuts or grazes my Mum would make us go outside and get the dogs to lick our legs.
> Male: I mean I wouldn't like them to lick you on the face. But as far as cuts and things, yeah.
> Female: Well I've learnt something tonight.
> Particpant B: That's the last thing you'd want a farm dog to do! (Laughter) (Waipukurau).

Others knew people who had already used these lozenges and were happy with them. This led to them being considered more favourably. It has already been mentioned how people made sense of this biotechnology by linking it to vaccinations, blood transfusions and transplants – things that they were familiar with. Some of the people in the Waimate focus group were very familiar with some of the agrifood literature, and this knowledge made them rather sceptical about what products made it to market:

> Male A: … there's also another one … which is another good sweetner which they've now banned in the EU because there were no scientific studies. It had just … been used for centuries. You've now got to come up with scientific studies to prove everything if you want to market it.
> Male B: You mean no-one could have a patent on it?
> Male A: Bascially, yeah. That's what it boils down to.
> Male C: Nobody's making any money (Waimate).

4.5 The Need for Choice

In this exemplar the focus groups were presented with a commercial product over which they could exercise consumer choice: "… and what's more you have a total freedom of choice. You don't have to put up with it if you don't like it" (Male, Auckland 3). For some it was 'All right for someone else but not for me': "But I don't want any of it - I've written down here (laughter) I don't want any!" (Female, Christchurch 2).

It was feared that this choice might be eroded in the workplace, for example. Some noted that employers almost required people to have 'flu vaccinations and in the same way workers may be required to take this lozenge to reduce the possibility of needing 'sick' leave:

> Male: Once again, I think as long as it is kept a personal choice and they don't say you've got to have this like any of these vaccinations going on you've got to have it then I think there's going to be a big problem. As long as it's personal choice
> Female B: But some workplaces are now where it is not actually a personal choice.
> Male: Oooo, I don't like that.
> Female B: … in administration - they do in their own little way an unspoken rule they actually make it quite clear that if you are happy to take the vaccination and you do get sick and need time off you'll get paid. If you don't take the vaccination and get sick you may not get that pay. And it's happening in the workplace everyday (Waipukurau).

One person did point out, "I guess this is already out there. There's not a lot we can do about it" (Male, Waimate). In other words there may be no choice over what reaches the market, only a choice over whether to buy it or not.

To have choice a consumer needs to trust the product labelling: "I mean, again, for me, its information. It's about choice. If you know, you can make a decision" (Male, Dunedin 1).

This raised the point of whether the label should say that the bacterium in this product is derived originally from saliva. One woman who worked in a pharmacy remembered:

> When we had a training in it, which was very brief because we were just told to sell it, we weren't told anything about it … human saliva. We were just told it's a new bacteria … (Female, Auckland).

There was also awareness that the marketing of a product influenced consumers. (This aspect is discussed further in the following section relating to perceptions of the word 'saliva'.)

Another concern was about how the presence of this accessible product could end up meaning that people had less choice about other ways of caring for themselves because some folk knowledge about how to maintain immunity would be lost.

> Um, it certainly rattled me as not being simple … I would really hate to not be able to go up the track and get my mana from kanuka … and so there is a place for this - a quick fix person that's going to be destroyed in their life if they can't get their income that day to earn. But if somebody has the knowledge to actually keep their immune system up that's not going to be an issue and I think that's the danger behind it (Female, Waimate).

4.6 Words and Their Connotations: Perceptions of Saliva

'Saliva' elicited many reactions from the participants in this study. Some did not know how to express their dislike while others quickly changed the word 'saliva' to 'spit' which had a greater negative nuance. Then there were others who focused on the bacteria rather than the saliva. This usually led on to discussion of the marketing and labelling such a product.

Did these lozenges contain saliva, spit of bacteria? Certain words in this exemplar produced responses that participants found difficult to articulate, as the following exchange illustrates:

> Female: I just didn't like the idea.
> Facilitator: What didn't you like about it?
> Female: I don't know. I just - it didn't do anything for me (Christchurch 2).

Others did not like the use of saliva for this purpose: "I mean it sounds horrible the way you described it" (Female, Auckland 2).

There was a lot of laughter in discussions about this exemplar. People quickly personalised 'saliva' into 'spit' making the lozenge even less acceptable: "Probably because it sounded a bit distasteful - the spit thing. So I just put 'two', as long as the consumer is aware - it's written on the box - it contains spit" (Female, Christchurch 2). This person obviously felt that if it was labelled in this way no-one would buy it. The lozenges acceptability was discussed in these terms.

> Female: I read about it and I thought that sounds like something [good] and I'm going to try it on my daughter. Isn't it terrible? (laughter)
> Participant A: Did you know about the spit? Did you know that it had spit -
> Female: No I didn't know when I got that. No.
> Participant A: Would you have purchased it had you known?
> Participant B: Would you have told your daughter?
> Participant A: Would you have given it to your daughter? (Nelson)

The word ‘saliva’ also conjured up links with infectious diseases spread through saliva.

> I just looked at the word human saliva and I thought if the majority of people in the country saw that umm, how acceptable would it be for them and there’s their perception of human saliva and thinking of things like this - limited knowledge about AIDs and hep C [hepatitis C] (Female, Nelson).

There were others who tried to disassociate the bacteria in the lozenge from saliva: “Well, I would hazard a guess it’s not actually someone else’s spit (laughter). It’s just the bacteria that was in it” (Male, Nelson). This had both positive and negative adherents:

> Female: And after numerous cultures, I mean you’d disassociate the host -
> Participant: Oh, I don’t know! (laughter) (Nelson).

> Female: I think it is a psychological. I mean, I’m sure there’s a lot of bacteria that are cultured anyway in products that we don’t know about. But it’s the thought of somebody’s spit bacteria being in my gob.
> Participant A: You know that’s what it is. It’s stupid isn’t it? It’s emotive.
> Participant B: A lot of people have felt exactly that.
> Participant C: It’s the same old thing. Ignorance is bliss. If you don’t know you are going to swallow it. You think it’s great. But if some one was going to say to me, “Hey, I cultured that out of the spit of Y’s gob!” I’d think … (Lots of laughter)
> Participant C: Nothing personal about that! You know -
> Participant D: And if you’re Y’s wife that’s not a problem!
> Participant C: That’s right.
> Male: Maybe! (More laughter) (Wellington).

The word ‘bacteria’ also had a negative connotation for some people: “I don’t know. It might just be that word bacteria” (Female, Christchurch 2). Some felt that this would be overcome:

> If it is safe, what’s wrong with it? It’s just another medicine. If you could get over the barrier of the fact that it is a bacteria and also associate bacteria with like killer viruses. If it can heal you, then why not? And it’s safe. I can’t see anything wrong with it. Yeah (Male, Auckland 3).

There was some cynicism expressed about marketing:

> Facilitator: Do you think it will sell?
> Male A: Yes (agreement).
> Female A: If it’s got a pretty packet it will sell.
> Male B: If it’s got the right person marketing it.
> Female A: Yeah.
> Male C: Particularly if they can find that the saliva it came from was very attractive (laughter).
> Male B: Oh, Elle McPherson saliva (laughter).
> Facilitator: Would you have any concern over whose saliva the bacteria was cultured from? …
> Female A: I mean, its not as though someone just spits in a bowl and they put it on a shelf. It goes through a process …
> Female B: Will they put, I mean like, will they put it on the packet where it says ingredients, will they put ‘human saliva’ on it? Or?
> Female A: Ooo, no. (Discussion muffled.)
> Female B: No, that’s what I’m asking. Would they sort of say, ‘human saliva’ or would they just put E12 and something else (Dunedin 1).

Because of the feelings participants had about saliva there was a debate in most groups about the marketing and labelling of this product and what information consumers should have: "I was just wondering how well that product would actually sell when people learnt how it's made" (Male, Wellington). To some people the labelling should state the derivation of the bacterium: "As long as the consumer is aware - it's written on the box - it contains spit" (Female, Christchurch 2), whereas others accepted that the label "… probably wouldn't have on the list of ingredients, someone else's spit" (Male, Nelson). The result would be: "We won't know what it is" (Female, Auckland 2).

Though most of them disliked the idea of a product derived from human saliva this distaste seemed to be overcome in terms of their judgements about the acceptability of the product. However, this acceptability may also have been governed by the fact that they had a choice over its use. A count of how many would actually use this product was not taken, so it is not possible to say that participants personally might have decided not to use it but felt that other people should have the choice.

4.7 'We' and 'They': Setting Up Oppositions and Responsibilities

Sometimes participants identified themselves with science or medicine using 'we', and sometimes 'they'. When are the situations different? What exemplars are 'we' and what are 'they'? The usage is on a continuum – it can be positive, neutral or negative.

In this lozenge exemplar participants frequently used 'we' as an identification with common human experiences as in: "We all had our tonsils out when we were young" (Male, Waimate). Or there were expressions such as: "Unless we pick it up and run with it we won't progress" (Male, Waimate), which perceived of ordinary people having some power, and having had power to make choices in the past:

> It's new in a way, and I guess if we want to be leaders we've got to be up with it but you've got to be very careful because you've only got to look at past experiences to see … like the DDT issue, the things we've done in the environment, the use of nuclear energy. All these things. We've just got to be so much more aware of what we do (Male, Waimate).

There were also counter expressions of powerlessness: "I guess this is already out there. There's not a lot we can do about it" (Auckland 1).

There was a neutral identification with scientists and medical researchers: "It's basically a recognised means by which we can fight bacteria. Again, we've been doing it for years, using one bacteria to fight another … "(Male, Nelson) and a critique:

> A lot of the things we seem to be doing now is trying to solve - we're not looking at the causes of where things come from, we're actually solving what's actually been caused, instead of going back to what's actually causing it (Male, Waimate).

'They' was used to refer to someone in authority who had power over others enough to make them have to do something. For example one person spoke of the situation in the workplace: "… in administration - they do it in their own little way - an unspoken rule - they actually make it quite clear … (Female, Waipukurau). 'They' could also be applied to a regulatory authority or Government.

When ‘they’ was applied to scientists it sometimes had a suspicious or slightly distrustful framing such as in: “They said that about thalidomide” (Wellington), and “I mean, how can they actually say that the saliva they got from that person is absolutely perfect when its taken … But besides that, what else do they put in it?” (Female, Dunedin 1).

Whereas health professionals were framed more positively:

> If they [pharmacists] said this is the best product for this job, well yes, I’d say, “Hey, I’d buy it because it’s a proven thing”. And if the medical people say this is the best product, I wouldn’t care what it’s made of … (Male, Wellington).

Marketers were also spoken of as ‘they’: “Will they put it on the packet where it says ingredients, will they put ‘human saliva’ on it?” (Female, Dunedin 1).

4.8 Discussion and Summary

The reality that this lozenge was already ‘out there’, as someone said, in the market and particularly sold in pharmacies, may have meant that it had an advantage over the other exemplars because this gave the impression that this product had been tested and hence was ‘safe’ and effective. In fact it has not been clinically tested (Peter Herbison, pers. comm.) because it is not sold as a ‘medicine’ but as a dietary supplement and therefore not subject to such stringent regulation.[30]

This throat lozenge exemplar was perceived as posing less risk to people because it seemed contained and tested, and would help relieve a common compliant on an individual by individual basis. It was a biotechnology over which people had the power of choice as long as the labelling ‘told the truth’ in relation to the bacterial product’s derivation from saliva. In spite of much talk about and dislike of ‘spit’, as saliva was named, this exemplar was the most acceptable to participants in this research.

[30] See the BLIS company website (www.blis.co.nz) for fuller information about this product.

Chapter 5
Themes From the Toad Gene in Potatoes Exemplar

5.1 Introduction

EXEMPLAR
- Potato → synthetic toad gene → antibiotic protects against soft rot.

In this exemplar a synthetic toad gene can be inserted into a potato. This gene carries an antibiotic toxin from an African toad that may protect potato crops against soft rot which is a major problem facing New Zealand's potato exporters.[31] This was the least acceptable exemplar to focus group participants.

Table 5
Acceptability Rankings for Exemplar 3, Toad Gene in Potatoes

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	0	1	2	2	5	0	10
Auckland 2	1	1	7	1	1	0	11
Auckland 3	1	5	2	1	1	0	10
Christchurch 1	0	1	1	5	5	0	12
Christchurch 2	2	4	2	0	2	0	10
Dunedin 1	0	0	1	7	4	0	12
Dunedin 2	0	2	1	2	4	0	9
Nelson	0	1	4	4	1	0	10
Waimate	2	2	1	1	5	0	11
Waipukurau	0	2	2	2	3	1	10
Wellington	1	0	3	1	7	0	12
Total	7 (6%)	19 (16%)	26 (22%)	26 (22%)	38 (32%)	1 (1%)	117

Some focus groups participants were able to fill out the exemplar descriptions with further information. For example, in this exemplar this knowledge was passed on:

> Male: Is soft rot caused by bacteria?
> Facilitator: I don't know.
> Male: Isn't antibiotic to kill bacterias?
> Female: Actually there are a fungus and a bacteria causing it. And it's the gene - a gene is a stretch of DNA - which can help fighting against this. It may be that the bacteria and the fungus have disease-causing properties, like, if from this toad, you have the gene which can combat either - if it is fungus or a bacteria, it can stop it.
> Male: So it is caused by some other organism? …

[31] The technology has now progressed to what is known as the 'next generation', and does not use a synthetic toad gene but transfers the resistance to potatoes through a common soil bacterium.

> Female: Yeah, it's a pathogen which is causing [it]. We classify them as pathogens. It could be a fungus, it could be a bacteria (Auckland 3).

5.2 Assessing the Impact of the Biotechnology: Risks and Related Issues

Most participants in the focus groups saw decisions about the acceptability of the exemplars as a balancing act between potential benefits and risks.

> I like it because it will cut costs, you know. We'd have more potatoes for food but there's sort of a worry about the toad genes … But I'm all for it. But what would happen if it affects the environment? I suppose everybody sees the plus side and forgets about the other side of it … (Male, Auckland 2).

This exemplar was the first to elicit an historical reflection from participants on how technology or a lack of it can have an enormous and unanticipated impact. For example, the Waimate focus group discussed how the Irish potato famine caused many deaths but as a result Irish people migrated all around the world to the benefit of the world as a whole.

The same group created their own scenario of what would happen if this technology was successful. What would be its social and economic impact? They related this to their own experience in the wheat growing industry and felt that any advantage might be nonexistent.

> Male A: What would happen if no potatoes rotted? What would happen? Would the price of potatoes go up or what?
> Female: It would go down wouldn't it?
> Male A: So is it an advantage? It has to be - there has to be a social or an economic advantage and would there be an economic advantage?
> Female, Male B, Male C: There'd be a glut of potatoes.
> Male B: Then they'd grow less.
> Male C: … if someone did the research … they would be like Monsanto and they would say, "Ah, ah, ah. You've got to grow our potatoes. And if you have another potato somewhere else, we will shoot you."
> Male D: It depends on your contract doesn't it? (Discussion)
> Male E: That's the worst scenario. You don't have to go along with that. I mean you don't even have to grow the one that has resistance.
> Male D: This has happened with GE. They've got control of the grain industry now. Even in New Zealand as it stands today. You're a wheat grower, you've got to grow your Monad wheat. You're tied in with a certain company and everything (Waimate).

The risks of this exemplar have been divided into the usual categories of the provisos or controls that participants wanted to see in place to make it acceptable, their fears of what could happen, the distrust they expressed about the motivations of those supporting such research, and the areas in which they felt there was a need for further information.

5.2.1 Provisos: "I would accept this as long as …"

Many participants placed provisos on their acceptability of this exemplar. They wanted it to be used in a controlled environment and used very cautiously and carefully.

> I had no fundamental objection to transgenic work just so long as we are very, very careful. There is some risk in it, hence initially it's got to be done with a great deal of control, but not only does this, if it works, gives us more food production, of course it

> reduces the amount of pesticide and fungicide you've got to pour all over your food. So I see that as a very definite benefit. But I'm still strongly in favour of very, very tight controls … Let's proceed with great caution (Male, Nelson).

5.2.2 Fears

These provisos led to an indication of what it was about this exemplar that participants feared – side effects in humans, impacts on the environment through cross contamination from a lack of containment, irreversibility, the risk of mutations, and the challenge to biodiversity.

Participants were concerned about the side effect of antibiotics in food. As one woman said:

> And I don't want any unnecessary antibiotics … antibiotics can have an adverse effect and if you don't need to take them then you build up a resistance so that when you do need to take them you've got to take stronger and stronger doses (Female, Wellington).

The worry was "What's it going to do to our bodies?" (Male, Waipukurau). "And I think anything that's put into food that actually retards their age actually ends up in our bodies and our bodies can't get rid of it" (Female, Waipukurau). There was also a fear that it might have allergenic or toxic properties (Male, Auckland 3).

There were questions about the impact on the environment of this GE potato. Would there be problems with antibiotics in the soil, GE altered seeds and cross fertilisation or gene transfer. Could the antibiotic/bacterial genes transfer to other potato cultivars or other plants? As one man pointed out:

> Potatoes are related to tobacco, to tomatoes, to nightshade, to a native species called porapora and probably others that I don't know about. That's all potato genus … So if you introduce a toad into a potato are you opening up all those other species to the same sort of effects or variations on a theme? (Male, Dunedin 2)

Some expressed concerns that this potato cultivar could turn into a "superweed" (Female, Nelson) and spread. "You've then got a genetically modified product that grows its seed and flowers … whizzing off through the environment somewhere" (Female, Wellington) and, "It's the only one where I can see any potential for it to start going places where we might not like it too" (Male, Dunedin 2). The farmers of Waimate likened the possibilities of escape from containment with those of cloned sheep in a rather 'in' sheep farming joke:

> Facilitator: You probably know about the cloned sheep in the North Island …
> Male: I hope they're not Perendales! (lots of laughter) (Waimate).
> [Perendale rams are notorious for jumping fences during the mating season.]

This possibility of escape posed the fear that this potato could come to dominate/contaminate local species and pose a risk to biodiversity. The men in the Waimate group were concerned that in Mexico the original native corn cultivars no longer existed because they had become contaminated by GE corn. This raised the apprehension that "It's spreading throughout the world. We're all going to be inundated by GE corn now". In Nelson a concern was expressed that if this potato became the main cultivar grown it would increase the risk of a disease that could wipe out all these potatoes, just as the New Zealand forestry industry was at risk of a disease that could threaten all pinus radiata because they are clones. Peanuts and bananas were also mentioned in this connection.

Fears about cross contamination and containment lead on to issues of reversibility if such escape scenarios ever eventuated: "… it's such an irreversible step really. In 20 years time you want to be sure. It's just such an unknown" (Male, Nelson). People were fearful that the approval of the release of one such crop could mean it "… opens the door for a lot of other crops to be developed which we just have absolutely no idea what the end result will be …" (Male, Nelson). A man from Waimate said, "If it works well it's OK, but if it's a mess, then it's a big mess … But you could be going down the same track as 20 or 30 years ago they went down with DDT. That's the scary bit".

Another fear was the risk of mutations. Could this potato mutate, could the fungi/bacteria/soft rot disease mutate (Female, Wellington), and how would such a GM potato deal with a mutated soft rot disease (Female, Nelson)?

Overall, this exemplar provoked a concern about the uncertainty of the impacts of biotechnology, as one woman said, "So really it's not only the things you can deal with but it's the unforeseen things that can be a bit scary as well" (Nelson).

5.2.3 Distrust: Challenging the Motivations and Knowledge of Stakeholders

As in the other exemplars participants wanted to know "Who is paying for this research and what are their ethics?" (Male, Nelson). Participants trusted Government funded research but were concerned about the objectivity of researchers: "That's why I liked the old DSIR. It was Government funded. They were neutral in their bias" (Male, Nelson). This was contrasted by a distrust of multinationals which were perceived as only wanting to make a profit, hooking growers in and leaving them with no choice, having links to Government and passing on biotechnology to third world countries when they no longer have a use for it.

The drive for profit was viewed as challenging a company's ethics:

> … research on this sort of thing is governed by the push to make profits then the ethics - we can do this, it may do this, it may not - so we keep that quiet, but we can do this and it's very good for everyone (Male, Nelson).

It was felt that companies would cut corners, take less time for testing etc.

> I haven't got the confidence in the industry to accept that what they're doing is going to be fully tested because, as I said before, they put a heap of money in. They want a return on it. They want a 20 percent return on their capital sort of thing and, "We don't want 20 years testing, that's far too long. What's wrong with two years testing?" … I guess what they're wary of is that we've heard about the corn crops in the US - how they looked really good and they were going to save on chemicals and that, and it hasn't turned out to be that. It hasn't turned out. It's not true and that's why I put it number five (Male, Waimate).

Monsanto was used frequently as an example of all that was perceived to be bad about corporate biotechnology companies. Another man in Nelson explained why he also had ranked this scenario as least acceptable:

> I would prefer that the potatoes that are produced for my consumption are produced through natural selection, not through economics. And really, being a cynic, the only reason these people are wanting to put toad genes into potatoes is to make money, pure and simple … And Monsanto are huge. They're huge. And with huge comes money,

> and with money comes power, with power comes lobby, and with lobby comes the ability to say to the moratorium, no moratorium. It all comes down to that, to power. And unfortunately with super money is power and I'm not an alarmist or anything else like that but I get very cynical when I see these huge companies producing stuff for their own good … it's not for the good of mankind. It's for their own good, because they will sell those potatoes to the farmers for huge amounts of money and they don't give a damn whether they taste like crap or not, or if they are perfect or not. All they will do is produce enough in order to make money … And I don't like the thought that people are mucking round with what I eat for profit … (Male, Nelson).

5.2.4 Need for More Information

The need for more information produced its own dilemma. How much information would be enough? "If we're going to wait for them to find out what everything does before we do anything we're not going to go anywhere, are we?" (Male, Waimate).

Basically participants wanted to know more about the biotechnology. For example, what does it mean to have a synthetic gene from a toad (see later), and what is the present situation regarding soft rot. What do growers do now to control soft rot? Do they use chemicals? Many other questions also arose out of participants' fears (see earlier), such as what would be the effect of antibiotics in potatoes, and are there any side effects. Were ways of controlling or containing this biotechnology should it get out of hand: "All I'm saying is what are the safeguards? You know, you may end up with jumping potatoes. I don't know" (Male, Wellington). Participants felt that they needed to know "who's paying for the research and what are their ethics?" (Male, Waipukurau). Someone mentioned the difficulties of finding information - that, "you have to know the people who know where to find it" (Nelson).

Participants then wanted to know what alternatives there were to GE potatoes to prevent soft rot. They thought there needed to be research into the potato cultivars that were already resistant to soft rot. One felt that the "agricultural practices" (Auckland 1) of potato growing needed further investigation: "… how much research do we have going into alternative farming management in terms of soft rot in potatoes, in terms of the types of potato, where we plant, what soil, what area, what region, you know?" (Female, Wellington). The Pacific Island community in Onehunga wondered "Why don't they eat the kumara or something else?" (Female, Auckland 2). In other words, there are always alternatives to potatoes.

5.2.5 Benefits

This exemplar was seen as producing many real benefits. Such a biotechnology, as is one of its stated aims, would increase potato exports by decreasing the incidence of soft rot hence increasing its storage life, as long as its GE technology was acceptable in overseas markets. It would reduce the amount and the number of chemicals used to control disease in the growing and the storage of potatoes. As one man said, "It reduces the amount of pesticide and fungicide you've got to pour all over your food" (Male, Nelson). Some participants hoped that increasing exports would mean a decrease in price, making potatoes more affordable in third world countries. Some even felt "It could help a lot of poor countries that we need to find a lot of food for" (Female, Christchurch 2). Hence, it could open up new markets. This technique speeds up the research required to produce a 'new' potato. Traditional breeding research takes a lot longer. It was seen as bringing many financial rewards to growers by boosting efficiency through greater crop yields, reducing economic risk, saving on chemicals, and the possibility of perhaps growing potatoes where they had not been able to grow before.

One woman mentioned whom she thought would benefit: "If I was a commercial potato grower I'd put it as number one [most acceptable] or if I owned a fish and chip shop I'd have put it as number one" (Female, Waipukurau).

Efficiency was seen in terms of if a farmer is growing potatoes s/he might as well do it as well as possible. This introduced the concept of 'utilising potential' – the idea that something is wasted if it's not producing as well as it could be (in this case, soil).

> Male A: Well I just thought it was a production thing. I thought utilising the ground properly, utilising a lot of things. You know, if we're growing potatoes might as well be growing potatoes. There's only so much ground you can grow potatoes in. We might as well be utilising it to its full potential.
> Male B: Grow good ones, yeah (Waimate).

Some participants in the Christchurch 2 group felt that this biotechnology was good because if the gene used was synthetic no living creature came to any harm in the process.

> Female A: I just put it first equal. I just put all positives, no side effects. Yeah, no-one gets hurt …
> Female B: Well I think it could help to - well anything that helps to keep food longer, especially such a staple food … Yeah, I don't think it seems to harm anything …
> Female C: I put it second. Basically, because it doesn't hurt anyone …
> Female D: Well the synthetics, and it's obviously not going to harm anyone, or hopefully … (Christchurch 2).

5.2.6 Pragmatism

The responses of many male participants to this exemplar were often very pragmatic. For one male participant progress is inevitable: "You can't stop progress" (Waimate), so why stand against it. For another: "A synthetic toad gene, if that would do the trick, go for it" (Male, Waimate), while another said to leave it to the market: "If you can sell it and people are willing to accept it, it doesn't worry me at all. I mean if you can't sell it and people won't accept it then obviously you don't do it" (Male, Christchurch 2). Another felt that it was all rather obvious: "There's benefits to the environment and benefits to the economy. I don't see why not?" (Male, Auckland 3).

5.2.7 Judging by the Size of the Problem: The Macro Versus Micro Arguments

The 'micro-macro' arguments were also apparent in this exemplar. One person challenged the size of the problem:

> How big a problem is it? It may be more acceptable if I could see the potato production actually going downhill to a state of extinction and we were really trying to save our potatoes … if it was a huge problem and there was going to be a world-wide shortage of potatoes and people weren't being fed, you know, we should do something about this. But if it's not an absolutely huge problem and we are still having potatoes, sorry (Female, Nelson).

Another felt that the problem of soft rot was not of sufficient importance compared with other potato diseases:

> There are more important pathogens [of] potatoes, than soft rot, I think. Because soft rot is a pretty rare pathogen but it is particularly important for the foreign market but a pathogen like potato blight, you know, that caused the potato famine, that's more to the point to put your energy into (Male, Auckland 3).

One man (Christchurch 1) pointed out that when considered as a percentage of the world population's staple diet potatoes were unlikely to feature. Others felt that a financial gain is not a sufficient reason for a biotechnology to gain support and acceptability (in comparison to those pragmatic types above). Biotechnology should benefit human kind.

5.2.8 Ethical Issues

This exemplar aroused some strong personal feelings in the focus group participants about ethical issues because it involved the transference of a synthetic gene modelled on an animal gene into a plant. (This issue is discussed further in the following theme about 'natural'.) Some expressed a discomfort about humans changing living things, 'playing God', entering 'forbidden' territory. One participant thought that such discomfort does not mean it is 'wrong'.

> Male A: Playing God.
> Male B: Yeah, you're playing God, you're changing our natural environment …
> Male C: It's not playing God …
> Male D: … Just because we don't understand something doesn't mean it's wrong or bad
> Male B: Yes, but we're going into - we're sort of going into - in a sense, what you could call forbidden territory.
> Male D: I think that we're going into something as individuals that we don't necessarily understand and therefore feel uncomfortable about it. But that doesn't make it wrong in my mind (Waimate).

Participants in one group made comments about the ethics of the communications and methods of protest used by both sides of the debate on GM food.

> Male: Well, during the – well, I'll show my ignorance and describe the thing – [the fuss] over cropping though GE. It was whipped up into an absolute hysteria and one of the slogans they kept carrying [on placards] - no toads in our potatoes etc. That is unconscionable, particular when young kids are carrying these.
> Participant A: Yeah, can't understand what they're doing.
> Participant B: Yeah, that's how these people work.
> Participant C: Yeah, by fear.
> Participant D: You know, no matter what side they're on.
> Participant C: They had all these people dressed up as butterflies (Nelson).

Most participants were concerned that the ethics of profit making companies would be subsumed by the desire to make a profit (see earlier). They felt this would lead to less objective evaluations of research, to cutting corners, for example, in the time spent in testing products, and that the focus would be on biotechnology that would make a profit for the company at the expense of other things that might be more beneficial to humankind.

5.3 Sense of Place: Perceptions of Nature and Natural

This exemplar produced rich discussions about how food should or should not be produced. Food should be kept 'natural', and not be "tampered" with (Female, Christchurch 2). There

was a feeling that people's sense of place was being disturbed. Food no longer fitted into the 'animal' or 'plant' categories it had been placed in, in the past.

5.3.1 What is Natural Food?

Participants wanted their food to be 'natural' and a component of this was that it should have come about by 'natural selection': "… if it doesn't happen naturally I don't know if we should be messing around with it" (Male, Nelson). One person described in great detail why he had ranked this exemplar as least acceptable:

> Up until about half an hour ago when I hadn't even given this topic a thought. Since then I've been thinking about it lots (laughter) and the more I think about it the less I like it. I do not like the thought that I don't know what I'm eating - that somebody else has been mucking around in some little lab somewhere to produce the perfect potato for my consumption. I don't necessarily want to eat the perfect potato. I want to eat a natural potato and you know, as Mike said, I would prefer that the potatoes that are produced for my consumption are produced through natural selection, not through economics … So I'm dead against that sort of manipulation of my food and it also worries me as to what the hell we are eating … I have just decided in the last half hour that I don't like people mucking around with what I eat, basically (Male, Nelson).

This quote incorporates several common ideas – food should not be "mucked" around with – particularly in a laboratory. This incorporated the feeling that those, the general public, who ate such food were being used to 'test' it, like laboratory animals, in order for someone or some company to make a profit and/or to make something 'perfect'.

Many participants expressed strong resistance to eating such a genetically modified potato: "For me, the question would be, who would eat the potato with that type of gene in it? I certainly wouldn't. I wouldn't buy it or support it" (Female, Dunedin 2). Another even said, "I just hate the thought of any genes being in food" (Female, Wellington)! To some genetically modified food hinted at the strange or bizarre. Such a potato would be "… big, huge, but will it taste the same?" (Female, Auckland 2) or such a process would "… get this freaky potato that's going to grow thousands off one potato sort of thing" (Male, Nelson).

5.3.2 Everything Has Its Place: Where Do Synthetic Genes Fit?

This exemplar challenged the conceptual boundaries that participants adhered to about the place of humans, animals and plants in the 'natural' world. For a start, what does it mean for a gene to be synthetic? Is it still 'from a toad'? Does it mean boundaries have been crossed or not? Was it just a matter of semantics?

> Male A: In other words, the only reason they say it's synthetic is the fact that they've made it in a laboratory, but it is a toad gene, a copy of -
> Facilitator: Yeah, it's a gene you find in a toad but it's not taken from a toad.
> Male B: No, but it's as close to the original as they can possibly get. So therefore it's a toad gene.
> Male A: So it's genetically engineered.
> Male C: And it shouldn't be called a toad gene, though because it's not toad gene. It hasn't been taken from a toad (Waimate).

The fact that the transferred gene is synthetic softened the impact of the 'toad' idea for some, and as well, as this person pointed out, people share a lot of genes with other species anyway:

> Well, I think the key word is synthetic here. The 'toad' word association - people thinking frogs - toads growing … but when you look at it where, you know, genes make up what people are - in the long-winded process. If you work it back down to that level then the gene is a very minor thing in the complexity of the whole organism. So a gene, one single gene is not going to make it a toad. In actual fact it is probably that many other organisms have that same gene (Female, Nelson).

Many felt that a synthetic gene had the advantage that to obtain the gene animals were not being harmed. When told in greater detail by the facilitator what a synthetic gene was, one man responded with, "So it's not part of the old toad's body" (Waipukurau), personalising the toad and thereby making harming it to obtain the gene even less acceptable. Another said, "I think because it's synthetic that really did appeal to me. It's not as if they're putting any animals at risk or anything" (Female, Waipukurau).

5.3.3 Human/animal/plant boundaries and hierarchies

Two factors are confounded in the responses to this exemplar. Participants reacted to the gene transfer from animal to plant while others were reacting to their perceptions about 'toads', the living creature. Where it was possible to distinguish between the two, the latter reactions have been placed in the section on the connotations key words had for participants.

However, for most participants synthetic or not, the gene still came from a toad and animals were being mixed up with plants which was not how it 'should' be. Everything has its place. A plant is not the 'place' to find a toad.

> A potato is a vegetable. A toad is an animal. I'm sorry, the two don't mix. I know it's a synthetic toad. (Lots of laughter.) … I like to keep them separate. That's my personal view and I don't like it the other way (Female, Christchurch 2).

Not only are living things becoming mixed up but the things that are being created do not have a place/space in which they belong. Would this potato be like a toad or not? This biotechnology would cause confusion for vegetarians! One woman's reaction to this biotechnology was: "I think it's disgusting. What about poor vegetarians? They love potatoes. And you're going to be putting toad in them? … Is it vegetarian? It's got a bit of toad in it" (Female, Wellington).

Participants had a sense of a hierarchy of living things, which included boundaries that should not be crossed (see later):

> Male A: One plant to another would be bad enough, but animal to plant …
> Female A: Animal to plant to us ...
> Female B: I would have a problem animal to animal. Plant to plant is much more – I think there's much more of a problem there with animal to animal. I don't believe that we should be creating species which to a certain extent we are doing. And I know you do it in plants as well but you can get rid of the plants a lot more easily than you can animals
> Male B: A lot of that is emotion.
> Chorus: Oh it is. Yeah.
> Facilitator: Why do you think there's a lot less emotion with plants than animals.
> Female B: Oh I think because of the way that we are brought up, you know.
> Female C: We have dogs and cats in our house and we get friendly with them but we don't really get friendly with our trees and that (Auckland 1).

To these participants the hierarchy is demonstrated by humans having a closer attachment to animals rather than plants. Another hierarchy that was mentioned placed a higher value on maintaining the integrity of native plants and animals over introduced species:

> Female: I have difficulty with using some of our native plants and putting different genes into our native plants … [They are] evolved to adapt to a certain environment and what right do we have to … change them. So I would have a problem with some plants too.
> Facilitator: Would it be the same with the animals? Anything native to New Zealand?
> Female: I would have a bigger issue with indigenous species than I would with introduced species but on saying that I still have a problem with animals … (Auckland 1).

Some viewed eating such a potato as putting something that is 'other' (foreign, unnatural) into your body. If we do eat it how will it affect us? One person expressed her concern like this: "Well because the flow-on effects to our body … putting something foreign into my body, and it's because it is the staple diet, you know. It's something that everybody eats" (Waipukurau). Another person said, " … it's putting something unnatural in our bodies, possibly, we don't know" (Male, Waipukurau).

There was another 'sense of place' introduced by this scenario. This exemplar suggests that by genetically modifying potatoes they could be grown more widely in places that they could not grow before. Some of the participants felt that this was wrong. One man said, "It's like broccoli growing in the wrong place. Grow something else there. You can't expect to grow potatoes everywhere" (Male, Auckland 1).

5.3.4 Changing the Natural Order

In summary, participants responses suggested that use of such a biotechnology would be 'tampering', or 'playing' with the natural order of 'how things are', and that humans are making new things/beings when it is not their place to do so. "I don't believe that we should be creating species which to a certain extent we are doing" (Female Auckland 1). Another said, "[I'm] just not happy with tampering with the major food that we all consume" (Female, Wellington). ('Playing' has connotations of being 'not serious' when it should be taken seriously. 'Tampering' implies that there might be some malicious intent.) There was talk of 'playing God', entering 'forbidden territory'; of humans trying to do things they 'should not' be doing, breaking boundaries, trespassing: "Yeah, you're playing God, you're changing our natural environment … but we're going into, in a sense, what you could call forbidden territory" (Male, Waimate). Underlying these reactions was a fear that if people do use such biotechnologies society will be punished in some way, as in the reference to DDT.

5.4 The Role of Personal Experience and Knowledge

As in the other exemplars participants brought their own knowledge and everyday experiences to bear on how they were to make sense of this genetic modification of potatoes exemplar.

Potatoes are an important food in the New Zealand diet so participants' reactions to this exemplar related to these everyday experiences. One person did not actually like potatoes: "It really just boils down to the personal. I don't mind. I'm not that fussed on spuds" (Female, Waipukurau), while another in the same group remembered: "It's good food, 'cos I lived by myself for about a year and a half out in the wops and spuds were really good and that.

Probably had them just about every night" (Male, Waipukurau). Another thought about her role as a the food buyer and provider for the household:

> I thought it was well worth controlled investigation because potatoes I think would possibly be the most amount of any vegetable that we actually purchase. And I felt that it would benefit the housewife and everybody in the long run (Female, Waipukurau).

One woman in Nelson had experienced the anti-GM sentiments of her workmates and felt that although "They are entitled to their opinion," they lacked knowledge about "… the fundamentals" and "… the propaganda that's pushed really clouds people's judgement and I think a lot of the time the information is definitely not two-sided, it's definitely swayed one way. I think that, yeah, almost brain washing. You've got to keep an open mind" (Female, Nelson). Her experience in this situation has meant that she seeks to understand and "… keep and open mind".

Anyone in the focus groups with a personal scientific knowledge took this opportunity to tell others what they knew. Participants who were farmers or scientists frequently knew what they were talking about (and what they said is not quoted here). However, some had a rather mixed version of 'the truth'.

Two of the men in the Dunedin 2 focus group remembered the days when most of New Zealand's commercial potatoes were grown in Pukekohe. They wondered if the present problems in growing potatoes have arisen through inferior soil fertilisation compared with the past:

> Male A: The thing is how did they used to grow all their potatoes years ago? They used to survive. They had good crops. They don't at Pukekohe though.
> Male B: That's where they got a bit greedy and they were planting two or three crops a year and bunging in pesticides and things like that.
> Male A: Things changed when they gave up using horses.
> Male B: Manure?
> Male A: That's right. That's when it came on the scene.
> Male B: Well, that could be a point couldn't it? That was all natural manure. That's died out now … I expect as old as you are now you can['t] remember horse drawn traffic, piles of dung on the road. Me Mum used to run out with a shovel and put it into a bucket for compost for her roses (Dunedin 2).

Some participants shared the knowledge they had gained from reading or from their work experience. One, an environmental scientist (Auckland 3) knew about a gene inserted into maize that killed all the pests, so even though pesticide was not needed all the pests disappeared which he did not feel was good for the environment. From this knowledge he wondered what side effects would come out of this exemplar.

Another scientific worker (Nelson) wondered if people knew "… how difficult it is to go through the whole application process. Anything that holds any remote connection to modification or engineering or cloning in New Zealand is … taken extremely seriously. It's not a walk in the park" and for this reason she trusted the process and did not think anything bad would happen.

One person stated that as far as he was concerned, "I don't think it's that important. There's enough potatoes out there to satisfy the needs of the country. As far as I'm aware I don't think we export potatoes. It's not an important crop" (Male, Auckland 2).

In summary, attitudes were partly dependent on whether participants actually liked potatoes and the fact that potatoes are an everyday food, part of the staple diet. Such local experience makes this exemplar more real. On the other hand, knowledge about the present regulatory situation is often limited. This exemplar led to some groups telling stories, for example about Monsanto and Irish migration, but the stories and myths may not be accurate/factual. Sometimes the stories demonstrated that negative things can have positive outcomes.

5.5 The Need For Choice

Very little came up about choice in this exemplar. The Pacific Islanders thought people could always have the choice of other staple foods – like taro or kumara and Asians could add rice. Only one person used a NIMBY approach, saying, "… well as long as it doesn't get in my garden I couldn't care less" (Male, Dunedin 2).

5.6 Words and Their Connotations

This exemplar produced particular responses to the two words 'potato' and 'toad'. Potatoes are part of the culture and heritage of many New Zealanders. Toads, on the other hand, are not. New Zealand does not have toads as part of its natural environment. These two extremes then present people with a problem when biotechnology puts them together.

5.6.1 The Potato

One small part of a discussion referred to the social dimension of potatoes in New Zealand society, hinting at some of the underlying reactions to this potato biotechnology:

> Male A: I just think the value of it socially.
> Male B: The social potato (laughter) (Waimate).

Another person asked about these GM potatoes, "What do the Irish think of them?" (Male, Christchurch 2) which was another reminder of the culture attached to potatoes, this time of the Irish heritage of many New Zealanders. For many Roman Catholic families fish and chips on Friday night was mandatory. Fish and chips were still the most popular takeaway in New Zealand in 1998-9 (RSNZ News, 22/9/99).[32]

Potatoes form a basic part of the diet of most of the population:

> Female A: Because the spud is still the basis of Western diets. So they need it to be cost effective and the specials are quite expensive now. For some families and homes the spud is the only vegetable that may be in the house three or four nights a week. Versatile.
> Female B: You can do a lot with a potato! …
> Male: The potato is the staple food of New Zealand … so the potato should be healthy and good … without any disease and rotting ... affect the health … most important vegetables in many shops (Waipukurau).

Although, there are now large groups in the New Zealand population for whom this is not so, e.g., Pacific Islanders, Asians:

[32] A year long study by the University of Auckland and the National Heart Foundation, called 'The Hot Chips Project' found that 44 percent of New Zealanders eat chips at least once a week (RSNZ News, 22/9/99).

> Female A: I just said that as a food it's not really important to me 'cos I'd rather eat taro, (laughter) but as an export product it would be feasible.
> Male A: Good old taro …
> Female A: Basic food for Kiwis. Always eating potatoes.
> Female B: I like the potatoes …
> Female C: … Why don't they eat the kumara or something else?
> Male B: I just put down 5 [least acceptable] because I prefer - I'm not a Kiwi ... Rice and taro's better! (Auckland 2).

A biotechnology that guaranteed potatoes would not rot could benefit a large number of 'ordinary' people. If there were something wrong with the technology it would also affect a large number.

5.6.2 The Toad

Participants expressed a general dislike of toads. The name itself could produce a reaction that was difficult for participants to articulate, which could be called 'the ugh factor'.

> I don't want another gene thank you very much. And I don't want it to be a toad gene … but it's also got the worst press hasn't it? Maybe we've all put that down as number 5 because you hear a lot about it (Female, Auckland 1).

> Female: Well, I really don't know. It just didn't appeal to me. The toads just [cringes][33].
> Facilitator: Make your skin crawl, you just sort of curled up there ... Well, you're still kind of like recoiling there.
> Female: I've seen a lot of cane toads …
> Facilitator: That's a kind of ugh factor.
> Female: Well, to me, it's just the name of something and it just totally put me off (Christchurch 1).

> Yes I was third as well. I guess when I saw synthetic toad gene I had visions of cane toads jumping round … and taking samples of them and injecting them into potatoes (Male, Nelson).

People made a strong association between toads and frogs often saying frog instead of toad. This association seemed to make out that 'frogs' had a positive image whereas toads did not. A woman said, "I just don't like the toad anyway so (laughter continues). I'm rather a frog person …" (Female, Christchurch 2). A man said:

> I gave it 'three' because [of the] toad gene. We don't normally eat toad. (Laughter) But we eat frogs, yes, particularly frogs but we don't eat toad for a reason. If there was like, fish's antifreeze gene I might probably give it 'two' but it is a toad gene (Male, Auckland 3).

One person did remind his group, "You've got to admit that all the best cookbooks have got toad in the hole (laughter)!" (Male, Dunedin).

A woman in the Nelson group did not think that this attitude to toads had any rational basis. She thought:

[33] Note taker's comment.

> … the key word is synthetic here. The 'toad' word association. People thinking frogs, toads growing … but … genes make up what people are … so a gene, one single gene, is not going to make it a toad (Female, Nelson).

5.5.3 The Mix-it Factor: Potatoes and Toads

The exemplar brought together the two contrasting images people had of potatoes and toads. Would such a potato be forever linked to a toad image? "I think it's people imagining having mashed potatoes having a bit toad in there. But it's not that at all. It's just a whole mental thing with pictures you've generated in your head …" (Male, Auckland 1). In another group the discussion went like this:

> Male: … Yeah, just don't like the thought of frogs in potatoes.
> Facilitator 2: But it's not.
> Participant: Oh, but the sound of it just makes you go "ergh" (Wellington).

Is this potato going to be animal of vegetable? Will the potatoes have a bit of 'real' toad in them? There were many jokes made about this, such as: "We wouldn't have jumping potatoes, would we?" (Female, Waimate), and this interchange:

> Male: Do the potatoes come out green like toads?
> Female: Do they go "ribbitt"? (Christchurch 2).

As with the lozenge exemplar, participants felt that the sale of GM potatoes would depend upon how they were marketed and what potential consumers would be told. One man in Dunedin thought that more products should be marketed as 'GE free'. A woman summed up this issue when she said, "We need to know what's in our food, because that influences our choice about what we support and what we don't" (Dunedin 2).

In summary, potatoes are part of New Zealanders' staple diet so have cultural and social significance. However, New Zealand is becoming multicultural and the Pacific Island participants, for example, could not understand why 'Kiwis' did not just eat taro or kumara if something happened to put them off potatoes. What will happen to the image of the potato in general if this biotechnology is used?

5.7 "We' and 'They': Setting Up Oppositions and Responsibilities

In this exemplar the words 'we' and 'they' were used with a wider variety of meanings than in other exemplars, illustrating how this exemplar helped participants sort out where they stood (the 'we' part) and who they were in opposition to (the 'they' part).

It was difficult to tell at times whether 'we' referred to 'we New Zealanders', as in: "You know, if we're growing potatoes might as well be growing potatoes … We might as well be utilising it [earth/soil] to its full potential" (Male, Waimate), or to 'we, as human beings alongside other human beings, citizens of the world', as in: "Just because we [society] don't understand something doesn't mean it's wrong or bad" (Male, Waimate), or, "You have dogs and cats in our houses and we [you and I, people in general] get friendly with them but we don't really get friendly with our [plants]" (Female, Auckland 1).

As such citizens 'we' have certain responsibilities, as demonstrated in these quotes: "It could help a lot of poor countries that we need to find a lot of food for" (Female, Christchurch 1),

"… it's the only one where I can see any potential for it to start going places where we [society] might not like it to" (Male, Dunedin 2), and "I have difficulty with using some of our [New Zealanders] native plants and putting different genes into our native plants … what right do we have to … change them?" (Female, Auckland 1).

However, 'we' are also 'acted upon', having things done to us without our consent, as in: "… it also worries me as to what the hell we are eating. Hopefully not necessarily here in New Zealand yet, although we can't regulate what's coming into New Zealand …" (Male, Nelson), and "[I'm] just not happy with tampering with the major food that we all consume" (Female, Wellington).

Also 'we' unwittingly participate in actions that we do not know the consequences of, as in: "And when we get ten, twenty years down the track we think, whoa, that wasn't so good after all" (Male, Waimate).

Participants also signified their association with scientists/scientists by their use of 'we': "I don't believe we should be creating species" (Female, Auckland 1), "I had no fundamental objection to transgenic work just so long as we [society and scientists] are very, very careful" (Male, Nelson) and "… we [society or scientists] just have absolutely no idea what the end result will be in 20 years time, for example" (Male, Nelson).

'They' referred to three groups: scientists, farmers/industry/commercial corporations and as 'other' – not 'us'. Each group is considered in turn.

The regard in which scientists were held ranged across the continuum from positive to negative in this exemplar. They were viewed in a good light by some, as these women from Waipukurau illustrate: "[I] liked that it was synthetic and that they'd [scientists] obviously isolated the DNA structure of some gene that would control it" and ,"It's not as if they're [scientists] putting any animals at risk or anything". There was a feeling that scientists will find out what is going on eventually, as this man from Waimate said: "If we're going to wait for them [scientists] to find out what everything does before we do anything we're not going to go anywhere, are we?" (Male, Waimate).

There were also many neutral statements about scientists with the implication that scientists can make links that ordinary people cannot. The following quotes give some examples: "How did they [scientists] work it out in the first place?" (Waipukurau), "What's interesting is how did they know that a toad gene would actually cure that?" (Dunedin), and "But they've [scientists] got to do the work to prove that that's not going to happen, don't they?" (Waimate).

This power attributed to scientists meant that science was perceived to be almost out of control of ordinary people. In this sense scientists were not quite trustworthy. They give words particular meanings not found in everyday speech to obscure the reality, as this quote implies: "In other words, the only reason they [scientists] say its synthetic is the fact that they've made it in a laboratory, but it is a toad gene - a copy of [a toad gene]" (Male, Waimate). No longer are scientists perceived to be independent:

> Male A: Should we not trust independent scientists that are interested - ?
> Male B: Yeah, we should if they were being independent (Waimate).

And some participants implied that if scientists really wanted to, they could find an alternative to using GM to reduce soft rot in potatoes: "And I believe that there's other ways that they [scientists, potato growers] could rectify this problem" (Male, Waipukurau). These quotes demonstrate the ambivalent and mixed attitudes to scientists amongst the focus group participants.

The potato industry and companies in general were described as 'they' in terms which demonstrated that such entities were only out to make a profit and could not be trusted to have the consumers' interests at heart: "All they will do is produce enough in order to make money (Male, Nelson", and

> I haven't got the confidence in the industry to accept that what they're [industry/business] doing is going to be fully tested because, as I said before, they put a heap of money in. They want a return on it. They want a 20% return on their capital sort of thing and, "We don't want 20 years testing, that's far too long. What's wrong with 2 years testing?" (Male, Waimate).

The potato farmers were sometimes portrayed as likely to be at the mercy of larger corporations:

> Male A: And … if someone did the research, they'd say they [commercial company] would be like Monsanto and they would say, "Ah, ah, ah. You've got to grow our potatoes. And if you have another potato somewhere else, we will shoot you." …
> Male B: This has happened with GE. They've [corporate business] got control of the grain industry now (Waimate).
>
> And all these toad potatoes - it's not for the good of mankind. It's for their own good, because they [industry/companies] will sell those potatoes to the farmers for huge amounts of money and they don't give a damn whether they taste like crap or not (Male, Nelson).

'They' was also used to apply to Government regulators and one farmer implied that they did not know what they were doing: "What did they [regulatory body/Government] say? You're allowed half a percentage GE. Well if you're allowed half a percentage GE you might as well give the whole lot away" (Male, Waimate). Another person thought the regulations were very tight and protective (Female, Nelson – already quoted).

'They' was always used to indicate the 'other' – those who were not 'us'. For the Pacific Islanders 'they' were New Zealanders, sometimes they were the people in the past (Dunedin 2), and sometimes 'they' were the anti-GE protestors (Nelson).

5.8 Discussion and Summary

This exemplar had many points of interest and discussion for the participants. It brought to the fore the issue of transferring genes from the animal kingdom to the plant kingdom and who would reap the benefit of that. It was felt that only the growers would benefit and for many this was not a sufficient reason to use such a controversial biotechnology on a plant that was part of the staple diet of most New Zealanders and for many, part of their historical culture. The use of a synthetic gene based on a toad gene was the most controversial part of this exemplar, not in the least because many, especially women, had strong negative associations with toads in particular, even though participants were aware that it was not an actual toad gene that was used. Many jokes were made about this potato-to-be and its link to

toads. Would it be a plant or an animal? Would vegetarians want to eat it? Overall these concerns made this exemplar the least acceptable to participants across all focus groups.

In this exemplar, farming participants demonstrated more experience of and interest in biotechnology so frequently talked from an experiential perspective whereas other participants talked from a 'what if…', theoretical perspective. The latter saw the environment in an 'enjoy it' sense whereas the farmers were more pragmatic and utilitarian. Land was to be used to produce the best crops possible and this exemplar in particular would help to do that in the case of potatoes.

Chapter 6
Themes From the Use of Embryonic Stem Cells in the Treatment of Alzheimers Exemplar

6.1 Introduction

EXEMPLAR

- Stem cells (5 day old embryo) → person with Alzheimer's → some reversal of condition.

In this exemplar stem cells from a five-day-old embryo can be inserted into the brain of a person suffering from Alzheimer's Disease, regenerating some of the cells that have been destroyed. The stem cells to be used would come from embryos 'left-over' from in-vitro fertilisation treatment. At present the embryos that are not used are disposed of.

Table 6
Acceptability Rankings for Exemplar 4, Stem Cells for Alzheimer's Disease

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	2	1	3	2	2	0	10
Auckland 2	1	4	2	1	3	0	11
Auckland 3	2	2	1	1	4	0	10
Christchurch 1	2	5	2	1	2	0	12
Christchurch 2	3	0	1	2	4	0	10
Dunedin 1	6	4	1	0	1	0	12
Dunedin 2	2	2	2	1	2	0	9
Nelson	3	1	2	1	3	0	10
Waimate	5	2	3	1	0	0	11
Waipukurau	2	4	2	1	1	0	10
Wellington	4	0	0	2	6	0	12
Total	32 (27%)	25 (21%)	19 (16%)	13 (11%)	28 (24%)	0 (0%)	117

This exemplar produced rich data. In a sense the number of themes was reduced but the categories within these themes were able to be described more fully. Ethics, for example, seemed to play a major part and raised many questions. On the other hand ideas about nature were submerged within the ethics. As can be seen in Table 6, five groups had a majority finding this exemplar acceptable with Dunedin 1 overwhelmingly so, but two groups, Wellington and Christchurch 2, considered it less acceptable, though this was not unanimous.

A dominant issue was the role of personal experience. People who had relations or friends with Alzheimers were obviously strongly affected by this experience, not least because if a relative had Alzheimers then a person asked themselves the question of whether this placed them at risk of developing the disease themselves. If it did, then did they want such research to go ahead in spite of their dislike of the use of embryos in research or treatment? This

dichotomy between a desired endpoint and the process to obtain it was more apparent in this exemplar than any other. Participants were being asked to decide between doing something they may have found repugnant, using an embryo, to achieve something – the relief of Alzheimer's Disease - which may benefit their own health in the future or help them with a relative who had the disease. It raised the whole question of whether one human life should be valued over another. This division was most marked in the Wellington focus group where participants found this biotechnology either most acceptable or less acceptable.

6.2 Assessing the Impact of the Biotechnology: Risks and Related Issues

The impact of this exemplar is considered under the usual headings. First there is the perception of risk surrounding its use, followed by its perceived benefits, the pragmatic or utilitarian viewpoints, the discussion of whether it was seen as a micro or a macro issue and the importance placed on that, and finally, the ethical implications this exemplar raised for focus group participants.

The perceived risks of this biotechnology are categorised as firstly, concerns about the control of the risk, or the way in which participants said they would find this exemplar acceptable under certain provisos. Secondly, the fears that these provisos express about the exemplar are summarised, followed by the participants' expressed distrust of the motivations of those developing such a biotechnology. The section concludes with an outline of extra information the participants felt they needed, and what further research they would like to see around the issues raised by this exemplar.

6.2.1 Provisos: The Precautionary Principle

One woman simply expressed the feelings of many participants when she said, "I think … you can wait for the technologies to develop a little more. So you can use the same thing in a wise way. It can wait. There's no hurry" (Auckland 3). This practice of caution was frequently stated alongside the wish to see the use of embryos policed and monitored in a systematic way.

In some of the focus groups the facilitator asked participants if they would prefer the cells used to come from the recipients of the therapy rather than from embryos.[34] This was much more acceptable:

> I've got a 'one' provided the cells are taken from the same person, and that person or their next of kin has consented - if they've got Alzheimers and that sort of thing. And I've put 4 if they're taken from an embryo because I mean they were going to throw the thing away (Male, Christchurch 2).

Others found this exemplar acceptable as long as the stem cells were a 'donation'.

6.2.2 Fears

A lot of fear was expressed about the commercial exploitation of embryos (see next section on 'distrust') because "… the potential for misuse is there as well" (Male, Christchurch 2).

[34] Two researchers at the University of Auckland, Richard Faull and Bronwyn Connor, are studying whether stem cells can be removed from a person, regenerated, then returned to the person (University of Auckland, 2003).

Participants felt there was a need for regulation but that even regulation is limited: "All we can do is govern what we do in New Zealand … keep those controls in place. What they do overseas you've got no control over anyway" (Male, Waimate).

Participants were very cynical about humans and what they are prepared to do. For example, one man said, "The man who invented the gun may have said we're only using it to defend ourselves but people still go around causing wars with it. You make a rule but its always going to be broken" (Male, Waimate) and another, "As long as there's money to be made there'll be a black market to trade in and there'll be people willing to sell bits to get the money" (Male, Waimate). One person pointed out that you can never tell how a technology is going to be used and for what purpose:

> There's always good and bad going. You say I'll use it and it will be good. You never know what I'm going to do. I can steal your technology and can do whatever. It has happened. It has happened always. So before you implement you've got to see all aspects. It's not always good. You may do it in a good way. I can do it in a wrong way. It is my choice. I steal your technology. I can do that anytime (Female, Auckland 3).

This was particularly applicable to the use of embryos:

> … of course that view is tempered with the realisation that there is going to be a lot of moral hand wringing with respect to the use of five day old embryos for the harvesting of the stem cells. You'd have to buy them of course. I do wonder whether or not it becomes an acceptable practice to use the stem cells for such research treatment - whether or not that then would justify the 'farming' of embryos. Again huge moral dilemmas will ensue as a result of that. But if it happens that's something society's going to have to face and deal with, and come to a decision with respect of - I just hope the decisions aren't governed by that power thing I was talking about … I hope it's a moral decision not an economic decision, because of course with every medical procedure there are huge amounts of money to be made (Male, Nelson).

Containment with this biotechnology could not be related to something being passed on to future generations but in this case there was a concern about the practice becoming prevalent. Once something starts being used it is very difficult to stop.

> In respect of farming, I think that situation's already been covered a number of times by people, by parents who deliberately have a child, have a further child with the stated aim of producing stem cells or whatever for a child who is desperately ill, you know. So that's acceptable, you know, sort of, already. It's already happening. But you know, I'm still having problems with it … [embryos] being farmed for that purpose (Male, Nelson).

Participants were worried about transferring cells from one 'person' to another and the unpredictability of what might happen: "… you might create another Frankenstein which you really don't know … you don't know whether it works or it might turn a good person to a killer or a superman. It might reverse – dangerous" (Male, Auckland 2).

Some of the participants in the Auckland 3 group knew more about this biotechnology:

> Female: But the thing that you don't know at present is these are the undifferentiated cells which are having a potential of making anything. They are all identical. But how much is this working in the situation here in humans? You don't know, because you

> have not tried …You never know sometimes … You know, each and every cell of our body is a cancer cell, yeah. It has got all the information. Each and every cell of our body is having the information for cancer. It's just a matter for triggering it - how it is triggered.
> Male: [There are] so many unknowns with stem cell biology. People don't even know what switches on, what switches off these stem cells. We are going blind in this particular project. … if you put stem cells in the brain, they won't guarantee you that there will be a brain cell growing there. It might be a liver cell will be growing in the brain. So the basic science is not there yet (Auckland 3).

6.2.3 Distrust: Challenging the Motivations and Knowledge of Stakeholders

Participants were very distrustful of the motivations of those who would fund this research. (Also see 'Ethics'.) One participant expressed his concern about commercial research being too focused with worthwhile sidelines not being pursued because they might only have the potential to benefit a small proportion of the community and therefore not be profitable. He felt that, "If it was Government funded, and unbiased funding as I said, then the avenue to look sideways is there" (Male, Waipukurau).

Others were concerned about turning "excess production" (Dunedin 2) or "waste management" (Female, Wellington) into profit:

> It's waste management. And that's what I struggle with … I think the purpose of IVF has got a dual function. It has a latent function of helping people to conceive but there's the manifest function slipping in with, "Oh gosh. Here's a business opportunity for us. Why throw them down the toilet? (Female, Wellington).

Some could see the profit-making motive move in to the private hospital arena:

> Because I can see we're all saying, "Oh, good can come of this," but you only need to look at this day and age, with other things - hearts - and how these private hospitals work. When they get short and start thinking of the dollars, all the safeguards, anything like that will be out the window. The dollars would count at the end. It's private enterprise, especially in the States and these other countries. So, I'd hate that thing to get off the ground (Male, Wellington).

Such a situation could then lead to "embryo farming" (Female, Auckland 1) and the possibility of "grow[ing] them [embryos] in a big laboratory in a Petrie dish or something or other" (Female, Christchurch 2), which was not acceptable.

Another related issue was about the transparency of the process of collecting and using embryos. As one woman said, "And I think it's really important - how do they collect them? Is it going to be done behind the scenes? All those who choose to say, have an abortion ..." (Female, Waipukurau).

In this exemplar it is not only business motives that were distrusted. One person expressed concern about the motivation of medical scientists with a preference for research with potential to win a Nobel Prize, for instance:

> And I believe that in a big way it actually diverts medical resources away from the primary care issue. So in terms of addressing quite a unique disease such as this you're diverting funds from primary health care and I mean, the greater good is being lost due to this allocation of resources. And I'm sure no-one ever got a Nobel Prize for teaching

> your kids better hygiene, exercise right and eat right, but I'm sure fixing Alzheimer's Disease is going to win people Nobel Prizes and lots of funding, yeah (Male, Wellington).

6.2.4 The Need for More Information and More Research

As in other exemplars, participants wanted to know more. Some felt they did not know enough to decide. They wanted to know about:

- The collection, storage and use of embryos, and "Is it an embryo that's going to develop into a baby or are they 'scientific' ones?" (Female, Dunedin 2).
- Whether this treatment would be permanent or temporary, partial or complete.

Participants felt there was a need for more research. They wondered what the side effects of such a treatment would be. They thought there should be alternative treatments that did not involve the use of embryos:

> I'd still like to think there was some sort of alternative because I find destroying an embryo for any reason of research - I'm certainly not anti-abortion - but for research purposes it's a bit hard to swallow (Female, Christchurch 2).

The treating of the effect of a disease rather than getting to the cause of it was raised in this exemplar also:

> … this type of therapy is like sticking a plaster on a wound, whereas you're not treating the wound itself. Alzheimers is a genetically linked disease so why not target that gene specifically as opposed to trying to bring in something else to solve the problem (Female, Nelson).

Many participants remembered the association of Alzheimer's Disease with the use if aluminium pots and cans, and had taken action in their own lives to restrict the use of food stored in aluminium containers:

> I've read, a good while ago, in a Time magazine, where the Americans … have related the increase in Alzheimers to a certain point of time which correlates with the use of aluminium cans ... I never let my children drink out of aluminium cans (Male, Nelson).

6.2.5 Benefits

Participants were very supportive of this biotechnology because "It's a terrible disease. Anything that could help I think would be great" (Female, Christchurch 2), "When people suffer from Alzheimers really they've no hope ..." (Female, Christchurch 2), "They can lead fuller lives" (Male, Nelson), "… new knowledge that will be gained from it" (Male, Auckland 2), and it will "… actually make it less burden on the tax payer if people can help themselves" (Male, Nelson). Not only that but it would be of obvious benefit to the families of Alzheimer's sufferers.

Such a biotechnology brings promise "… for the health of the population of the future … to help people age better or less or enjoy their older years better in some way" (Male, Dunedin). Stem cell research also has potential to help people in a lot of other areas, such as those with spinal injuries of other neurological diseases. Some participants knew about the possibility of storing umbilical cords in a bank as a future source of stem cells "… in case something did

crop up with one of my other children" (Female, Nelson), and they hoped that this would become a common practice and even become Government funded.

Another benefit participants felt was important was that this treatment would be contained by being limited to an individual, and what is more, an individual who would not be reproducing, since Alzheimers is a mainly a disease of the elderly:

> … you're dealing with something which is specific, which is treating some one person and its helping that one person; there's no risk of it of something entering a food chain and there's no risk of genetic mutation continuing (Male, Christchurch 1).

As can be seen, there are many positive benefits arising from this biotechnology in comparison with some of the other exemplars:

> I wasn't sure whether this synthetic toad gene thing really existed, or couldn't see any real benefit in potatoes for that. And the methane … you know that's a debatable thing - we're talking about ozone holes and things like that. And there's a large body of thought that don't accept that that is a problem. So I've just written, what's the problem? (Male, Dunedin 2).

6.2.6 The Pragmatic/Utilitarian Approach

Significant numbers of people get Alzheimer's Disease and with the increasing proportion of aged people in our population it will become more of a problem to society as a whole, partly, to the pragmatist, because of the cost of their care. This exemplar provides a way of helping such people which uses something (embryos) that otherwise would be disposed of. To pragmatic participants, if at all possible, things should be used, not wasted.

> Male A: Yeah, initially the idea of using a five day old embryo didn't appeal to me too much, but the fact is that these embryos will be destroyed so it would be quite good if they could used for something useful like helping somebody with these serious diseases …
> Male B: Why not? It's not hurting anyone. It's just going to go to waste so why not give them to someone with Alzheimers (Wellington).

This perspective was expressed by at least one person in most groups.

Another side to this pragmatic and utilitarian trait found in people was that such a biotechnology as this would lead to Alzheimers' sufferers being able to lead a "useful life" (Male, Nelson). Such a pragmatic approach was also apparent in the responses of some who implied that because the subjects of this research were elderly, it "lessens the caution that needs to be used" (Female, Waimate).

6.2.7 Judging by the 'Size' of the Problem: The Macro Versus Micro Arguments

This exemplar exposed the divide between those who found a biotechnology acceptable if it would help a large number of people all at once, compared with individuals. For a man in Wellington (already quoted) improving primary health care was a better way of allocating resources. Others also saw this exemplar as a macro issue, because of the degree of suffering caused to a lot of people, the cost to the country, and the improved quality of life it could bring to a large number of people in the future.

> It's got real benefit for real problems. Significant for a lot of people and causes a lot of suffering and will improve quality of life for people. Not getting a cold through taking a throat lozenge is minor compared with Alzheimers and cancer. They're far bigger issues and extremely costly to the country (Male, Waimate).

Another aspect of the micro/macro concept was the importance placed on anything that affected humans over the environment. There was a hierarchical system which valued some parts of the body over others, the brain being one of the most important, as this man stated: "If you loose the brain then everything else starts breaking up so I feel it's important" (Male, Waipukurau).

As has been discussed earlier, there were those who felt this biotechnology's limitation to individuals made it more important. There were others who just did not feel that it applied to, or impacted on them as individuals so was not important.

6.2.8 Ethical Issues

Ethics emerged as more important in this exemplar than in any other. The related ethical issues were strongly associated with the meanings given to the word 'embryo' (see later) and to the fears arising from the use of stem cells taken from embryos (see above). Participants expressed themselves very powerfully. Many women expressed similar feelings to those in these quotes: "I don't think it's ethically right. And I do believe that doing that is just working against natural selection. I'm totally against it" (Auckland 3), "But I think it's morally repugnant. I think it's wrong in general" (Wellington) and:

> To me it's not acceptable at all to use a human … embryo ... It's a God given thing, you know? An embryo is a living thing. It's a baby. As soon as its heart starts beating it's a human, so why should you kill off something to help save someone else. It's not - it's just not right (Auckland 3).

The Wellington focus group found themselves completely polarised on the acceptability of this exemplar. They ranked it as 'ones' or 'fours' and 'fives'. This highlights how this exemplar in particular was asking participants to decide between two difficult questions. Firstly, they were asked whether people suffering from Alzhiemers should be helped. Participants mainly saw that positively. Secondly, they were asked to do that by destroying an embryo. That may be something they could come to terms with, as this woman said, "Well, I've got a divided opinion: yes, it would be good to help the chronic conditions that are out there, and no, because of taking an embryo" (Female, Christchurch 2). A man said, "I was interested to notice that although I've rated it 'five' I've agreed with a lot of people who rated it 'one' " Male, Nelson). So how did participants make such a decision?

Participants in this study linked this exemplar to some other issues that had occurred in New Zealand and to their own experience to inform their ethical stance and to make sense of this biotechnology. They associated it with informed consent and remembered the cervical cancer inquiry that became known as 'the unfortunate experiment', and the way in which hearts of babies who had died all around New Zealand were kept without their parents' knowledge (see Chapter 1). Gaining informed consent from Alzheimer's sufferers is problematic, and gaining informed consent from parents for the use of an embryo produced for IVF treatment is a possibility with this exemplar.

The issue of the use of embryos was related to that of abortion, because a foetus starts off as an embryo, and the abortion debate raged in New Zealand for many years over whether the destruction of a foetus was murder or not.

Others saw this exemplar as the same as an organ donation:

> … but if it was a donor then I'd push it right up to 'one' because I don't think it's any different than donating your eye, or your heart, or your kidney, or your liver, or anything else to help someone (Female, Christchurch 2).

However, in another group debating the same thing, one participant felt that body part donors have a choice but an embryo does not. In other words, parents should not be able to 'speak' on an embryo's behalf – an embryo is a living entity in itself, with the potential not to be dependent on a 'body' for its life.

> Particpant B: I have a choice. An embryo doesn't have a choice.
> Female: At what point does somebody have the power to choose? (Dunedin 2).

One of the participants (Auckland 3) had conducted experiments on a live animal and felt this animal's fear of her as a result had coloured her attitude to such experimentation. Another person thought about Hitler and how even though good things can come out of bad, does that justify the 'bad'?

> It's justifying destroying the babies. It's saying, well here's something good coming out of something bad. But it's like Hitler, using all the experiments that he did on people. And whether a person wants the baby or not it's still a baby … The interesting thing is though that even at the time of Adolf Hitler, Dr Mendel and some of the greatest techniques in human surgery came out of those revolting experiments. I mean that's the reality of our human history. While we may be abhorrent to what happened we actually are the beneficiaries of what occurred. And I mean that's the irony of it all. And that's why I think something like this is so incredibly hard. There are beneficiaries essentially to someone losing out (Female, Wellington).

Some saw this exemplar as taking one life to save another. Others pointed out that the embryo was not going to survive/live anyway so it is better to use it. Others questioned the value of the life of people suffering from Alzheimers. Is it worth talking one life to save that of another person who is nearing the end of their life anyway? Others thought of how much it would help the lives of those whose relatives were Alzheimer's sufferers.

Are embryos babies? When does an embryo become a baby? Participants who described embryos as babies immediately made the word 'embryo' very emotive, and using an embryo was translated into killing a baby and life was 'sacred'.

> I don't care whether it's one day old or nine months old. And to me if I had embryos I wouldn't want to have them destroyed. I would find it abhorrent to have any of my babies killed. We've lost two babies - one at two months and one at two and a half months and to me they were still babies. They weren't products of conception. They were babies … to me life is sacred and should not be destroyed … and whether a person wants the baby or not it's still a baby (Female, Wellington).

Some participants wondered if there was some distinction between embryos that become babies and those used in research: "Like, is it an embryo that's going to develop into a baby or are they 'scientific' ones" (Female, Dunedin 2), and "It's probably made in the lab anyway

– artificial" (Male, Nelson). Another person felt that experimentation would be fine as long as the embryo was donated, but they were against embryos being produced for research purposes:

> I had number 'five' … well I'm not anti-abortion. That's not a problem for me but to grow embryos for research I find extremely distasteful. It doesn't sit with me well. But X's idea of if somebody was willing to donate embryos I would be fine with that … or if somebody decided to out of their self - that's fine with me as well … But to grow them in a big laboratory in a Petri dish or something or other … (Female, Christchurch 2).

Others were quite sure that embryos should *not* be experimented on, as this woman said, "I'm against interference with embryos" (Female, Christchurch 2) and a man said, "Don't use human embryos in experiments" (Male, Auckland 2). An embryo is the first stage of human life and should not be produced for instrumental purposes, but valued for its own sake.

> … I get quite choked up with this - the thought of producing humans as a means to an end as opposed to giving life I find abhorrent to me and my beliefs, personally. Just - yeah, I just find it abhorrent (Male, Christchurch 2).

It is destroying something that has not yet had the chance to achieve its potential:

> The Indian mythology says that even if the baby is not born when it is developing in your body it can understand and it can hear you. So, it's like exploiting a life which has not even seen the world (Female, Auckland 3).

Related to this 'aliveness' of embryos was the issue of choice: "You could claim that it [embryo] was alive, and if you're alive you've kind of got choices. But you can't really have a choice as an embryo so they're kind of taking advantage of that fact" (Female, Dunedin 2).

Similarly the issue of informed consent arose for those with Alzheimers. Is it possible for a person with this disease to make a decision about having this treatment? How could you know whether they agreed with the use of stem cells from embryos? (The Nelson focus group had quite a discussion about this.) What does this mean about the 'aliveness' of Alzheimers' sufferers? Do people have to have a certain quality of life to count as people? This issue was touched on in some of the groups:

> Yeah, but a lot of it is staving off the ultimate passing away and are we really increasing their quality of life? Now there are examples where younger people who have a car accident say, the stem cell research is a benefit to them, helping them get back on their feet, getting them more mobile … but America, when you get beyond a certain age you are jut put to the side because you are not producing an income for the wider community … (Male, Nelson).

Is aliveness to do with living a 'useful' life? Is a useful life tied in to paying your taxes or needing the taxes of others to stay alive? The following quotes are representative of some of the discussion that produced these questions:

> We've touched on the triple by-pass and whether or not it's worth having one. It doesn't matter how old you are. If you are able to lead any sort of useful life after having an operation then it should be available to you. You can't cross the line (Male, Nelson).

> Participant A: … but the question is, do we need to have a increasing number of elderly people being supported by an ever decreasing number of tax payers who are faced with that burden and by doing a lot of this stem cell research, and granted, a lot of it is to the benefit of [relatives].
> Participant B: [It will] actually make it less burden on the taxpayer if people can help themselves (Nelson).

There was a fear that this biotechnology would be the 'beginning of the end' – that if was used it would get out of hand. Using embryos for their stem cells could be the start of something that gets out of control and it may be better not to start. Once started the technology could be picked up by unscrupulous people over whom there would be no control. There were questions about where do the limits lie in the use of embryos. Would researchers start using foetuses?

> And I also think that once you allow five day embryos to be used where would you stop? Would they become two weeks embryos? A month embryo? You know? You'd be eating away (Male, Auckland 3).

Could such a biotechnology lead to the 'manufacture' of babies with certain wanted characteristics? "I just wonder if once you set out on this road, the human embryo thing, are you then on the road to producing babies with blue eyes because you want a baby with blue eyes" (Male, Nelson).

Such talk led to worries about the intrusion of business, with the accompanying concern about the domination of the profit motive, which was discussed earlier. It was in this context that this technology was mentioned as possibly being 'the beginning of the end'.

> Male: I think this could be the beginning of the end. I hear what you were saying here. I think if they get short of stock this will now become a business opportunity. People now will be breeding embryos to put away because they get paid for them, because some private hospital is short of them and it's going in like they do in the States now, they pay you to go and get a blood transfusion. Someone will be paying you to go and give them some of these. And this is what frightens me. I believe we're now starting to try and play God. And that's why I've marked it - the only one - at 'five'. Because I can see we're all saying, "Oh good can come of this," but you only need to look at this day and age, with other things – hearts - and how these private hospitals work. When they get short and start thinking of the dollars all the safeguards, anything like that will be out the window. The dollars would count at the end. It's a private enterprise, especially in the States and these other countries. So, I'd hate that thing to get off the ground.
> Particpant A: I agree, especially like in the second world countries, like the Philippines or whatever, where they're actually harvesting -
> Particpant B: Body parts
> Female: Which is what I think they'd do. They'd be corrupt business opportunities. I mean in theory it sounds like a great idea - it's going to be wasted, why not use it? But I think it's morally repugnant. I think it's wrong in general (Wellington).

One participant was worried about the potential for the use of embryos to create civil dissent. She said, "Then you get people outside with the old placards. That can be quite frightening for those who are wanting to help research in that area" (Waipukurau).

Some participants were aware that attitudes to the use of embryos could be dependent on cultural or religious meanings:

> I'm concerned about it because we live in a multicultural [country], just the cultural side of it, you know, and the assumption of consent … I'm sure it would be incredibly culturally insensitive to a lot of people (Female, Wellington).

One of the Maori women participants said, "It's actually a big deal if I was asked to hand over my embryo. I would actually be wanting to say no." (Female, Dunedin 2). On the other hand, a man from China speaking through an interpreter, said:

> It's being developed and used in many countries, by many countries. He thinks while humans are involved it usually has been evaluated … And he said in China there are many people willing to donate embryos so he has no ethical issues with that. He thinks if can cure diseases, why not? (Male, Auckland 3).

Whereas an Indian woman said, "Indian mythology says that even if the baby is not born when it is developing in your body it can understand and can hear you" (Female, Auckland 3).

It is interesting to note that very few pakeha New Zealanders mentioned religion as a reason for their perspective (it may well have been but they did not say so), but a young Asian mentioned how he had come across the Christian perspective:

> Well, for scientific reasons I've got nothing against it. However, the ethical reasons, especially with New Zealand … there is a strong religious foundation, perhaps not background, but foundation. It's really hard for people to accept that using an embryo, even before it turns into a zygote, or whatever, to heal someone, another human. To them, a Christian, it would be like killing one human to save another. I mean, are we really down to that savage level? (Male, Auckland 3).

From this summary of the ethical issues that arose from this exemplar it can be seen that participants views ranged from 'using embryos should not be allowed', through 'it is doing something with embryos when they would otherwise be wasted', to 'if it takes using embryos to give a greater quality of life to sufferers from Alzheimer's Disease, then proceed with such treatment'. There was also debate about whether it was worthwhile to treat older members of the population. This debate went from 'if there is a treatment that has the possibility of relieving a medical problem then it must be available to people irrespective of age or ability' to 'older members of the population are going to die soon, and those with Alzheimer's are not experiencing any pain as a result of their condition, so using an embryo to help them, which is so controversial anyway, should not happen'. This was essentially a discussion about the qualities of 'aliveness'. What did it mean to be 'alive' and what did society owe to those who were alive?

6.3 Sense of Place: Perceptions of Nature and Natural

Participants liked it that this biotechnology used "… humans basically to cure other humans" (Male, Waimate), and saw it as "… taking stuff from your own body, which is OK" (Auckland 3). In other words, taking stem cells from embryos to transfer to another human was acceptable because it was viewed as taking something from one human to place in another. The throat lozenge technology was seen as acceptable for the same reason.

Others thought that this exemplar was 'interfering' with nature. One woman said, "I'm against interference with embryos" (Christchurch 2). In two groups there were people who felt that diseases were here to keep control of the human population. If people are kept alive

who would otherwise be dead then this exemplar is interfering with the process of natural selection:

> Female A: Yeah, it's different in a way from a condition that may be terminal, such as cancer and the hard fact is that - and I mean I don't like it, and the majority of people wouldn't like it, but cancer and other major diseases and viruses like AIDs are there for a reason, to keep a cap on the human population and the more we try and fix these problems the more we are adding to -
> Female B: Social problems
> Female A: Yeah, exactly ... Everyone knows someone who is inflicted by a terminal disease somewhere along the line and to know that we've got the power to fix that but then be faced with a series of questions that we've got to take a harder look at, you know, and say, "What are we doing here in the long run?" (Nelson)

There is an implication in this quotation that diseases are so hard to cure or treat because we should not be doing either. Diseases are there to stop the world's population getting too large so they should be left to just follow their natural course. It is going against nature to do something about them. The feeling was that it was asking for trouble to go against nature: "Whenever you are going against nature it does have a side effect" (Female, Auckland 3).

(Many of the ethical issues discussed earlier fit in this section also.)

6.4 The Role of Personal Experience and Knowledge

Participants in the focus groups were able to bring their own experiences, stories and knowledge of Alzheimer's Disease and of pregnancy to this exemplar. Many had friends and relatives who had suffered from Alzheimer's and they linked Alzheimer's disease with other neurological ailments such as epilepsy and motor-neurone disease. They had heard that similar technology may be useful to people who had suffered spinal damage etc. In the focus group at Waipukurau six in the group had relatives who had Alzheimer's or a similar disease:

> I have a relative that's young, you know, in her 40s, that's got it. And I also have a grandmother of 95 that's got it and it's just - yeah, it would be nice to see some research done into it and something to happen to improve it (Female, Waipukurau).

A personal experience of Alzheimer's did not mean that a participant ranked the treatment with stem cells as 'most acceptable' but it affected their way of thinking about it. Underlying this is the constant worry, usually not stated, that if it is hereditary, will it affect me?

> Female: It is a worry that it's going to come down through my grandmother …
> Facilitator: You have a history?
> Female: My grandmother had it and Y's mother (Nelson).

This experience had led people to reflect on the impact of the disease: "I actually think it was quite cruel. I thought that's the worst thing I would ever want to happen to me or my friends that I've got close to me" (Female, Waipukurau), with most feeling that people who had it really did suffer. Many thought that it was "… probably harder on the family than on the person themselves" (Female, Waipukurau). Others had "… heard a lot of horror stories about it" (Male, Waipukurau). There was no doubt that the majority of participants supported research into ways of curing or relieving the symptoms of Alzheimers. Participants were able to imagine themselves or their relatives with Alzheimers: "If I get it I'd want someone to shoot me or something like that" (Male, Waipukurau), and the ability to reflect in this way

meant that "I know that if I was in the situation I would want every possible [treatment]" (Female, Nelson).

Many of the female participants drew on their experience as mothers and potential mothers as a way of relating to the use of embryos. A participant in one group was pregnant. The use of embryos was a particularly difficult issue for one woman who had experienced two miscarriages. One of the younger participants reflected on his father's teasing of him and saying he had the mental age of a baby even though he was now an adult. This participant used this experience to identify with embryos:

> My father always tells me that my age is at ten months (laughs) … because of that … I think that five days old is alive. Yeah. So I couldn't agree more with all the others who are ranking it 'five' [least acceptable], yeah (laughter) (Auckland 3).

Participants related very closely to this exemplar because they were able to relate it to their own concrete (rather than abstract) experiences.

6.5 The Need for Choice

In this exemplar the issue of choice is closely related to ethical considerations, and informed consent. How could a sufferer of Alzhiemers' Disease or their relatives consent to such treatment, and who should give permission of the use of embryos? These issues have also been covered in the other sections, and are summarised in this quote:

> … so my question would be, are we just going to use IVF embryos? What happens if demand exceeds the supply? What protections do we actually have in that? Do the parents actually get to consent to say where their destroyed embryos go? Who actually gets to choose? Is it the people who initially got the embryos and had them frozen or do they become part of a fertility associates property list …? (Female, Wellington).

6.6 Words and Their Connotations

This theme becomes strongly associated with ethics in this exemplar because of the images conjured up by the word 'embryo'. There are also particular images associated with some other words used to describe this exemplar. For example, "I don't like the thought of a thing going in [to the brain] - you know, transferring [brain cells]" (Female, Auckland 2).

The word 'embryo' drew emotional responses from the participants, as one woman said, "I think there is an ethical dilemma with embryos because they are so emotive" (Wellington). Another identified strongly through "… being an expectant mother now … [I have an] emotional reaction" (Female, Wellington). Such responses are often inarticulate as illustrated in this interaction:

> Female: I really wasn't sure because I didn't like the embryo thing.
> Facilitator: What didn't you like about it?
> Female: I just can't sort of get my head round taking stem cells from an embryo.
> Male: Processed
> Female: Yeah. Yes, I don't know. It's a bit precious I suppose. Personal experience so, yeah, I find it hard to consider (Christchurch 2).

The words used to describe the use of embryos were "morally repugnant … wrong" (Female, Wellington), "dangerous" (Male, Auckland 2), "horrible" (Female, Auckland 2) and "abhorrent" (Male, Christchurch 2). Another person linked unacceptability to fear and because he had "… no fear of it so I ranked it first" (Male, Waimate). Embryos themselves had associations with new life, babies, pregnancy, miscarriage and abortion.

A word that countered this negative reaction to embryo use was 'waste'. This has already been discussed in the section on pragmatism. Participants would change their reaction to the use of embryos when they realised that if the embryos, as products of the IVF process, were not 'used' then they would be disposed of.

6.7 'We' and 'They': Setting up Oppositions and Responsibilities

As in the chapters on the previous exemplars the words 'we', 'they' and other associated words were used to determine attitudes to some of the players in the world of biotechnology.

6.7.1 Attitudes to Scientists

Attitudes to science and scientists were indicated by the use of both 'we' and 'they'. Scientists could be portrayed as doing good work, as neutral, or with suspicion. Participants personally associated themselves with the 'good' work of scientists and medical researchers and had great expectations of them if they had the appropriate resources. For example, "… when I look at the quality of life of the people living on this earth we need to preserve and enhance it if we can" (Female, Nelson), and:

> Because I've had personal experience of my own mother and my own aunt with [Alzheimers], so I really want them [scientists] to do it … I think we're only beginning to discover things that we [the human race/identification with scientists] think we know, and there's enormous areas that we don't know about. When you look at the problems we have, the gaps in the field. I just think we need tons and tons of money and tons of research (Female, Waipukurau).

On the other hand 'they' was used whenever there was a negative feeling about scientists. There was a suspicion that scientists' processes would not be transparent, as this woman said, "And I think it's really important, how do they [scientists] collect them [embryos]. Is it going to be done behind the scenes?" (Female, Waipukurau), and that research could be carried out without consent as in the case of the research on hearts of deceased babies: "That was definitely because they [medical researchers] hadn't got the consent completely. We would hope that they've learned sufficient from that never to repeat it" (Wellington).

6.7.2 The Use of 'You' and 'We' to Signify Agency

Participants used 'you' in a way which could also mean 'we' or 'they', as in the following examples. It was as if it was actually a choice each of us could make: "And I also think that once you allow five day [old] embryos to be used where would you stop? Would they become two weeks embryos? A month embryo? You know?" (Male, Auckland 3), or something any of us could do: "You can actually engineer a gene ... (Female, Auckland 3). In other words, this use of 'you' implies agency – people, of which 'you' are a representative, have the ability to do these things, but should they do these things?

"We' was used by participants as an indicator of issues they thought were shared by all humanity. This woman thought that everyone needed to know more before being able to make important decisions about biotechnology: "But what concerns me is that we're not informed" (Female, Dunedin 2). Another man, in the same group made the response:

> I mean, I think we have some responsibility to inform ourselves. We shouldn't expect information to be given to us on a plate. We should demand it and if we don't get it we should refuse to buy a product … We should just say, stuff you. You're not going to label it, I won't bloody buy it. That's how we should really approach this problem (Male, Dunedin 2).

The use of 'we', in contrast to 'they' implied that the participants felt they had some power or agency to make a difference: "And this is what frightens me. I believe we're now starting to try and play God" (Male, Wellington), to make decisions: "… but the question is, do we need to have a increasing number of elderly people being supported by an ever decreasing number of tax payers …?" (Male, Nelson) and to reflect: "I mean, are we really down to that savage level?" (Male, Auckland 3).

When participants perceived science and scientists to be doing research or having the potential to do research they considered important, they associated themselves with science and scientists, but when they were concerned about the power this gave scientists over which participants had no control or choice, they dissociated themselves. Participants did feel that there were certain areas in which they could still make decisions and reflect on those decisions.

6.8 Discussion and Summary

A woman from Wellington summed up the reactions to this exemplar. In this instance she is focusing on the use of embryos rather than the treatment of Alzheimer's Disease:

> I think there is an ethical dilemma with embryos because they are so emotive … a biotechnology like IVF designed to enhance people's chances of conceiving and having children, which is very honourable and great and a good way to celebrate biotechnology and yet there is this somewhat cynical and insidious part of me that thinks, "Here is a potential supply and demand market." Pharmaceutical companies that stand to profit greatly from the harvesting or the production harvesting of stem cells (Female, Wellington).

In the discussions on this exemplar participants who had relatives with Alzheimer's Disease found any treatment for it acceptable while many others found the use of embryos 'abhorrent' and that it did not matter what good such use would do, it was still unacceptable. As has been pointed out before, this exemplar gave great clarity to the basic questions arising from biotechnology by accentuating the contrast between doing something which is claimed to be of benefit to humanity, and doing something that uses a process which is different from the past and therefore challenges the way the biological resources of nature are used.

Embryos have the potential of producing a new human being so they are special. But the whole stem cell issue (compared with tissue culture in plants) means that eventually it may be that any cell in our body is capable of producing human life. This has momentous societal implications. Does that mean we will value each other more? Or does it mean that we will develop a hierarchy of people – those that are able to be 'bred' from and those that are not?

Such developments open up whole new ways of earning money ‘from’ our bodies rather than ‘with’ our bodies. A person may choose to grow something on/in their own bodies for payment, like having a couple choose to have a surrogate mother bear their child if it was not convenient or safe for the mother to have the child herself. The technology already exists to grow a human ear on a mouse so presumably it could be used on humans rather than mice. Payment for blood for transfusions raises similar ethical issues and the solution to the ethical issue in New Zealand and some other countries has been to organise it on a voluntary basis. This exemplar raised many pertinent and interesting issues about the use of biotechnology in society.

Chapter 7
Themes from the Bioremediation of DDE Exemplar

7.1 Introduction

EXEMPLAR
- GM bacterium → helps clean up New Zealand soil from a toxin produced when DDT breaks down.

A genetically modified bacterium has been developed that helps to remediate New Zealand's soil from the effects of DDE contamination. DDE is a toxin produced when the pesticide DDT breaks down in soil. DDT was used extensively in New Zealand in the 1950s on pastoral farmland to kill grass grub and porina moth larvae. Grass grub is an endemic pest that eats at the roots of ryegrass, the most common species of grass used in New Zealand's pastoral farming. The use of DDT was phased out through the 1960s before being finally banned on pasture in 1970. DDE contamination of soil has limited the recent development of farmland for dairying. Some of the participants were able to fill in the information on this exemplar from their own knowledge:

> Oh it's one of those nasty, nasties, which a few years ago people weren't aware of. So it got tipped on a tremendous amount … and the effect on the country is still there in a lot of places. In fact one of the things a dairy farmer may take great notice of is the DDT levels because you can't dairy farm wherever your DDT levels are too high. It gets into the milk (Male, Nelson).
>
> Male A: If you have cows on that for instance, they'll have it in the milk. If you take the milk, if you turn it into cream it concentrates it, and if you take the cream and make it into something like that it concentrates it again.
> Male B: Only because you're getting more fat. It sticks in the fat. They [cows] can't get DDE from eating grass out of high DDE paddocks. They have to eat the dirt … (Waimate).

Table 7
Acceptability Rankings for Exemplar 5, Bioremediation of DDE

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. Least acceptable						
Auckland 1	1	2	2	4	1	0	10
Auckland 2	1	2	4	1	2	1	11
Auckland 3	3	3	0	1	3	0	10
Christchurch 1	0	1	1	5	5	0	12
Christchurch 2	4	2	1	2	1	0	10
Dunedin 1	0	0	2	4	6	0	12
Dunedin 2	0	2	2	1	4	0	9
Nelson	1	1	3	4	1	0	10
Waimate	6	0	1	2	2	0	11
Waipukurau	3	4	3	0	0	0	10
Wellington	5	4	0	1	2	0	12
Total	24 (21%)	21 (18%)	19 (16%)	25 (21%)	27 (23%)	1 (1%)	117

This exemplar produces another clash between participants' concern to do something good – this time for the environment – and their worries about whether it could turn into something bad, as this man explains:

> I sat on the fence a bit with this. I could have gone either way - up to 'one' or down to 'five', but I don't know enough about it. Umm, what worries me is this GM bacteria … OK it's teaming up with toxins produced from DDT but what is it putting in the soil that's going to have another side effect down the track? I mean is this going to be as bad as DDT? In ten years time are we going to find that this stuff that was meant to fix this other problem is giving us another problem? So that's why I sat on the fence (Male, Waipukurau).

Many of the quotes used in this exemplar inform attitudes across many of the emergent themes. They are multi-dimensional. There does not seem to be a concern about commercial exploitation or a distrust of the motivations of researchers in this exemplar.

7.2 Assessing the Impact of this Biotechnology: Risks and Related Issues

Nearly all participants knew something about DDT and this made them very aware that at one time DDT had been thought of as the solution to many problems around the world. Hence many expressed a concern about control of any introduced biotechnology, and even more, were fearful that such biotechnology could create another problem. At the same time they wanted to somehow make New Zealand 'the way it used to be' and part of that would be cleaning up the soil to make up for past mistakes:

> And it's something applied to a bigger scale which is difficult to contain. If anything goes wrong there's no way to reverse [it]. But it does seem to be something we have to trust … our previous generation have messed up our environment in a way that leave us some huge burdens to clear up. So if there's nothing else we can do let's try this. Do field trials first … (Male, Auckland 3).

7.2.1 Provisos and the Precautionary Principle

There was a general agreement that "It's a good idea," (Male, Wellington) and that this biotechnology should go ahead if at all possible, but participants thought there needed to be continual monitoring to make sure it did not become another problem. As someone said, "It's always going to need watching" (Male, Nelson).

> I don't like caution, but you don't ban it. You don't say no to these things. You say yes, with caution. But how long does it take to test these things? Well we've got to find out. That's the track we've got to go down, which the Government has gone down with the moratorium. Take your time, look at it, test it, test it again and then perhaps we'll give it a go (Male, Waimate).

There is always the question about how long should such a technology be tested before it is released:

> Well, is anything enough? I mean, if you waited 100 years is that enough? I mean everything has its risks. Everything we do has got its risks. Every new technology, every advancement. You don't have to be a Luddite. You don't have to burn down the machines. You don't have to just rip out the plants (Male, Waimate).

One man suggested that the technology should be tested elsewhere to reduce the risks to mainland New Zealand:

> My concern for it is, why don't they take it out there – [to] other islands out of the mainlands around here. Do their experiments down there and don't let it inland … if it doesn't work out, leave it as is (Male, Auckland 2).

7.2.2 Fears

One person voiced a common element in many responses to biotechnology when she said, "It's the unknown again, isn't it, the fear of the unknown?" (Female, Christchurch 1). Another said, "I think you should let sleeping dogs lie. Don't mess around with something we didn't know more [about] the first time" (Male, Nelson).

This exemplar produced specific fears about how such a bacteria could be contained and how difficult it would be to reverse any detrimental effects. One person said, "… like once it's out there, you're not going to be able to get it back, whereas other things you can kind of stop" (Female, Christchurch 1). Another said, "There is no way you can say, 'This doesn't work, take the ground out!' " (Male, Auckland 3).

Participants wondered what some of the unforeseen consequences could be. Would solving the DDE problem in this way produce another problem? "What do they [the bacteria] do if they run out of DDE?" (Male, Nelson), or, could it be that "… if you put it in the soil and it actually gobbled up all the beneficial bacteria in the soil instead of worrying about the DDT … what have you got then?" (Male, Waimate). This woman elaborated further:

> I was concerned about the result of the GM bacteria. What happens to them? Do they turn pathological or do they attack something else which is actually good in the soil, when they haven't got any more toxins to feed on? (Female, Waipukurau).

Could this bacteria mutate?

> I'm a wee bit sceptical of making a silver bullet to go in and kill one thing and then expecting it to go away when it's done its job … You know - it's a bacteria. It's got a mind of its own and you know, outside they mutate. They can do something that was completely unforeseen ... So you know, I gave it a very low 'four' (Male, Nelson).

One woman (Auckland 2) wondered if this bacterium could affect people who work in the soil. Other participants speculated about its impact on soil ecology and whether it could have repercussions down the food chain:

> I'd probably be more worried about that one than I would about a lot of the others I've seen, because something like that is so small. You wouldn't have any knowledge about how it was spreading and what it was actually doing to the whole of the ecosystem (Female, Christchurch 1).

Related to this issue of the 'smallness' of bacteria there was the awareness that such a bioremediation technology could "… actually kill things that we don't even know exist" (Male, Dunedin 1). In other words, "Even scientists don't know what they don't know" (Female, Dunedin 1). New Zealanders are particularly aware of this, as this conversation in the Waimate group illustrates:

> Male A: I think we're really concerned here that we've made messes in the past and they're irreparable. I mean New Zealand must have been a terrific place before gorse and broom and possums and -
> Male B: Rats
> Male C: Wallabies
> Male D: Stoats
> Male E: Humans
> Male A: Came in.
> Male E: So nobody should have come in the first place really. Should have just left it here.
> Male B: Well, we could have been a bit more careful about [it].
> Male A: But it was the knowledge of the day, wasn't it? (Waimate).

Some joked with an air of resignation about humanity in general:

> I mean you don't really know what's going to happen in the future. For all we know in another 30 or 40 years our kids will be in this room discussing what happened back then and what they are going to do - the next step they're going to do in the future. You just don't know, eh? (Female, Auckland 2).

7.2.3 Distrust: Challenging the Motivations of Knowledge of Stakeholders

The expressions of distrust were rather sparse and wide ranging as the comments below demonstrate. The woman, quoted above, who wondered about 'how we do not know what we don't know', went on to say, "… as scientists, you would have to honestly say that you don't know, ten years down the track, what the effect of introducing that bacteria is going to be" (Female, Dunedin 1). In this statement she indicated the need for scientists to acknowledge the limits of their knowledge. Several participants asked why there was such a fuss about DDT when there has been no evidence of it causing harm to humans, and someone said it was probably political and economic – to do with trade and tariffs put in place to restrict imports. One person expressed some cynicism about 'clean-ups' and whether they would really 'clean up' anything: "Is it just one of those pretty picture ones?" (laughs) (Female, Waipukurau). Another participant felt that "It's too good to be true" (Female, Dunedin 1). Others expressed a distrust of what happens in a lab.

7.2.4 The Need for More Information

A basic question arising out of this exemplar is how can what is known be balanced against what is unknown? Will more information provide answers or will it just point to how much more is not known?[35] Participants wanted to know specific things about DDT and DDE, because, as a man said, "It looks good. It sounds good. But I want to know a hell of a lot more and I know absolutely nothing about this at the moment so 'three' is the middle ground" (Male, Nelson).

Specific questions participants raised were:

[35] The discussion paper *Illuminated or blinded by science?* issued by the Parliamentary Commissioner for the Environment draws a distinction between scientists and policy makers – the former keep producing more questions and the latter want answers (Taylor et al., 2003: 26-28).

- What is DDE?
- How long does it take to break down?
- What depth does it go to?
- How long was DDT used before it was banned?
- How much was used?

Then they raised questions about the bacterium such as: "What's in it anyway? What's this GM bacterium?" (Female, Auckland 2) and "What is it, what will it do?" (Male, Nelson).

Participants wanted more research on the bacterium, especially on its long term effects and ecological impact. The questions participants posed about risk are mentioned above.

7.2.5 Benefits

The benefits of this biotechnology for the country, agriculture, the environment, the food chain, the soil, and New Zealand's image were very apparent to participants:

> As I said before, we pride ourselves on being a clean green country and over the years we've put a lot of crap on our pasture … So there's still a lot of toxins and that in our grass and our soil, so if we can get rid of that and step back to square one, and find out what's good and what's not, what's been trialed, then chuck whatever on, and the follow-on effects as well. So, cleaner, greener grass and that. Have better healthier animals, which have better milk and better meat (Male, Waipukurau).

Soil was perceived to be an important resource:

> Soil is the most important thing … For example, plants, animals all depend on soil. In turn, human beings are dependent on plants and animals … the growth of the plants and the growth of the animals depends upon the soil structure, its content and its profile. If the soil is good, crop is healthy. Crop is healthy, animals are healthy, crops and animals are healthy, by-products of plants and animals will be healthy … It is most important to keep the soil clean (Male, Auckland 3).

Soil was also seen as a heritage to be valued, cared for, and passed on to the next generations, particularly by farming people: "… we're farmers and we'd like to hand our soils down to our sons in the best possible condition so that, you know, they can carry it on. So we need to look after it" (Female, Waipukurau).

Cleaning up DDE was believed to have an economic benefit because DDT residue in soil impacts on exports:

> Male B: It's not a good look is it?
> Male A: Yeah, it's not a good look for overseas markets basically (Waimate).

Even the city folk were aware of the importance of agricultural exports:

> This is actually my number one number one. This is the best because this, I think, is a real big problem … animals are eating the grass and stuff … and what it's going to take really is for someone in Sainsbury's or some supermarket somewhere to run some tests and find that this particular bit of lamb has got 25,000 times as much of the allowable level of DDT and we're all going to be a lot poorer than we used to be (Male, Christchurch 2).

If New Zealand can develop this biotechnology it has potential spin-offs for a future industry as "You could go on from there to develop bacterium that break down radioactive residue … nuclear power is the world's most environmentally friendly power source" (Male, Waimate).

As is obvious from this section, many participants were very excited about the possible benefits of this biotechnology.

7.2.6 Pragmatism and Simplicity

As in the other exemplars there were those who felt that if this biotechnology worked simply and cheaply then it had to be acceptable. As this man said, "… if it really is a clean, neat solution that only fixes the DDT and then goes away I think it's very essential" (Male, Christchurch 2). Then there were those who made the 'we're getting by without it now so why meddle with it' response as represented by this man who said, "I believe it's the least [important] of all of them [the exemplars] because we're coping now as a country with our crops" (Male, Auckland 2). Another had the "Let sleeping dogs lie. Don't mess around with something we didn't know more [about] the first time" (Male, Nelson) philosophy.

7.2.7 Judging by the 'Size' of the Problem: The Macro Versus Micro Arguments

There was an understanding that this biotechnology had the potential to cause an impact on agriculture and the environment and this had both a positive and a negative side. The quotes above have already emphasised this understanding. Those participants who found biotechnology more acceptable if it helped something 'big' like the environment supported this exemplar. In contrast, those who were worried about containment were more likely to find this unacceptable. Soil was perceived to be at the base of the food chain, and as such, the future of human beings is dependent on it.

7.2.8 Ethical Issues

Ethical issues arose in this exemplar around the responsibility of caring for the environment because it is not only 'ours'. It belongs to future generations. So is it better to try to 'clean' it up or to leave it as it is, and not risk making further mistakes? Out of this arises the issue of justice. Is it necessary to apportion blame (and hence cost) for mistakes of the past that have caused harm to the environment? Should we just get on with fixing them? Shouldn't wrongs be righted?

The group at Waipukurau, a rural community, felt that this technology in some way blamed farmers, and they were on the side of the farmers.

> Participant A: You can't blame the farmers. They were doing the best that they could at the time. They were told that DDT was the answer to everything. It was. It killed a few grass grubs for 25 years.
> Participant B: It was. It was just 'the thing'.
> Participant C: And all the best farmers used heaps of it (Waipukurau).

Others felt the need to set right a wrong. There was a strongly expressed feeling that "we" need to "clean up the problem that we've made" (Female, Wellington) but at the same time this is balanced by a concern not to create another problem.

> Why did I place it 'four'? I guess there's a part of me that thinks we've done a really dumb thing and put pesticides on the ground and we had a by-product called DDE that we didn't know about and yet here we are again putting something in the ground (laughs) to get rid of the poison that we've made and in ten to fifteen years time we may in fact be facing the same spin-off. I think it does have the merit that we want to clean up our environment. I guess I'm a little bit dubious having come from an agricultural background. I grew up on a farm and knowing what DDT can do I am hesitant at supporting another toxin bacteria going into the ground to make up for a mistake. And I think, we blew it with DDT and here we are throwing in something else again (Female, Wellington).

7.3 Sense of Place: Perceptions of Nature and Natural

This exemplar produced further interesting insights into the many perceptions of nature. Nature can be seen as bad or threatening, or as pure and good, apart from humans who keep spoiling it. Human beings keep making mistakes and trying to control and change things that should be left to nature. On the other hand it is human beings who are also trying to do things to benefit humankind and the earth. (This is a basic assumption which was rarely articulated as such.)

Only one person articulated the Christian fundamentalist belief "… that because sin entered the world there is no way we can correct past mistakes that were manmade in the beginning. As far as I'm concerned we only make things worse". (This quote was written down by one of Wellington participants on her ranking form.) Another point of view was that nature is so complex "We're never going to understand absolutely everything" (Male, Waimate). Then there were those who thought that humans should always use natural ways of solving a problem if at all possible. This then involves asking the question, what was the environment like before the problem?

> Participant A: I wonder how we used to get on before? … so sometimes I think we forget about looking back into how things used to be, natural.
> Participant B: But was it an unnatural way of solving the problem? I don't know.
> Participant C: But it's not a natural problem! (laughs) (Dunedin 2)

Sometimes it is difficult to even remember what the original problem was! In the case of DDT which was used to kill grass grub, the problem is now what to do with the DDT. However, even grass grub was a problem created by growing pasture for sheep, in a country where sheep were not indigenous animals, and ryegrass was not a native plant (Hunt, 2004).

This preference for natural processes related to a suspicion of what goes on in labs, and of products produced in labs:

> Female A: If we do have natural things we should use them rather than go to the lab and make new ones …
> Male: Natural bacterium in concentration may still create problems, but at least being natural you're half way to finding a solution (Auckland 1).

> Facilitator: Would it make any difference if it was a bacteria that occurs naturally?
> Male: I'd have no problem with it. If it was genetically modified, yes. I think if it was say a bacterium that, you know, was in sheep droppings or something like that. You mix that in the soil and it did the job no problems with that. It occurs naturally. It's not something that's been made in a lab (Nelson).

Another issue of concern to participants was whether the use of a GM bacterium would affect New Zealand's 'clean and green' image:

> You can find DDT everywhere in the world, so, if New Zealand one day uses GM bacterium to digest DDT and the consumer realises you're using GM bacteria to digest your already existing DDT, so what would they think? (Male, Auckland 3).

In contrast to the above quote some participants were quite sure New Zealand had to develop GM products. As this person said:

> In ten years time the technology will catch up and then people will accept genetically modified products and then by [that] time you cannot catch up with the technology gap so everybody who has the technology will have the upper hands, so you will be maybe a little Chile, or even South Africa might have better technology than New Zealand and then New Zealand will have less product to compete with, so … (Male, Auckland 3).

Some participants were concerned about the use of GM bacteria when something more natural could be used as this was perceived to pose less risk to both the environment and the economy. However, not pursuing GM technology created the risk of New Zealand falling behind other countries technologically.

7.4 The Role of Personal Experience and Knowledge

Some participants from farming backgrounds had personal experience or stories about the use of DDT and its impact since on property saleability and food exports. They were also aware of the difficulty of cleaning up sites where pesticides had been dumped, one person in Nelson mentioning Mapua, for example.

As with much personal knowledge and acquired information participants were able to share what they knew about DDT and related matters, whether it was correct or not. For example farmers knew about the management of grazing on pasture with DDT contaminated soils. Some had heard about DDT causing porous bones, which has been dismissed by scientific research more recently, and someone else moved on to make claims about how it therefore might be linked to osteoporosis (Waimate). Some participants (Dunedin 2) knew a lot about DDT including current research which has not been able to demonstrate its harmfulness in spite of its build up in the fat of mammals.

Many of the participants living in cities indicated their awareness of the importance of farming to New Zealand's economy. However, they did confuse DDT at times with other agricultural chemicals such as dieldrin from the period when this chemical was used in sheep dips and then was picked up in meat exports which were then banned in the United States in the 1960s. It was dumped in unmarked spots around the New Zealand countryside which are only recently being rediscovered (Hunt, 2004).

7.5 The Need for Choice

There was little about choice in this exemplar, maybe because the only choice seemed to be whether such a biotechnology should be tested in New Zealand or somewhere else, providing another example of NIMBY.

7.6 Words and Their Connotations

Three words of significance in this exemplar were 'clean', 'DDT' and 'bacteria'. 'Clean' appeared to be related to people's desires to make things clean, tidy (inferred) and useable, in contrast to DDT which has made the environment 'unclean'. With the preponderance of antibacterial household cleaners it would have been logical for 'bacteria' to be viewed as 'dirty' but this did not arise, except in the sense that bacteria were somehow untrustworthy through their perceived unpredictability.

7.6.1 'Clean' and 'DDT'

In this exemplar it seemed that the old adage 'cleanliness is next to godliness' is still commonly subscribed to. On participant said, "It is most important to keep the soil clean" (Male, Waipukurau) and another, "And it's a nasty thing to have sitting around in the soil anyway" (Male, Nelson). It was as if DDT was 'dirty', because the word 'clean' was used so frequently and was often contrasted with 'mess' or 'problem'. We have made a mess and we have to clean it up,[36] as these three participants said: "I think we're really concerned here that we've made messes in the past and they're irreparable" (Male, Waimate), "… our previous generation have messed up our environment in a way that leave us some huge burdens to clear up" (Male, Auckland 3), and "As I said before, we pride ourselves on being a clean green country and over the years we've put a lot of crap on our pasture …" (Male, Waipukurau).

Facing up to a problem and doing something about it was presented as responsible behaviour: "I think it does have the merit that we want to clean up our environment" (Female, Wellington). Interestingly the DDT 'problem' was expressed as 'our' problem by people of all races and value positions – even Asians and Pacific Islanders who may not have been born here and who could think that they did not have anything to do with the original problem. It is also worth noting that participants used the words 'clean up' rather than 'fix' in this exemplar, and that this biotechnology "will clean up the soil so they can plant other things …" (Female, Auckland 3), thus enabling better use of the soil resource. It is also interesting to note that soil which is often called 'dirt' and usually seen as 'dirty' was somehow going to be made 'clean' by this biotechnology.

7.6.2 Bacteria

Bacteria seem to be not included in the perceived hierarchy of living things in nature. Bacteria seem to do things that were not considered natural. They infiltrate and penetrate spaces. Their behaviour was perceived to be unpredictable: "… you know, it's a bacteria. It's got a mind of its own and you know, outside they mutate. They can do something that was completely unforeseen" (Male, Nelson). They were associated with antibiotics and resistance. Bacteria are very small and therefore invisible, so can do things without humans being aware of what is going on:

> I'd probably be more worried about that one … because something like that is so small. You wouldn't have any knowledge about how it was spreading and what it was actually doing to the whole of the ecosystem (Female, Christchurch 1).

[36] There is a problem with this analysis because the facilitator probably used the word first, but having said that, participants did pick up on it and also it has associations with 'clean and green'.

7.7 'We' and 'They': Setting Up Oppositions and Responsibilities

The use of 'we' and 'they' as oppositions was not so apparent in this exemplar. Sometimes 'they' were farmers with the understanding that in using DDT "… they were doing the best that they could at the time" (Male, Waipukurau). When 'they' were scientists, some of the Waimate group, particularly those associated with farming, saw scientists as more 'real' or ordinary, than the other groups: "Generally they're well meaning people. They're not bad people" (Male, Waimate).

The use of 'we' signified identity as New Zealanders, as innovators – do-it-yourselfers - and therefore was associated with scientific breakthroughs made by New Zealanders, and associated in some way with agriculture. Its use was frequently in association with taking responsibility for mistakes in the past, as discussed earlier.

7.8 Discussion and Summary

This exemplar was strongly linked to participants desire to do something good for the environment by making amends for past mistakes for which they appeared to take some responsibility, even though they personally had not used DDT.[37] The risk, so apparent to participants, is that the remediating bacteria could create another DDT-type problem, and they did not want that to happen. At the same time they wanted to preserve New Zealand's 'clean and green' image. Overall the verdict on this exemplar was summarised by this man:

> I don't like caution, but you don't ban it. You don't say no to these things. You say yes, with caution. But how long does it take to test these things? Well we've got to find out. That's the track we've got to go down, which the Government has gone down with the moratorium. Take your time, look at it, test it, test it again and then perhaps we'll give it a go (Male, Waimate).

[37] It is of interest to ask if this is associated with the Treaty of Waitangi claims, and is now part of a New Zealand consciousness.

Chapter 8
Summary of Acceptability Factors Common Across Exemplars

8.1 Introduction

This chapter summarises the factors common to the ranking decisions about acceptability made across all exemplars presented to the focus groups. In the focus group process the facilitator sometimes asked participants after they had discussed their acceptability rankings, what overall factors or criteria they had used to make their decisions. This chapter includes this aspect of participants' responses by being divided into two parts. The first part summarises what participants said when asked this question.[38] However, when they actually did their rankings a more complex pattern emerges and this is the focus of the second part of the chapter which summarises the factors drawn from the previous five chapters on each exemplar. This latter section of the chapter uses direct quotations as in the earlier chapters but here they are carefully selected from the exemplars to represent the general point being made.

8.2 Summary of Overall factors participants *said* they used to make their rankings

The results from this section will be divided three ways. First of all, participants were aware of balancing and managing risk. Secondly, there is a consideration of the dimensions and qualities involved in decision-making. The section concludes with a discussion of the feelings that participants had about making these decisions.

8.2.1 Risk: A Balancing Act

There was a basic understanding that all biotechnology involves a balancing act between potential positive and negative impacts: "There has to be some risk attached, I think, because you'd never get anywhere if you didn't try it … calculated risk" (Female, Christchurch 2).

Many people were clear that to progress in the areas of health and care of the environment we need to take risks but that this risk needs to be managed with as much care as possible to minimise the chance of negative consequences:

> We've progressed as a society by taking risks. You know, when you go back and you think about our forefathers coming here. They took the biggest risk to sail half way around the world. And they survived. Now we've got new risks to face and some of them are related to biotechnology. We have to take some of those risks to progress (Male, Waimate).

In general most participants accepted that there was never a one hundred percent surety that a biotechnology will only be of benefit. There was an understanding and a concern that the cost of the biotechnological intervention had to be balanced eventually by an economic benefit and participants wanted to be sure that this resulted in a societal benefit rather than only producing profit for a commercial company:

[38] Not all focus groups were asked this.

> And then you come down to the economic question and if it's not worth doing, if for example, the potato thing costs $5 a potato and a potato's worth 20c, no-one's going to do it. But the idea is if there is an economic benefit … you know it's only through doing these things that we're going to be able to afford better health, better education, keep our environment clean, and all those sorts of things. It's not that we all want to all get rich. The bank balance is first (Male, Christchurch 2).

Risk was to be managed through developing greater knowledge and providing more information about the biotechnology involved, particularly through reputable scientists doing independent and unbiased research. The general suspicion and distrust of research done by companies for profit was balanced by some who were concerned that "We have to trust somebody" (Male, Waimate). This usually led to a discussion about the reliability of scientists and medical professionals (doctors and pharmacists in particular) and their association with commercial enterprises. An example of such a discussion is this one:

> "I would accept a risk that I can see has been researched by reputable scientists, independent, and give me the information to then make up my mind and then say, yes, that's an acceptable risk."
> "Well, that's what we don't know."
> "Who are the independent scientists?"
> "That's the key one. Independence is the key."
> "When we had the DSIR [Department of Scientific and industrial Research] you could rely on them because they were independent. We haven't got it now, so where do you get them from? I don't know."
> "There's a financial carrot waving in front of all of them."
> "Yes, and everybody is associated with one company or another. So, do you not accept the information from any of them?"
> "Even the universities now take grants from companies for someone to do research on a subject. And you can guarantee that there could be a bias."
> "Do you trust your local doctor because the drug companies give them [pharmaceutical drugs] to him and say - "
> "No, I don't."
> "That's the problem. You've got to trust somebody at some stage. You can't just say, well I'm just going to go all green now and just stay at home and grow veges."
> (Males at Waimate)

8.2.2 The Balancing Act: Dimensions and Scale

Participants used various dimensions of a biotechnology and rated these across a scale of the impact on an individual or on society as a whole. Each end of the scale could be valued over the other. The dimensions they considered were health, the environment or financial. For example, in the financial dimension participants asked how would a biotechnology impact financially on the individual, society or the business/corporate stakeholder? Who would benefit from its positive impact, and who would be liable and who would end up paying for its negative impacts?

For some participants high rankings went to the exemplars which had the potential to help more people, especially if they had a global impact. Participants with these views would rank an exemplar lower down if it only helped individuals. They would consider that the resources would be better spent elsewhere. (This was usually linked to containment and choice issues – see later.) In contrast some ranked exemplars highly if they had the potential to help them as individuals and others decided that if it did not affect them then it would receive a low ranking. Some related their rankings to their perceptions of the seriousness or the size of the

problem. For example, fixing up a sore throat was seen as far less an issue than dealing with potential cures for Alzheimer's Disease, heart disease and cancer:

> And I did get sore throats – we all had our tonsils out when we were young – five years old or something like that. And I do know some people that do get affected by a sore throat continuously … I put it 'two'. But I didn't actually put anything as number one because we're only looking at a group of things. There are some other things that probably rank higher. Probably something to do with heart disease or something like that (Male, Waimate).

Biotechnologies suggesting a potential to improve human health were generally given much higher rankings than environmental biotechnologies though this was contradicted in some instances. For example:

> I ranked it best on benefits, risks and opportunity costs – what else – what other greater benefit could have been done with the resources? For example, the methane gas one. The benefits are global. Sure there's a certain amount of risk. I ranked it because the benefits are so huge, maybe the risk is worth taking. Whereas with Alzheimer's Disease, the risk is still very high but the benefits are limited to a small section of society (Male, Wellington).

Higher rankings were given where participants saw the least chance of harm, where they felt not a lot could go wrong. The reason given for low rankings was usually a concern about an environmental or a health related risk. There was a wide awareness of the potential for a 'problem-solution-problem'[39] scenario, in which the solution to one problem actually causes another problem: "… because for me, it seemed to be a problem fixing a problem. And something Y said before, are we going to continue having another problem [to] fix in another 20 years? (Male, Dunedin 1). Participants drew on their own knowledge of Hiroshima and the atomic bomb, DDT, the over-use of antibiotics, and issues of biosecurity, biodiversity or the introduction of weeds and pests to New Zealand to back up this concern. One person used biblical backing to justify his argument: "… the bible also says, the sins of the forefathers will visit the third and fourth generations … and it could be the same thing that happens with what we're doing with these genes (Male, Waimate).

Decisions about rankings were not usually based on how much the biotechnology was going to cost or how much money it would make for anyone – individual, company or nation. However, there was a deep distrust of biotechnology companies and an assumption that the biotechnologies they produced would primarily benefit the company:

> Male A: There's an extreme fear of conspiracy here. Personally I'm sure that man did walk on the moon. I don't believe that the CIA killed Kennedy (laughter). And I do not believe that all scientists are inherently evil, which seems to be the thing. Everybody seems to be so scared of a scientist -
> Male B: No, it's not the scientists that are the problem. It's whatever backs them – who they work for (Males, Waimate).

It was felt that companies were often using the general public as guinea pigs, rather than carrying out sufficient testing before releasing a product to market. There was a concern that pressure to make a profit meant that companies took short cuts and did not do the testing of new products over a long enough time frame: "Often you get the impression from the media

[39] Beck (1992).

… the media aren't accurate but are things kind of hurried through ethics committees and whatever for the sake of the dollar?" (Male, Christchurch 2).

This was exacerbated by the lack of liability legislation, as a participant at Waimate noted.

> Insurance companies will not insure anything to do with GE. So that's one thing that worries me for a start. If they won't insure it because they don't know how much risk is involved themselves. So there's that one as well. The other thing is GE companies don't want to have any liability for doing whatever they're doing. They want us to wear the liability and we're not even involved with it except as the guinea pig. And I don't agree with that either (Male, Waimate).

The decisions about what rankings to give to human health compared with environmental biotechnologies were often made because health issues involved personal choice, personal responsibility and containment. For example, everyone had a choice of whether or not to use the throat lozenge as a way of taking responsibility for their own ill health and if it had a negative effect on them they could stop taking it. It was mainly felt that any negative impact would go no further than the individual, though some did challenge this with the possibility of taking medication when it was not needed, and it being a quick fix when the problem of causation was not being addressed:

> In the throaties … I put that down as a 'three', but I'd actually drop it to a 'four' because I think … we have too many quick fix – [easy] availability of medicines and often we're not treating ourselves properly ... sometimes you can make the wrong mistake of taking something and treating … yourself and finding out that it's not [what you think] … I see the throaties as being so easily available because of the price, and the availability – being able to go to chemists and buy them - that people who can afford doctors fees may keep taking them and they'll never go and address the real symptoms … Pills for everything (Female, Waipukurau).

On the other hand individuals felt they would have little control over the impact of bioremediation of DDE in soil, or the reduction of methane production in sheep. This was related to the concern about the containment of biotechnologies. One person said, "I just looked at the ones that were more likely to be controlled as opposed to those that could be not controlled" (Female, Christchurch 1), while another indicated how strongly he felt about it when he said, "Just bloody well make sure there's sufficient research done before anything gets let loose. Like gorse for shelter – meant to be a great idea but - " (Male, Nelson).

Participants often developed a hierarchy to measure acceptability, which did not consider an impact in a particular dimension such as health, but considered the biotechnology in terms of whether it had anything to do with people or not. This attitude is illustrated by these quotations:

> I suppose I based my criteria on emotions. I found the soil and the potato not too emotive. And then it sort of came to the saliva and the sheep and that was more emotional. And I had like the embryos. That was sort of object, and then animal, then person, sort of. That's where I ended up - emotional (Female, Christchurch 2).

> My ones were all grouped as benefiting man, you know, like benefiting the person. My twos were more on benefiting the environment and the lower rankings were the ones … maybe better things for the environment … (Female, Christchurch 2).

> [I remember hearing Z] … who was a professor of philosophy … His postulate was that you always thought about ethics in terms of – through the eyes of a person who had not yet been born and who knew absolutely nothing about what they were going to be born into (Male, Dunedin 2).

The first quote in particular draws attention to a quality of the biotechnology – that of whether the biotechnology under consideration involves people, other animals, plants or bacteria – and it is based on an emotional reaction, as the participant says. This is a hierarchical concern with more concern being aroused by a biotechnology that 'does something' to people (see 'interference' in the next paragraphs). It was regarded as more acceptable to 'do something ' to bacteria, plants, animals than people, in that order. In terms of 'benefit' this order was reversed, as the second quotation illustrates.

Many participants felt that genetic modification in particular meant that we as humans were crossing some invisible line about what humans should and should not do: "That's the way I see it. The beginning of the end – trying to play God" (Male, Wellington). GM was not allowing natural selection to take place and was viewed as 'interfering' with nature or what was natural to create something 'new'. Other examples were a woman who said: "… but I don't like the idea of interfering – devices in the stomach tend to do that … And the embryos which are actually interfering with life …" (Christchurch 2), and a man who said: "Mine was more interference less good – the whole of life thing" (Christchurch 2). The word 'interfering' was used in several senses. It could mean just doing something to an animal which was not considered to be 'nice'; taking life as in the use of embryos for their stem cells; or actually 'altering' life in some way. Sometimes a discussion would ensue about what 'new' meant because some felt that we never create 'new' things, we only modify or change what is already there: "Well we're not playing God. We're not creating things. All we're doing is modifying, as we've done from the moment we got our hands on our first animal – we started modifying it" (Male, Waimate).

It is interesting to note that God always seemed to end up against biotechnology!

> I think the whole thing here – this biotechnology – this is not just taking the same plant/family and modifying it slightly or something simple like that. This is going – this is blending animals with plants or humans with plants or humans with animals. This is really changing the face of the earth as we know it and the Bible actually says that God has made man in his own image and we have to consider that avenue too. Because if we don't we are not living under a democratic process. So you know that is a real thing for me. We are starting to really play with fire (Male, Waimate).

Some participants felt that if something appeared to be simple then it should be ranked highly. The corollary was that the seemingly complex would be ranked low, though that never came up directly. Many took the pragmatic approach that if a biotechnology was already 'out there' in the market place then it must be acceptable, because it must have been tested sufficiently. In another sense of 'out there' they felt that something to do with 'bacteria', for example, must be acceptable because we all have bacteria, just as long as it wasn't 'interfered' with. Some felt that if a biotechnology brought commercial benefit to some group in the population that was considered at risk (e.g., potato growers) then it must be good.

8.2.3 Hard Decisions: Feelings About Ranking the Exemplars

The questions that people wanted answered at this stage (see later) were to do with how harmful was the biotechnology to humans, who would it hurt and how, and who would be liable? Many participants felt they did not have enough information to really make an informed decision and this then enabled the facilitator of the focus group to find out what sort of information they wanted. Others felt "incompetent" to judge:

> … I'm going to make it quite clear that when I was ranking them I wasn't competent ranking them because I didn't have any facts. I didn't really know what I was ranking. This was just what I thought … As long as you know that I felt – because if someone wants to screw me down and say, "Why do this, why not that?" - because I'm incompetent, I really am (Male, Wellington).

Some felt they were not "educated" enough, implying that understanding biotechnology is linked to one's level of education:

> Facilitator: Does anyone else have anything to say about that? How did you do that ranking? What did you base it on?
> Female: Gut feeling ... I'm not a highly educated person, so, this is just how I see it. Just my perspective. But I couldn't explain to you how I feel about it (Christchurch 1).

Some thought that their decision-making was based on emotions as if that was not the best way to make such decisions. Often it was difficult for participants to articulate their thoughts. Some participants found it difficult to believe and trust any information:

> I wasn't sure whether this … thing really existed, or couldn't see any real benefit … And the methane … you know that's a debatable thing – we're talking about ozone holes and things like that. And there's a large body of thought that don't accept that that is a problem. So I've just written, what's the problem? (Male, Dunedin 2).

The first part of this chapter has summarised the factors participants in the focus groups thought they took into account in ranking acceptability across all exemplars. The results of this can be used to show how biotechnology may be more acceptable if:

- the benefit outweighs the perceived risk.
- the benefit is to society, not just to business
- risk is managed by more independent, unbiased, scientific research
- there is less likelihood of a 'problem-solution-problem' scenario
- individual's have choice over the use of the biotechnology
- it does not involve 'interfering' of 'playing God' with living things
- it is perceived to be simple (the simpler the better)
- trustworthy information is available (the more information the better).

The next part generalises what factors participants actually used when they ranked the acceptability of the exemplars. It takes the analysis of what participants said about each exemplar as reported in the previous five chapters and summarises what elements they have in common. This demonstrates the complexity and the case dependence of the acceptability of different biotechnologies.

8.3 Generic Themes Common to Rankings Across All Five Exemplars

When participants in the focus groups *actually* ranked each exemplar separately, the factors that they took into account were often more complex and varied than the factors they thought they had applied, as described in the first section of this chapter. The factors are considered under the same themes as in the previous five chapters showing the generic themes that occur with each exemplar, with the differences occurring more in terms of the weight placed on each theme, and the broadening of the discussion on particular themes that the different exemplars initiated.

8.3.1 Assessing the Impact of the Biotechnology: Risks and Related Issues

The introduction of biotechnology was viewed as balancing act. There would always be positives and negatives and the decision was to decide whether the positives outweighed the negatives. There was an underlying acknowledgement that risk management can be about trying to control or limit negative impacts: "It's always going to need watching," (Male, Nelson).

Participants were very concerned about the risks posed by biotechnology. Risk was frequently stated in terms of the need for care to be taken, or participants would endorse a particular biotechnology with certain provisos which acknowledged indirectly the fears that they had, or the distrust they had of the motivations of those developing or commercialising biotechnology. This led on to the need for more information being needed for decision making.

Provisos: "I Would Accept This as Long as …"
Most participants felt biotechnologies were acceptable as long as 1) there were no side effects, which implied a need for publicly available information on the research and what had been covered in that research, and 2) that the biotechnology was introduced in a controlled and cautious way as this man said, "Let's proceed with great caution" (Male, Nelson), and was well regulated and monitored, as this woman said, "There ought to be really strong checks and balances in place …" (Female, Wellington). Others promoted taking more time: "I think you should wait for … for the technologies to develop a little more. So you can use the same thing in a wise way. It can wait. There's no hurry" (Female, Auckland 3).

Fears
Participants' fears were associated with the provisos. Hence, there was a concern about unforeseen side effects, as these participants expressed it: "It's the unknown again, isn't it, the fear of the unknown?" (Female, Christchurch 1), "So really it's not only the things you can deal with but it's the unforeseen things that can be a bit scary as well" (Female, Nelson), "It [may] actually kill things that we don't even know exist" (Male, Dunedin 1), and "I think that the problem is that … even scientists don't know what they don't know" (Female, Dunedin 1).

Such side effects were described in terms of cross contamination, containment, the impact of long-term use and the creation of monsters. Someone expressed a concern that a particular biotechnology had the potential "… to start going places where we might not like it to" (Male, Dunedin 2).

There was a worry that in the future a plant biotechnology would get out of control by spreading as a superweed as these women feared: "… take over as a superweed and out-compete other plants, which is a real issue in cancer. With biologically modified crops you have the problem of superweeds" (Nelson) and "… once its out there, you're not going to be able to get it back, whereas other things you can kind of stop" (Christchurch 1). Or, it could cross contaminate or infect other cultivars or species.

Another way of thinking about containment was the fear that some had that once certain biotechnologies were approved for commercial development it would then be easier for other similar biotechnologies to be approved without the same rigour.

Participants feared that solving one problem might create another one ('problem-solution-problem'). "… you might create another Frankenstein" (Male, Auckland 2). They were very aware of past mistakes and had a fear that the same thing would happen again, as illustrated by this male conversation in the Waimate focus group, and a quote from Christchurch.

> "I think we're really concerned here that we've made messes in the past and they're irreparable. I mean New Zealand must have been a terrific place before gorse and broom and possums and -"
> "Rats."
> "Wallabies."
> "Stoats."
> "Humans."
> "Came in."
> "So nobody should have come in the first place really. Should have just left it here."
> "Well, we could have been a bit more careful about [it]."
> "But it was the knowledge of the day, wasn't it?" (Waimate).
>
> I mean you don't really know what's going to happen in the future. For all we know in another 30 or 40 years our kids will be in this room discussing what happened back then and what they are going to do ... You just don't know, eh? (Female, Auckland 2).

A particular fear was that bacteria could mutate and change, which could be quite unpredictable and hard to track:

> I'd probably be more worried about that one than I would about a lot of the others I've seen, because something like that is so small. You wouldn't have any knowledge about how it was spreading and what it was actually doing to the whole of the ecosystem (Female, Christchurch 1).

Participants expressed a worry that we now seem to be busy solving problems but not looking at their cause (Male, Waimate).

Impacts on the environment were viewed in both a macro and a micro sense. That is participants were concerned not only about the impact on land and water but also about the impact on them personally and on the internal environment of their bodies. For example, the moment an antibiotic or anti-fungal effect of a biotechnology was mentioned participants were concerned about the impact of this on people's immune systems and the development of resistance. As a woman said, "I don't want any unnecessary antibiotics" (Wellington).

Out of this 'problem-solution-problem' unease grew a concern for reversibility. Could a negative impact be reversed if it had some unanticipated consequences? Participants drew on their experience and knowledge of such things as DDT to provide backup for such fears:

> If it works well it's OK, but if it's a mess, then it's a big mess … you could be going down the same track as 20 or 30 years ago they went down with DDT. That's the scary bit (Male, Waimate).

There was a common fear of commercialisation and the profit making motivation of big business (see 'Distrust' next). Participants felt that there was a need to regulate the development and entry of biotechnologies into the market but they were aware that in spite of regulation some people will break the rules:

> The man who invented the gun may have said we're only using it to defend ourselves but people still go around causing wars with it. You make a rule but it's always going to be broken (Male, Waimate),

Biotechnologies developed for one reason could always be used/abused for another reason. It was felt there really was no control over that:

> There's always good and bad going. You say I'll use it and it will be good. You never know what I'm going to do. I can steal your technology and can do whatever. It has happened. It has happened always. So before you implement you've got to see all aspects. It's not always good. You may do it in a good way. I can do it in a wrong way. It is my choice. I steal your technology. I can do that anytime. (Female, Auckland 3)

Regulations are made for certain reasons and participants hoped that the reasons were to do with morality not economics:

> I just hope the decisions aren't governed by that power thing I was talking about … I hope it's a moral decision not an economic decision, because of course, with every medical procedure there are huge amounts of money to be made (Male, Nelson).

There was a fear that some biotechnologies had the potential to impact on exports either positively or negatively. For example, the bioremediation of DDE in the soil should be viewed positively but what if overseas markets discovered it was being removed with genetically modified bacteria?

Distrust: Challenges to the Motivations of Those Involved in this Biotechnology

Who could people trust? Some participants assumed that because a product was on the market it must be tested already by a regulatory authority or the Health Department. Some said they would trust medical professionals such as pharmacists and doctors while others reminded groups that pharmacists are in the business of selling, doctors are frequently visited by company reps, and medical research is supported by pharmaceutical companies. Some said they would trust scientists while others felt that scientists may be compromised by the company they work for.

Participants seemed to think that scientists would not have thought of the things that they have: "I think to undertake something and not know what the benefits or the outcome of the results you're looking for [is wrong]. I would want to know. But also what are the

alternatives …" (Female, Wellington). The implication was perhaps that scientists are not practically minded or that participants distrusted scientists' motivations.

Anyone in the pay of profit making companies was distrusted. The dilemma for participants was that research for solutions to problems takes money and to get such money companies need to make money.

> Male A: I think at the end of the day … this word biotechnology - in today's world there's a world called money - big money associated. And a lot of these ideas come through, not necessarily out of a genuine well-being. Well that's how they are portrayed - but it's big money behind it that's pushing it ...
> Male B: Someone sometime has to actually invest money in developing this stuff. Now there is a risk in this. Of all the things that money gets poured into in medical research, my guess is that very few of them actually pay off and therefore to get people to put money in, to get the developments and the advances there must be a potential financial benefit to them, otherwise they would never - otherwise nothing would happen (Waimate).

However, participants did not usually acknowledge this dilemma and feared that the motivations of developers and those who commercialised biotechnology were simply to make money. (See ' 'We' and 'they' ' later.) They wanted to know who was paying for this research? What were their ethics? They distrusted multinationals and felt their prime motivation was to make a profit. (Some harked back to the days of DSIR when they felt Government research could be trusted as unbiased and objective.) This would lead to such companies taking short cuts, not providing full information about a product when it was marketed, or only following up on research options which would be profitable.

> I'd like to see a lot more controlled research by an unbiased company. I have a huge problem with multinationals funding [research] because they are funding for specific reasons - for profit. And I think if they are doing that sort of research for that thing then something might be moved sideways. They might be doing research say, for Alzheimers, and they are going down the Alzheimers' line and because it's profit driven they discard anything that could be sideways that may be the cure for motor neurone (Male, Waipukurau).

> Because I can see we're all saying, "Oh, good can come of this," but you only need to look at this day and age … and how these private hospitals work. When they get short and start thinking of the dollars, all the safeguards, anything like that will be out the window. The dollars would count at the end. It's private enterprise, especially in the States and these other countries (Male, Wellington).

It was suggested that such enterprises are not open with information: "Is it going to be done behind the scenes?" (Female, Waipukurau). There was a continuing discussion in most groups about labelling and advertising of products. What was the source of the product? Has it been 'changed'? What else is in it? Would companies 'tell the truth' on product labels?

There was a lot of apprehension articulated about the involvement of food with business:

> I would prefer that the potatoes that are produced for my consumption are produced through natural selection, not through economics … I'm not an alarmist or anything else like that but I get very cynical when I see these huge companies producing stuff for their own good … it's not for the good of mankind it's for their own good, because they will sell those potatoes to the farmers for huge amounts of money and they don't

> give a damn whether they taste like crap or not, or if they are perfect or not. All they will do is produce enough in order to make money (Male, Nelson).

Some even hinted that companies were experimenting with consumers – testing their products on them:

> Up until about half an hour ago … I hadn't even given this topic a thought. Since then I've been thinking about it lots (laughter) and the more I think about it the less I like it. I do not like the thought that I don't know what I'm eating - that somebody else has been mucking around in some little lab somewhere to produce the perfect potato for my consumption. I don't necessarily want to eat the perfect potato. I want to eat a natural potato and you know, as Y said, I would prefer that the potatoes that are produced for my consumption are produced through natural selection, not through economics … So I'm dead against that sort of manipulation of my food and it also worries me as to what the hell we are eating (Male, Nelson).

In the methane reduction exemplar in particular, participants conveyed a distrust of the reasons for the biotechnology because they felt the Government just wished to demonstrate its support for the Kyoto protocol, when in reality the participants felt that the contribution of New Zealand in reducing greenhouse gases would be insignificant globally.

> Is our contribution through cows and sheep doing their business - is that a serious factor or is that just our little token of what we can put into the world and say, this is what we are doing? (Female, Nelson).

Need More Information

The desire for risk to be managed in a way that dealt with people's fears, led on to the need for more specific information, more research or information about alternatives. As one woman said, "I would want to know" (Wellington). A few participants felt that they did not understand biotechnology in general or else that they did not know enough to decide: "It looks good. It sounds good. But I want to know a hell of a lot more and I know absolutely nothing about this at the moment so 'three' is the middle ground" (Male, Nelson).

Some confronted the dilemma: "If we're going to wait for them to find out what everything does before we do anything we're not going to go anywhere, are we?" (Male, Waimate.) At the same time they were aware that the more information available to them the more informed their choice, and they were concerned about the right to information.

Participants wanted answers to the questions:

- What is the problem? What is its extent? Whose problem is it? Who ends up paying?
- What is this biotechnology? What is it made of? How is it produced?
- What is the impact of this biotechnology on humans, animals, plants, society, the economy and the environment?
- What other problems could it lead to? What are the side effects? Can it be contained?
- Who is paying for the research? What are their ethics? Who will benefit? Who makes the profit?
- Is the research underpinning this objective and trustworthy?
- What would be the cost to the end-user?
- What are the alternatives?
- How do you know whether to trust the information you do have?

- Priorities. Is this the way to spend our money? Isn't something else more important?
- Should something be fixed that is 'natural'?

Benefits
One man summed up the decisions they were asked to make in the focus groups by saying, "The question is whether sucking lollies is better than farting!" (Male, Waimate).

Participants saw how all the exemplars would benefit people or the environment or both by dealing with a problem. Such benefit could be in terms of health for an individual (relieving a sore throat), or a family (reversal of Alzheimer's symptoms), or economic (prevention of soft rot in potatoes thereby increasing exports) or the society by having a positive effect on the global environment (breakdown of DDE in soil, reduction of methane gases, restoration of the 'clean, green' image). There was an awareness that some biotechnologies could result in less use of pesticides, fungicides or antibiotics. A rare few found all exemplars acceptable because they felt the benefits outweighed the potential negative impacts. Participants frequently saw benefits that were related to the positive side of the risk equation, such as being reversible or contained: "It was most acceptable because it seemed to me there were less side effects for and more positive things going to come out of it than negative" (Female, Nelson).

Often participants dealt with benefit by seeing it as conferring a 'macro' positive effect by making life better for a lot of people, or a 'micro' effect by helping individuals which meant they still retained a personal choice over the use of the biotechnology and it was hence more likely to be perceived as safe, 'contained' and reversible. For some participants the decision was easy. If they considered the biotechnology simple, convenient, or making something or someone more useful then they found it acceptable.

Biotechnology was seen as often producing a faster way of dealing with a problem. This could be regarded both negatively (as described earlier) or positively: "Soft rot is a terrible disease of potatoes and if we were going to try and breed a resistant potato it could take another 20 years to get a resistant potato" (Male, Waimate). They were also aware that some biotechnologies would lead on to more potentially promising research.

A hierarchy was involved. It was most important to "keep the human people as healthy as possible first. All the others [exemplars] are to do with - not people" (Male, Dunedin 2), and "… basically to protect the environment isn't my most important" (Female, Christchurch 2). Benefit to people was more important then benefiting animals, plants or the environment:

> Facilitator: Why did you place that above the sheep, for instance?
> Female: Because I'm not a sheep (Christchurch 1).

Pragmatism and simplicity
Some participants decided on the acceptability of a biotechnology using the factors of pragmatism and simplicity, which could be perceived as benefits. However, these factors could be taken as continuums with both positive and negative extremities and in fact the number of questions that participants raised about risk indicates that most biotechnologies were seen as complex with many interrelated factors.

Many participants decided on acceptability by taking into account the apparent simplicity of the biotechnology: "Because – it would be a bit of a hassle putting it in – but beside that point … basically if it does that without affecting the sheep it struck me as quite a simple solution

for the problem ..." (Male, Waimate). Another pragmatic factor was its cost in time or money. Participants said things like: "One of my thoughts was really the cost of it … overall I mean you're talking about a huge quantity. Just the logistics of it really, basically" (Female, Christchurch), "Yeah. I just think it would be totally unrealistic unless it was particularly cheap and [a] particularly simple operation" (Male, Nelson) and " It works simply, doesn't cost much and has powerful effects and that's good" (Male, Nelson).

If it works then use it, was the philosophy espoused by many: "… if that would do the trick, go for it" (Male, Waimate), or "I just thought if it works, why not? We can afford to do it" (Male, Wellington). Some regarded taking risks as necessary for progress and anyway progress was inevitable:

> Male A: But you could be going down the same track as 20 or 30 years ago they went down with DDT. That's the scary bit.
> Male B: Of course you could, but then you can't stop progress (Waimate).

This was sometimes countered by the idea that we are getting by all right now without it, so why do it? Some were happy to leave it to the market: "And, yeah, if you can sell it and people are willing to accept it, it doesn't worry me at all. I mean if you can't sell it and people won't accept it then obviously you don't do it" (Male, Waimate).

Some participants were more likely to approve of something that seemed 'real' to them: "I mean it looks to me like a very simple solution to a problem a lot of people have. So great go for it. I think it's fantastic" (Male, Waimate).

Often participants were very concerned about waste and the efficient utilisation of resources. If embryos were to be "wasted" or "discarded" if they were not used then this was justification for "using" them, making them "productive" (Female, Nelson). If it helped sufferers' from some illness to become more "useful" (Male, Nelson) members of society then that was regarded very positively.

> Yeah, initially the idea of using a five day old embryo didn't appeal to me too much, but the fact is that these embryos will be destroyed so it would be quite good if they could used for something useful like helping somebody with these serious diseases (Male, Wellington).

The economic benefit of a biotechnology could also be linked to using something to its maximum potential. For example if you were growing potatoes then you might as well grow them as well as possible, then the use of the ground would be efficient and perhaps would free up other ground which could then be used for something else. Similarly, removing DDE from soil made it more 'useable'. At present Alzheimer's sufferers were a waste of resources and if their symptoms could be reversed it make them less of a drain on their families and the taxpayer. (This was only touched on in some groups because it was a difficult thing to say.)

The pragmatism and simplicity factors participants used to make their decisions could be considered across several continuums. Each end of the continuum could be equally prized (with the exception of the last one):

- Pragmatic ↔ idealistic
- If it works then do it ↔ there is no room for mistakes (risk averse)
- Simple ↔ complex
- Wasteful ↔ efficient

Judging by the 'Size' of the Problem: the Micro Versus Macro Arguments

There was an inherent contradiction in most assessments of acceptability. If someone viewed a particular biotechnology as conferring a macro or global benefit this may have been a reason for them to accept it because: "Well I liked it because it has a global impact. It should help every country in the world" (Female, Waipukurau), or reject it as more risky because it was more likely to be difficult to contain or reverse, and frequently individual choice about its use was not possible.

If it only provided benefit for an individual rather than a whole society this could also be viewed as positive or negative depending on the individual. The fact that all groups decided the throat lozenge was the most acceptable to them illustrates the dominance of the former viewpoint. The man represented those with the latter view:

> And I believe that in a big way it actually diverts medical resources away from the primary care issue. So in terms of addressing quite a unique disease such as this you're diverting funds from primary health care and I mean, the greater good is being lost due to this allocation of resources. And I'm sure no-one ever got a Nobel Prize for teaching your kids better hygiene, exercise right and eat right, but I'm sure fixing Alzheimer's Disease is going to win people Nobel Prizes and lots of funding, yeah (Wellington).

> Well I find it less acceptable because it's - you're tampering with something that has quite a limited impact of benefit to society. I mean if you're going to mess around with this sort of thing you might as well make sure that it's got huge potential to deliver huge benefits globally or nationally (Same male, Wellington).

Sometimes something that affected people in their everyday lives was given more or less importance: "Well it doesn't apply to me" (Female, Auckland 3), "Well I didn't think it was important as against the other thing. It's not a concern I have as a daily concern" (Male, Christchurch 2), and "I just thought it would make the least difference to my life … Simply because I was more interested in things that were going to help medically" (Female, Dunedin 2). Others felt that it had to have more than an economic benefit: "Yeah, I dropped it down a bit because the gains seemed to be all economic, whereas the other ones seemed to be a bit more to it than that" (Male, Christchurch 2).

Some worked on a continuum of degree of suffering or quality of life (in the hierarchy of human health problems) such as: "… when I look at the quality of life of the people living on this earth we need to preserve and enhance it we can (Female, Nelson), and "… keep the human people as healthy as possible first" (Male, Dunedin 2). Another consideration was the cost to a society, not an individual:

> It's got real benefit for real problems. Significant for a lot of people and causes a lot of suffering and will improve quality of life for people. Not getting a cold through taking a throat lozenge is minor compared with Alzheimer's and Cancer. They're a far bigger issue and extremely costly to the country (Male, Waimate).

These attitudes are summarised in Table 8.

Table 8
Scale of Biotechnology and Perceived Attributes

Global	Individual
Greater risk (to environment)	Less risk
More will benefit	I will benefit
Less choice/imposed	Individual choice
Less likely to be containable or reversible	More likely to be containable and reversible

Ethical Issues
Some of the participants found that some of the exemplars created ethical issues for them. There were issues to do with justice. Who was being blamed for this problem and was it the same group who would have to pay for it? Then there was the dilemma of the duality of most exemplars. They had the potential for great good and participants felt they should do good things to help people and the world, but at what risk and at what cost? Did it mean to do something good they would be required to do something they considered to be bad?

The justice issues were related to these questions:

- Whose problem is it anyway?
- Who created the problem?
- Who should 'pay for' solving the problem?

For example, some participants felt that sheep were being 'blamed' for something they had nothing to do with:

> My question is, why do we need to bother suppressing a natural process of an animal to counterbalance a problem we've caused in industry? I ranked it 'five' personally because I can't see why we need to go sticking things down the sheep's throats because we've buggered up industry in the last 100 years (Male, Auckland 1).

Should we do something about it anyway? This person presented a hopeless perspective:

> I am a Christian and believe that because sin entered the world, there is no way we can correct mistakes that were man made in the beginning. As far as I'm concerned we only make things worse (Female, Wellington).

Alongside this general idea that we humans have messed up our world, there was the concern that we should therefore make some reparation for this and care for our environment for future generations: "… our previous generation have messed up our environment in a way that leave us some huge burdens to clear up. So if there's nothing else we can do let's try this" (Male, Auckland 3).

These exemplars often confronted participants with the difficulty of choosing between a process and its endpoint. A biotechnology may have the potential for great good: "I think we should help people if we can" (Male, Waimate), but it may use a process involving something some found very distasteful: "Well I've got a divided opinion. Yes, it would be good to help the chronic conditions that are out there, and no because of taking an embryo" (Female, Christchurch 2). This concern about the process that could be involved in 'doing good' was particularly accentuated by the use of embryos for stem cell research, and this created the

most ethical problems for participants over all the exemplars. It elicited responses from those who thought that humans should not be 'meddling' with nature (see next theme), and especially those who felt:

> It's a God given thing, you know? An embryo is a living thing. It's a baby. As soon as its heart starts beating it's a human, so why should you kill off something to help save someone else. It's not - it's just not right (Female, Auckland 2).

At the same time some participants were conscious that frequently good does come out of bad. They were concerned, as already mentioned, that the dominance of the profit-making motive could come at the expense of unethical behaviour by some commercial companies. The notion of 'good' and 'bad' had the depressing side to it that participants felt that whatever regulations were put in place to protect the use of biotechnology there would always be some people who would abuse the technology.

Ethical issues were also related to choice. People should be free to decide if at all possible. However, some participants wanted a line drawn against the use of certain biotechnologies, such as those using embryos. This would lead to ethical or religious beliefs restricting choice.

This section has summarised the factors participants in the focus groups considered to be important when considering the impact of biotechnology. They were concerned about risk – the provisos they wanted included as conditions in accepting a biotechnology, fears they had about it, who could be trusted and what further information they needed to make decisions about biotechnology. They assessed the benefits of the exemplars, and considered the impacts as macro or micro – dependent on their impact on the wider world or environment, or on individuals. Some had quite pragmatic views. Finally the ethical challenges biotechnology raises were considered. The next section discusses how perceptions of nature affected the acceptability ranking process.

8.3.2 Sense of Place: Perceptions of Nature and Natural

There is a sense in which people have a model of how they think the world is and where everything fits or belongs in it. This model is challenged by biotechnology. Some humans keep challenging the models of other humans by crossing perceptual boundaries and mixing things up. This can occur at many levels. For example, there is the simple placing of a device in a sheep – putting something inside a sheep that would not normally be there and will still be there when the sheep dies. Some felt that there were certain types of ground in which potatoes would grow and to try and make potatoes that would grow in other places was not right. Most felt it was acceptable to take a naturally occurring bacteria from one human being and put it in another. (The discussion about the use of stem cells that could be placed in Alzheimer's sufferers also went along these lines too.) But then there were those who challenged this because they said this bacteria had been cultured in a lab and probably had other things added in its formulation to make it last in lozenge form, therefore it was no longer 'natural'. The next distinction was made between inserting genes from one species to another. Did it make a difference if the gene was synthetic? It generally was not regarded as acceptable to take a gene from an animal and place it in a plant.

What is natural? Humans keep changing things. If we are 'part of nature' then this is 'normal' behaviour: "I'm natural. If I do it therefore it's natural" (Female, Waimate). But if

we are not part of nature this is 'unnatural' behaviour because everything has its place and it should be left like that: "I actually think it is unnatural to place such devices in an animal" (Female, Waipukurau). It is 'playing God', trespassing – "Yeah, you're playing God, you're changing our natural environment … but we're going into, in a sense, what you could call forbidden territory" (Male, Waimate) or 'interfering' (Male, Wellington) with nature.

Something that occurs in 'nature' was considered 'natural'. Hence, sore throats, methane production in ruminants, and food were considered natural. Using something natural was regarded as unlikely to interfere with other things such as our natural bodily processes (Female, Dunedin 2). Natural selection was nature's way: "… if it doesn't happen naturally I don't know if we should be messing around with it" (Male, Nelson). However, this posed a problem because diseases etc. were thought by some to be nature's way of selecting the fittest to survive (Females, Nelson and Auckland 3) yet humans seek to prevent and treat diseases.

How much should we humans be able to change 'nature', to change what is 'natural'? Opinions on this ranged across those who felt that "… it's a natural occurrence so let it be" (Male, Waipukurau), and "[I] prefer food not to be tampered with (from notes[40])… I can see it on both sides but my initial thought was to keep food natural" (Female, Waipukurau), to those who felt such change was acceptable in certain circumstances.

> Female: Well you know yourself, if you suffer from gas it's something you've eaten. So you don't eat it or you modify what you're eating. You change your diet. Same thing for animals … You modify the diet.
> Male A: They're producing it all the time. It's part of their natural -
> Male B: Regardless of what you feed them. Ruminants are still producing gas.
> Female: But you can lower the gas, can't you? (Waimate)
>
> Female A: And I do believe that doing that is just working against natural selection. I'm totally against it.
> Fiona: In what way working against natural selection?
> Female A: Well I guess it's just a genetic defect so if that particular human being is unfit by the forces of natural selection you will simply get eliminated. Of course it hurts if it is a member of your family, if it involves you, but that's just how nature works.
> Female B: In your opinion we shouldn't have hospitals?
> (Laughter, lots of talk.)
> Female A: Of course, not to that extent ... If it can be remedied by other medical means, why not? But if you have to use another life then I think it's not good (Auckland 3).

There was the warning that if humans do interfere with natural processes then we will have problems such as an increased risk of cancer or the likelihood that we could accidentally create something bizarre: "… because I'm very sure that whenever you are going against nature it does have a side effect" (Female, Auckland 3). Therefore it was felt to be better to work with nature by doing things naturally.

If humans do 'interfere' then what is interfered with is no longer 'natural'. This perspective produced its own set of problems for participants. What does it mean to 'interfere'? This is not simple. For example, there might be something in a genetic structure of a human, animal of plant that is just not 'turned on' or expressed, and we can learn how to turn it on. (A man in the Waimate focus group talked of the drought gene in ryegrass, as an example.) Some participants wanted to draw a distinction between the suppression of a natural process and

[40] The process of each focus group was also recorded in written notes.

dealing with the result of that natural process, for example in the animal production of methane. It was regarded as acceptable to change the diet, or to deal with the produced gas, but was not acceptable to suppress it.[41] If any product had anything to do with a laboratory it was regarded with suspicion as not being natural: "It isn't a natural thing because they have artificially cultured it …" (Male, Auckland 3). But participants were well aware that vaccines, blood transfusions, and plant and animal breeding provide examples which have become accepted practice. Similarly people grappled with what it meant to have a synthetic gene rather than one taken from an actual toad. The fact that it was synthetic seemed to soften the impact for some of the 'toad' image. The positive aspect was that animals were not being put at risk to get the gene.

Participants had a hierarchical sense of the world. At the top were humans, then animals, and then plants. Everything has its place. We shouldn't try to grow potatoes in places where they would not 'normally' grow: "It's like broccoli growing in the wrong place. Grow something else there, you can't expect to grow potatoes everywhere" (Male, Auckland 1). And you shouldn't put a toad into a plant – it is not the 'place' to find a toad: "A potato is a vegetable. A toad is an animal. I'm sorry, the two don't mix" (Female, Christchurch 2).

Parallel to this there was a perceived feeling/emotion hierarchy. Animals were more likely to feel to a certain extent the way we humans do and this made them more like us than plants: "I put 'three' because if the potato [other exemplar] had feelings it would be easier for me" (Female, Christchurch 2). The place of bacteria and viruses in this hierarchy was not articulated though they were so strongly associated with humans and antibiotics.

This perception places boundaries between the hierarchies which means that some participants thought such boundaries should not be crossed. This meant that some felt the transference of bacteria or stem cells from one human to another was acceptable: "From embryos to the human body. It's good and I hope the research is going on" (Male, Waipukurau), but eating a plant with an animal gene in it was not – it was "putting something foreign into my body" (Female, Waipukurau). If human to human transfer was acceptable then this led to a dilemma for some in the source of stem cells: "I'm against interference with embryos" (Female, Christchurch 2).

There were many perspectives on nature. All of nature can be seen as bad or threatening, or nature can be seen as pure and good apart from humans who keep spoiling it. Human beings keep making mistakes and trying to control and change things that should be left to 'nature'. On the other hand it is human beings who are also trying to do things to benefit humankind and the earth. (This is a basic assumption which was rarely articulated as such.) 'Nature' is very complex and we are never likely understand it:

> I think that saying they think they're improving it means they think they understand it and if anybody claims they know fully encompassed natural processes, how everything works in reaction to each other, I think we've proved time after time that we don't, because every time we do something, something else comes up … We're never going to understand absolutely everything, but … nature isn't perfect in a lot of ways anyway. We just use it and don't understand how to use it ourselves (Male, Waimate).[42]

[41] This in itself had an inherent contradiction because changing the diet would affect the digestive process.

[42] This view is similar to the one put forward in the academic literature: "Nothing will be more important to human well-being and survival than the wisdom to appreciate that however great our knowledge, our ignorance is also vast. In this ignorance we have taken huge risks and inadvertently gambled with survival. Now that we

This section has considered how participants' perceptions about nature and the natural impacted on their decisions about biotechnology. The next section considers the impact of personal experience and knowledge on these decisions.

8.3.3 The Role of Personal Experience and Knowledge ('Situated Knowledges'[43])

If an exemplar was regarded as a 'real' problem, known in people's experience then it was more likely to get support. Some had heard or read about certain issues and they used this knowledge to validate or critique an exemplar.

Group participants were able to count on experiences of their own to inform their decisions about biotechnology. Those who were farmers were able to bring their experience of farming practice to issues on the practicality of inserting a device into a sheep's stomach to reduce exhaled methane, for example. Almost every one had experienced some of the problems the exemplars aimed to relieve or solve, such as a sore throat, and this influenced the almost overwhelming acceptability of the throat lozenge as a biotechnology product. A sore throat was a discomfort but not potentially fatal. Participants had all experienced it and so if the lozenge helped that was good but at the same time there was not likely to be any disastrous side effects from its use, and there was a personal choice of treatments.

In a sense the potato-toad gene exemplar suffered from an over familiarity with potatoes! Potatoes are a staple food not a health related product. The genetic modification of potatoes brought GM into the every day and associated potatoes with the toad, a creature with a "bad press" as someone inferred (Female, Auckland 1).

The importance of personal experience was also emphasised in the use of stem cells to relieve Alzheimer's Disease exemplar. Many of the participants had experience of relatives with this disease and there was a (usually not stated) fear of getting the disease themselves, which resulted in an approval of any biotechnological research offering a promise of relieving or curing Alzheimer's, and relieving the burden on caregivers and relatives. Similarly, many of the women who had had babies strongly resisted the use of embryos for stem cells.

The DDE bioremediation exemplar resonated with participant's image of New Zealand as 'clean and green' and the story of the use of DDT in New Zealand acted to counter to this image, so anything that could restore it was highly regarded by many participants. However, the story itself bore with it the message of how solving one problem could lead to another and this promoted a cautious approach.

Participants often used knowledge they had gleaned from their own reading, sources of communication, and from their own pursued interests, to inform other members of the focus groups. Others would pass on stories they had heard. Sometimes this knowledge was factually correct and sometimes not. Sometimes it was out of date. Such sources of knowledge are very important because they inform people and communicate to them how important particular things are:

---

know better, we must have the courage to be cautious for the stakes are very high." (Colborn et al. 1996: 249, cited in PCE, 2001: 32).

[43] Haraway (1991).

> I've read about methane. They've been doing a study for a long time. I have read about it and I think of all the studies that have been made it is something that's extremely [important] (Female, Christchurch 2).

Hence the response to all of these exemplars was affected in one way or another by the personal experiences and knowledge of the participants.

8.3.4 The Need for Choice

Choice of use of a biotechnology product was very important to participants. No-one liked the idea of having some product forced on them – such as the possibility that employers might make employees take the throat lozenge if they had a sore throat so they would not be absent from work, or that Government might regulate that all sheep had to be fitted with the methane reducing device.

It was regarded as important for there to be choice in available products, i.e., the market was competitive (Male, Waimate), and that the information provided on the labelling could be trusted: "I mean, again, for me, it's information. It's about choice. If you know, you can make a decision" (Male, Dunedin 1). In this sense Pacific Islanders and Asians were much more aware of the alternatives to eating potatoes! Discussions on choice usually led on to the relationship between informed consent and responsible decision making behaviour.

Informed consent was also touched upon in the use of stem cells from embryos exemplar. Who would consent to such treatment when a sufferer from Alzheimer's Disease may be unable to give an informed consent? Consent was needed by the 'owners' of the embryos for their use as a source of stem cells.

Usually one or two people in each group would suggest something along the lines of how they found this biotechnology acceptable as long as they did not have to use the product, or as long as it did not affect them – "You'd like to see it done but you wouldn't want to do it!" (Waimate). This has been called the 'Not In My Back Yard' or NIMBY syndrome. For example, some participants preferred that sheep be treated in some way to reduce greenhouse gases than have to take or do something themselves[44]:

> Male A: And also I rather the sheep take the damn thing rather than me take the damn thing. (Laughs)
> Male B: … and the same as him. I'd rather the sheep than myself, so yeah, that's the main reason (Wellington).

This aspect of NIMBY could also be referred to as 'Not In My Body' or NIMB syndrome, to coin a new acronym. Another suggestion was that any risky research should be tested somewhere else (on an offshore island or another country) before being released on mainland New Zealand, which fits with the more common usage and understanding of NIMBY.

In this section the important role that choice plays in the acceptability of biotechnology, and the desire of some for others to bear the brunt of a biotechnology have been described. The next section outlines how the use of words affects the acceptability of a biotechnology.

[44] A new acronym for this particular response to biotechnology could be NIMB or Not In My Body syndrome! There was evidence for it in all five exemplars.

8.3.5 Words and Their Connotations

It is important to have a careful choice of words when information is conveyed about different biotechnologies. Words can quickly convey bias. Words are rarely neutral: "It just didn't appeal to me ... Well, to me, it's just the name of something and it just totally put me off" (Female, Christchurch 1). Words conjure up different meanings for people, as this mans said, "It's just a whole mental thing with pictures you've generated in your head …" (Auckland 1). Some meanings may be held in common, others are unique to the individual: "I gave it a 'four' mainly because of that word 'device'" (Female, Christchurch). Words will play an important part in marketing a product. Understandings people have are also related to how people have been told – whether something is presented as a 'fact' or as opinion. Some said they did not know all the 'facts' so they could not make a decision.

Some words had almost automatic connections with other, frequently emotional images. Associations that came up in the exemplars are summarised in Table 9.

The response to some words was often difficult for people to articulate, as the following examples illustrate:

> Female: I just didn't like the idea.
> Facilitator: What didn't you like about it?
> Female: I don't know. I just - it didn't do anything for me. I don't know enough about it (Christchurch 2).

> Female: I really wasn't sure because I didn't like the embryo thing.
> Facilitator: What didn't you like about it?
> Female: I just can't sort of get my head round taking stem cells from an embryo (Christchurch 2).

Participants modified, softened or hardened some words. For example, 'saliva' became 'spit' which made it more real and less clinical, and the response to it more negative. Someone spoke of the synthetic gene not being part of "the old toad's body" (Male, Waipukurau), which gave it a familiarity, softening the 'toad' gene impact.

Table 9
Word Associations

Word	Association
Sheep	New Zealand identity
Potatoes	Fish and chips, Irish heritage, pakeha diet (compared with Māori and Pacific Island diet)
Saliva	Spit, HIV Aids, hepatitis C
Bacteria	Infection, antibiotics, inoculations, invisibility
Toads	Frogs, jumping, green, making a croaking noise, "disgusting", "gross"
Embryos	Babies, new life
Use of embryos	Ethical, "morally repugnant", "killing", "abhorrent"
Waste	Important not to waste anything, must use resources, efficiency, must achieve potential
Clean	"clean up environment", "clean up problem/mess", New Zealand identity – 'clean and green' image, important to be clean, anti-bacterial
DDT	Mistakes, anti-science

This section has considered the different meanings conveyed to participants by the words used in the exemplars. The next section also considers words but describes how they are used to communicate perceived power relations and responsibilities.

8.3.6 'We' and 'They': Setting Up Oppositions and Responsibilities

When participants talked about 'we' and 'they' who were they meaning? What did they personally identify themselves as having power over and what was ascribed to others? Where did they see themselves as powerless? Who and what were they reifying? The use of 'we' and 'they' was not only about setting up opposites but was also about accepting and stating responsibilities as citizens. For example: "I think we're really concerned here that we've made messes in the past …" (Male, Waimate), and "… when I look at the quality of life of the people living on this earth, we need to preserve and enhance it if we can" (Female, Nelson).

'We' are Members of the Human Race

When participants spoke about 'we' they were frequently associating themselves with humankind in general. As humans we have certain responsibilities, or so some participants implied – the responsibility to care for others: "I think we should help people if we can" (Male, Waimate), and "It could help a lot of poor countries that we need to find a lot of food for" (Female, Christchurch 1). And there was a need to keep informed so that 'we' can make good decisions:

> I mean, I think we have some responsibility to inform ourselves. We shouldn't expect information to be given to us on a plate. We should demand it and if we don't get it we should refuse to buy a product. … We should just say, stuff you. You're not going to label it, I won't bloody buy it. That's how we should really approach this problem (Male, Dunedin 2).

Others expressed fears about what is happening to us: "I mean, are we really down to that savage level?" (Male, Auckland 3), "And this is what frightens me. I believe that we're now starting to try and play God" (Male, Wellington). And others felt they were being manipulated in some ways by powers beyond their control: "Well it's putting something unnatural in our bodies possibly, we don't know (Male, Waipukurau), "[I'm] just not happy with tampering with the major food [potatoes] that we all consume" (Female, Wellington) and "I guess this is already out there. There's not a lot we can do about it" (Auckland 1). However, others expressed the need to take stock, "… we've got to take a harder look at, you know, and say, "What are we doing here in the long run?" "(Female, Nelson), while others wanted to take some risks, otherwise "unless we pick it up and run with it we won't progress" (Male, Waimate). These latter quotes indicate that some participants felt they had some power over decision making.

Participants took personal responsibility for mistakes in the past and felt that humans had a responsibility to fix such mistakes[45] and wanted to "Clean up the environment. Clean up the problem that we've made" (Female, Wellington). Another wanted to see New Zealand as he thought it had been in the past:

> … we pride ourselves on being a clean green country and over the years we've put a lot of crap on our pasture and that so if we can get rid of all the stuff that didn't do anything or 'cos talking to old guys over the years they say, "Oh, we just put on this

[45] Is this associated with the Treaty of Waitangi claims, and now part of our consciousness?

> stuff, and then a few years later chucked on something different". So there's still a lot of toxins and that in our grass and our soil, so if we can get rid of that and step back to square one … (Male, Waipukurau).

'We' are New Zealanders

Participants took ownership of New Zealand's resources as New Zealanders. One participant said, "You know, if we're growing potatoes [we] might as well be growing potatoes … We might as well be utilising it [earth/soil] to its full potential" (Male, Waimate) and another, "I have difficulty with using some of our native plants and putting different genes into our native plants … what right do we have to … change them?" (Female, Auckland 1).

'We' are associated with science

Participants also identified themselves with what is happening in science, as if they themselves were doing research and were scientists as in these quotes: "I don't believe we should be creating species" (Female, Auckland 1) and "I've heard a lot of horror stories about it, umm, and I think if we can do something …" (Male, Waipukurau).

> Because I've had personal experience of my own mother and my own aunt with [Alzheimer's Disease]. So I really want them to do it … I think we're only beginning to discover things that we think we know, and there's enormous areas that we don't know about. When you look at the problems we have, the gaps in the field, I just think we need tons and tons of money and tons of research (Female, Waipukurau).

There was also a general association with farming as demonstrated by these quotes: "I saw on TV how uncomfortable overseas buyers are when we do something to our animals" (Female, Waipukurau), and "I ranked it 'five' personally because I can't see why we need to go sticking things down the sheep's throats because we've buggered up industry in the last 100 years" (Male, Auckland 1).

'They' as 'Other'

In contrast to the use of 'we' by participants, the use of 'they' indicated 'otherness' – someone apart from them, in opposition to them, or not like them. In this quote a participant in the Pacific island focus group separates herself from New Zealanders: "Why don't they eat the kumara or something else?" (Female, Auckland 2). In this one 'they' were members of anti-GE groups with whom the speakers did not identify:

> Male: It was whipped up into an absolute hysteria and one of the slogans they [the opposition – in this case the Greens] kept carrying away – no toads in our potatoes etc.
> Participant: You know, no matter what side they're on.
> Male: They had all these people dressed up as butterflies (Nelson).

'They' generally signified someone in authority – someone or something that participants did not expect to have power over: "Once again, I think as long as it is kept a personal choice and they [workplace managers] don't say you've got to have this – like any of these vaccinations going on" (Male, Waipukurau).

Scientists were usually 'they' (except when included as 'we') and this could have neutral connotations, as in: "I've read about methane. They've [scientists?] been doing a study for a long time" (Female, Christchurch 2). However, such implied nuances about scientists were more frequently negative: "They said that about thalidomide" (Wellington).

> I think that saying they think they're improving it means they think they understand it and if anybody claims they know fully encompassed natural processes, how everything works in reaction to each other I think we've proved time after time that we don't, because every time we do something, something else comes up (Male, Waimate).

> Well the embryo - you could claim that it was alive, and if you're alive you've kind of got choices. But you can't really have a choice as an embryo so they're kind of taking advantage of that fact (Female, Dunedin 2).

There was a suspicion scientists will not be open about available information, that they will work behind the scenes in some way, and that if scientists are going to be unbiased they need to work in Government sponsored research. In contrast there was a general trust of medical workers but there was some debate about their links to business.

As mentioned previously, participants had a deep distrust of profit making and hence industry or companies were frequently referred to as 'they' – "All they will do is produce enough in order to make money" (Male, Nelson).

> And all these toad potatoes – it's not for the good of mankind. It's for their own good, because they will sell those potatoes to the farmers for huge amounts of money and they don't give a damn whether they taste like crap or not (Male, Nelson).

Regulatory bodies and Government were also referred to as 'they', and sometimes it was inferred that they did not know their 'stuff'. For example, a farmer from Waimate challenged the regulations about GE contamination in seed: "What did they say? You're allowed half a percentage GE. Well if you're allowed half a percentage GE you might as well give the whole lot away" (Male, Waimate).

This section has covered how the way participants used the words 'we' and 'they' could be seen as describing how participants saw themselves in relation to others in society. What they identified with and had responsibility for contrasted with how they saw 'the other', those who were not like them, or who did things outside their control.

8.4 Discussion and Summary

Part One of this chapter drew together the factors that participants in the focus groups said were determining the overall ways in which they made their acceptability rankings. It was included to be true to the focus group process as this was one of the questions participants were asked in some groups. As is apparent from the preceding chapters, these factors were ones which had already come up in the focus group discussions stimulated by the individual exemplars, but in reality the factors participants actually took into account were far more complex and had different emphases according to the exemplar being considered. Such differences support the argument for a case-by-case consideration of the acceptability of different biotechnologies.

Part Two of this chapter has generalised the factors that were common across the decisions focus group participants made in their rankings of exemplars. It has shown that these factors could be divided into six different generic themes covering their major considerations: the impact of the biotechnology, participants' sense of everything having its place in nature, participants' experience and knowledge, whether the exemplar offered some personal choice in its use of biotechnology, the connotations different words elicited from participants, and

finally, what the use of the words ‘we’ and ‘they’ revealed about participants’ feelings of who was responsible for what. These themes demonstrate the awareness participants had of the complexity of the impacts of biotechnologies and their competence and ability to think widely and imaginatively about this issue.

Chapter 9
Summary, Discussion and Conclusion

9.1 Introduction

This chapter gives an overall summary of the findings from the focus groups of the factors affecting acceptability of biotechnology. It compares these with factors found in the literature pertaining to New Zealand and other countries. A discussion about making meaning follows and leads into a brief consideration of how attitudes to biotechnology may be related to certain characteristics of the New Zealand national identity.

9.2 Summary

New Zealanders in the focus groups studied were very concerned about risk. They were very aware of the balance between costs and benefits indicating that they did not see any biotechnology as being risk free (agreeing with Raynor, 1992). This can be called ambivalence (Marris et al., 2001) because participants could see the good that would come from a particular biotechnology but were also aware of and concerned about the possible risks it posed. They often said that they found a biotechnology acceptable 'as long as …' or 'if …'. Such provisos indicated their fears were centred about the risk of a biotechnology getting out of control, or the risk of it creating another problem unforeseen at the time, which would then have to be dealt with in ten or twenty years time (matching both other New Zealand studies and international studies). They were very aware of the complexity of the food chain and its interdependence (also Cronin and Marchant, 2002: 24, and Marris et al., 2001: 51). Many wondered what their children would say about the decisions made now, and whether they too would some time in the future concerned about what happened in the past. Only in one workshop (Waimate) was the subject of 'liability' introduced. Participants were more concerned about what might go wrong than who would be liable if it did go wrong. Most participants were quite clear that when something did go wrong it would be they, the general public, who would bear the cost (in monetary and health terms) both individually or through taxation. (Legal liability was an issue at the Royal Commission but it seems more likely to be more of an issue for 'experts' on both sides of the debate rather than the generalised public.) These fears then led on to the need participants had for more information. The implication was that they did not know enough from the sources they already had available or that the sort of information they had acquired was not the sort of information the actually wanted. (This was also found in the PABE study and in Australia (Norton et al, 1998).) In the focus group situation this may well have been accentuated because the participants were provided only with minimal information on each exemplar, a conscious decision on the part of the researchers, who wanted to find out what sort of information people wanted, rather than educate them on the biotechnologies presented as exemplars.

So what did focus group participants want to know? They wanted to find out more specific details about the biotechnology. How was it made? What was it made of? Then they wanted to know the reasons for having this biotechnology. Why had the researchers become interested in it? What was its purpose? Who was going to benefit from it? Who was paying for it to be researched and developed? They wanted to know what research had been done on the risks surrounding it and who had done this research. (These questions match those that arose in the PABE study, Marris et al., 2001: 48.) It was implied by participants that scientists had not thought of or researched the risks that they perceived. Participants wanted

to know if such biotechnology was going to be monitored and regulated. In all of this it needs to be noted that these participants were not asking for quantitative measures or comparisons of risk (matching Sandman, 1993 and Wynne, 1992) and they were not asking for great scientific detail. They were more interested in the social aspects of the technology and its possible social, health and environmental impacts on themselves and their country, both now but more importantly, in the future.

This lack of information of the type they wanted played a part in the dominant concern and distrust about the role of business in biotechnology products. (This concern was also prominent in much of the literature.) If the purpose of a biotechnology was simply to make more money for one part of society then many felt that it was not worth the risk. This was a general comment but did not seem to apply to particular products. For instance, the throat lozenge was the most acceptable of the exemplars yet it is a commercial product (see Table 10). Participants were suspicious of the need for a toad gene in potatoes but there was a certain sympathy among some for potato growers and the need to increase exports. Medical technologies gained greater acceptance even though participants were aware that pharmaceutical companies were involved in profit making. This reinforces the case by case nature of people's decision-making, as the comparison between their overall way of deciding acceptability of a generalised biotechnology product differed from that used on a particular example.[46]

Table 10
Comparisons Between Acceptability Rankings Over All Exemplars

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Scenario	most acceptable…. least acceptable						
Reduction of methane production in sheep	30 (26%)	19 (16%)	26 (22%)	23 (20%)	18 (15%)	1 (1%)	117
Throat lozenge	50 (43%)	30 (26%)	21 (18%)	7 (6%)	9 (8%)	0 (0%)	117
Toad gene in potato	7 (6%)	19 (16%)	26 (22%)	26 (22%)	38 (32%)	1 (1%)	117
Stem cells for Alzheimer's Disease	32 (27%)	25 (21%)	19 (16%)	13 (11%)	28 (24%)	0 (0%)	117
GM bacteria to clean up DDE	24 (21%)	21 (18%)	19 (16%)	25 (21%)	27 (23%)	1 (1%)	117

For participants in these focus groups, as in other studies, information also played a vital role in choice and consent. Participants wanted to be able to have enough information to make up their own mind about a biotechnology as a citizen, and where it was possible, to make a choice about using a biotechnology product, as a consumer. The dilemma appears when it comes to exercising their rights as a citizen. No-one appeared to think that they had any control over decisions about whether or not a biotechnology should be developed in the first place. They feared that such decisions had already been made by Government and regulators who consult but do not appear to change policy or regulations as a result of consultation. The issue of research and consent was frequently mentioned in relation to medical research in

[46] This questions the validity of some surveys which ask generic questions like: 'Do you support the release of GM products in New Zealand?' or, "Do you support the lifting of the moratorium on GM field testing?'

New Zealand in which consent was not obtained, e.g., the storage of babies' hearts and the cervical cancer 'experiment' at Greenlane Hospital.

Most exemplars were seen to be beneficial to individuals, society in general, or the environment in some way. However, benefits were seen as a balancing act in which to be acceptable, an exemplar had to have more benefit or a greater quality of benefit than risk. There was a fear that it was only companies that would benefit from biotechnology, particularly GM, with an accompanying suspicion that a technology would only be developed if somebody could make some money out of it. Some pragmatic people felt that economic benefit to New Zealand was important but most felt that benefits had to be much wider. In a sense the nature of the focus group structure led to a concentration on problems rather than positive outcomes. Positive aspects can be simply stated and so do not take up as much space in the debate. At least one of the participants in each focus group said they found all of the exemplars acceptable so that it just became a question of which ones were more so than others.

A factor that played an important role in the acceptability of biotechnology related to its impact on a continuum ranging from individuals as entities, to the earth as a whole environmental entity. However, a focus on either extreme could make a biotechnology more or less acceptable. So, there were those who said the throat lozenge was most acceptable because it would help the many individuals who suffer from sore throats, and there were others who said throat lozenges were a waste of resources because they would not have a global impact. Such people saw reducing methane emissions as more important because it would not only benefit New Zealand but reduce greenhouse gases for the whole world, hence having some impact on global warming. This has been called this the micro-macro factor in this report. Because people subscribe to perceptions at both ends of this continuum this factor would not be a good direct predictor of attitudes to biotechnology. But it could be part of a pathway to decision-making as people rating the importance of individual benefit may well tend to be more favourable to medical biotechnology while those at the other end of the spectrum are more favourable to environmental biotechnology.

A pragmatic attitude and the simplicity of a biotechnology were other factors that related to the acceptability. If something seemed like a good idea then 'go for it' was a common response. If a biotechnology was already in use, then it must be all right. There was no point in thinking about it further. If something seemed simple, straightforward and easy to understand then that was very much a plus.

Applications of biotechnology challenge people's ethics because decisions about their use are frequently about finding a balance between the good something may do compared with the process that has been used to get this biotechnology, or the risk that using it may have. Biotechnology also challenges ethics because it asks questions about where we as humans fit in our natural world and for some this has connotations of good and evil and justice. For some it includes a religious and/or spiritual dimension. Who is going benefit from a biotechnology is at its heart an ethical and juridical question. Also at their most basic, ethics are about a code and set some limits to what we can do and not do. Unspoken but shared implicit ethical codes are important for social cohesion.

Ethical factors lead nicely into 'sense of place' factors. Biotechnology challenges the sense of understanding that we have of our natural world and where everything fits, and where we fit – our identity in fact. At a very basic level genetic modification for some implies a genetic determinism – we are our genes. And if our genes have a lot in common with the genes of

plants and animals and can all be moved around like building blocks what does that mean about who we are and the sort of things that we as humans can do? Some participants were concerned about 'unnatural' gene transfer between the plant and animal kingdoms and between plants, animals and humans. They felt this interfered with 'natural selection' and that such interference would hinder in some way the balance of nature. Many spoke of how humans were different to plants and animals, with humans, for example, having 'feelings' and emotions, while animals experience these traits in some lesser way and plants not at all.

The personal experience of participants was frequently used as a way of understanding or making meaning of a biotechnology and ultimately could influence its acceptability due to participant's experiences in the past. For example, participants associated exemplars with things that they knew about or had experienced. Hence they were worried about the purity of the bacterial component derived from saliva, in the throat lozenge, because they knew about the transmission of 'flu, glandular fever, HIV AIDS and so on. They also knew about inoculations. They worried that the bacteria used to break down DDE in the soil could mutate as could the fungi or the bacteria that caused soft rot in potatoes. What then would be the impact of the GM bacteria? How would it behave? They were very aware of the development of antibiotic resistance and the need therefore to reduce antibiotic use. This interest in mutation and resistance was not present in the concerns expressed in other studies (e.g., the use of growth hormones in the USA (USFDA, 2000) and pesticides and additives in food in New Zealand (Gamble et al., 2000)). When the exemplar using stem cells was presented it could be related to blood transfusions or kidney transplants. In the same way, the concern about business making undue profits may have come about because a participant felt they had been 'ripped off' on occasions, or they see the rich getting richer and poor getting poorer in New Zealand, or overseas ownership of some companies. They may be concerned about the attitudes to regulations because they have seen people flouting them and fear that the same may happen with GM. Participants were aware of the issues surrounding the use of DDT and they did not want similar things to happen again. This experience and knowledge demonstrates that their concerns are valid. They cannot be categorised as emotional, irrational and unreasonable arguments. People learn from experience.[47] Similarly, some of the participants had been reading up or following various issues and in fact were well informed. It also needs to be acknowledged that information does become distorted and partially remembered and understood therefore the more that is available the better so that people can see that there is a variety of points of view and different ways of telling the same story. At present the debate tends to be polarised and this choice is not available.

The last paragraph introduced choice and this was a strong factor in acceptability. As such, biotechnology to be used in the environment was not so well supported because there would be less choice possible over contact with it. There is an interaction between choice and regulation as was apparent in the issue of whether or not sheep should have a device inserted to reduce methane gas emission. If something was wrong with the technology at least the farmer could stop using it, but they would not be likely to use it if they had to pay for it, or unless it became part of a Government regulation. If the bacteria used in the degradation of soil DDE mutated and spread then there would be no choice.

[47] Ironically, a scientist at the FRST symposium, 'Impacts of emerging biotechnologies' (5-6 September 2003, Victoria University of Wellington) when asked what ways social scientists could help him, suggested they could help him communicate better, and they could help him make people aware of the potential for biotechnology rather than always harking back to the past.

Certain words seemed to have special meanings for participants in the focus groups. For example, one of these words is 'waste' which also seems to be tied into 'clean'. Many participants did not like to see anything wasted. They felt the throat lozenge technology was using a bacteria some New Zealanders had in a way that would benefit others, so such a beneficial bacterium would not be wasted but made use of. They did not like the idea that five-day-old embryos could be used for their stem cells until it was suggested that otherwise they would be 'wasted', or disposed of. The potato technology would enable more efficient production of potatoes – fewer would be 'wasted'. Finding a solution to bioremediate soil DDE meant that soil could be used again and would be 'cleaned up'. The Minister of Science, Research and Technology suggested recently "reducing [methane] emissions means reducing waste, which offers the opportunity for productivity gains for farmers" (RSNZ News, 4 Sept. 2003). Coyle et al. (2003) also consider the associations participants in the focus groups attached to the 'clean and green' image.

When the way participants used the words 'we' and 'they' and other associated words such as 'our' was anaylsed, it was found that participants took ownership of 'the mess the world is in', of New Zealand agriculture in general and of some scientific discoveries. This latter ownership differs from the findings of the PABE study (Marris et al., 2001) in which scientists were seen as neutral or as 'normal' people dependent on funding and therefore no more trustworthy than those in business. These two views were also apparent in the focus groups but need to include this additional third view of association with some of the achievements of science. 'They' were associated more with business, profit making, and in general any stakeholders who made decisions about biotechnology – regulators, Government, companies, scientists associated with companies. 'They' were the people or organisations over which participants felt they had no power, except the power of being a consumer and that was limited by labelling and available information.

The exemplar which received the greatest acceptability was the throat lozenge (see Table 10). It could be thought that this demonstrates the greatest acceptability for biotechnologies with medical applications (particularly as the use of stem cells for treating Alzheimer's Disease came second, but only by a narrow, inconsequential margin from the third choice) compared with biotechnologies with food or environmental applications. However, this interpretation is difficult to substantiate with this data. Biotechnologies with medical applications can be perceived as posing the least risk. Consumers could choose whether to use the lozenge or not (in spite of labelling issues) and it was generally thought that such a product was limited to the body of the individual taking it. Sore throats were common in people's experience and so many individuals could benefit from the biotechnology without posing a risk to the community or the environment. In addition the lozenge was not a GM product. On the other hand, the least acceptable exemplar, the synthetic toad gene in potatoes (Table 10), was seen as of limited benefit, it ran the risk of getting loose in the environment, and there was the general distaste for the placing of an animal gene in a plant, and the question of where then did such a plant 'belong'? Was it an animal or a plant? Hence, there were other issues involved in its lack of acceptability apart from it being a 'food'. So with focus group data, even though many participants said that they would prefer something that cured or treated some common but serious medical problem such as heart disease or cancer, it is difficult to say categorically that medical applications are preferred over others. These data do demonstrate that the participants discriminated between different medical applications as they did in the PABE study (Marris et al., 2001). Also, as in the PABE study, participants assumed that medical applications of biotechnology had received more thorough testing and were monitored more than food or environmental applications. In this instance they were not aware of (or made aware of) the distinction between the throat lozenge being a dietary

supplement not a medicine (many assuming it had to be prescribed), and the different regulations surrounding these products.

The PABE report noted that there were no issues surrounding the genetic modification of micro-organisms (Marris et al., 2001: 57-58). This was not so in this study in which participants expressed an anxiety about bacteria in soil and in people, linked to a high awareness of the development of antibiotic resistance and the risk of mutations. They gave no indication of where micro-organisms fitted in the human-animal-plant hierarchy.[48]

Some gender differences were apparent in the focus groups but as they did not constitute a random, representative sample of the New Zealand population such differences should not be taken to indicate differences in the population as a whole and this question is worthy of more research. Women were more concerned about 'natural' treatments and protecting or building up 'natural' immunity, the use of embryos, 'toads' – the 'yuck' factor, and generally caring for people over and above the environment. The people who found all exemplars acceptable were males, and it could be said they were more supportive of biotechnology in general than women, as Slovic (2000) has documented, however, there were some notable exceptions.

9.3 Making Meaning in a Time of Uncertainty and Lack of Agency

When considering factors that the general public take into account when deciding on the acceptability of different biotechnologies the context in which this is happening needs to be accounted for. Such factors can be seen to represent the ways in which people make meaning in uncertain times – in times in which they feel they have little power to make a difference except by their consumer power. (Yet even this power is dependent on the information disseminated by interested parties in whom the general public appear to have little confidence.) And the context of this research is New Zealand and so people's responses may come out of their perceptions about being a New Zealander, the New Zealand identity.

So what do people do when experiencing uncertainty? They seek more information. They want to know specific things about a biotechnology – how is it made, what does it do, what is it made of. They want to know why this biotechnology is being produced – what is the need for it. Who is going to benefit from it? Is it the producer, the company, the consumer, only those people who have enough money to buy it, the environment, or the Government? What are the benefits? What are the risks to people and the environment? Have the researchers and the companies selling this product thought of the risks? What plans have regulatory bodies and companies got in place to prevent or minimise these risks? Is there long-term monitoring in place? And so on. People want to see this information provided as of right, from trustworthy sources. They draw on their own experience of everyday life and the stories that they read or hear via the media and those around them, to find information that they consider relevant.

How do people make meaning out of uncertainty? They draw on all the information they can find, as mentioned above. This can mean that they experience ambivalence. They can see that most biotechnologies have good and bad sides. The chance of getting some benefit from a technology may outweigh the risk if the benefit is considered of sufficient value. They wish to be able to weigh up for themselves the benefits and the risks. However, they are also aware that good can come out of bad.

[48] Micro-organisms play a vital role in gene transfer and are used in genetic modification techniques for this purpose.

People practice some distancing tactics. They become sceptical and then often cynical as they distrust the motives of Government, companies and scientists. Such distancing enables them to say to themselves something like: 'In the world I live in a lot of things happen that I disagree with and which I have no control over, but I still believe in certain things in spite this. I do have a choice over who I am, my identity, and there are some other choices that I can make.' Perhaps the most dominant of the arenas in which they have no choice is whether or not New Zealand should be a 'market-led, free market economy'. This has become dogma in New Zealand (Brown, 1997). There is no way of opposing it, yet there seem to be few people who agree with it, even those in business (e.g., Baragwanath, 2003).

People tie in new biotechnologies to the things that they already know – they draw on their own experience. For example, they associate a biotechnology with the potential of treating Alzheimer's Disease with those they know who have that disease or ones similar and the awareness that they too might be at risk in the future. In a similar way they might know about the use of DDT and have felt that the world was let down by insufficient long-term research into its potential consequences when it first came into use. Or, they might have observed via the media the Government's responses to the Kyoto Protocol or the lack of consent obtained from people in medical experiments and so developed a distrust of Members of Parliament, Government regulations and scientists.

Biotechnology challenges the sense of place that people have. People have a certain view of how the world should be, what belongs where. For example, some think that an animal is an animal and a plant is a plant. What if a copy is made in the laboratory of a very small part of a toad and inserted into a potato? Is the result a plant or an animal? What does this mean about human beings – that we have the power to do these things, that we might do them to ourselves?

9.4 Attitudes to Biotechnology and the New Zealand National Identity

What does it mean to be a New Zealander? Certain aspects of the New Zealand identity myths could be very pertinent to the factors that play a part in the acceptability of biotechnologies to the public.[49] The first most relevant aspect of the New Zealand identity is the awareness and pride in the portrayal of New Zealand as 'God's own country' and a pastoral, clean and green paradise (Conrich and Davy, 1997: 3).[50] Secondly, New Zealanders have a dream of an egalitarian society and this is probably at the root of the general suspicion of business and any sort of showiness with regard to making money and the cutting down of any 'tall poppies' who lift their heads too high. Thirdly, many middle aged and older New Zealanders identify strongly with agriculture and how they think the economy of the country depends on it. Fourthly, New Zealanders are very proud of the scientific expertise of New Zealanders, dating back to Ernest Rutherford, and of how well some scientists have done overseas. They are aware that New Zealand has developed an expertise in agriculture which owes a lot to science, particularly that associated with the past days of the DSIR and the

[49] Risk has socio-political and cultural determinants (Slovic, 2000).

[50] It is interesting to note that 'clean and green' was only mentioned once in the focus group of Pacific Islanders, whereas in the group of Asian people it was mentioned seven times and seems to have been an image which encouraged them to come to live in New Zealand:
Male A: I heard about New Zealand about ten years ago on a TV programme. Green and a very blue sky. So I decide to immigrate here, yes …
Male B: Before coming to New Zealand my idea of New Zealand is that New Zealand is a green and clean country and that's why I move here.

Ministry of Agricultural and Fisheries. They also see themselves as the ultimate 'do-it-yourselfers' – being able to mend anything with a bit of No.8 wire should the need arise.

Calling our nation Aotearoa New Zealand, to indicate a New Zealand encompassing Māoriness, indicates also a troublesome, adversarial identity as illustrated by the present debate (2003) about the ownership of the seabed and foreshore. One way of disguising this dilemma has been to present the idea that "the real New Zealand is one without people", giving the impression that both Māori and pakeha are "interlopers" (Brown, 1997: 6). This presentation is used in 'green tourism' (Bell, 1996: 50). Hence even nature is a commodity to be marketed (Brown, 1997: 6).

Since 1984 (with the restructuring of the economy) New Zealand's governments have sought an international free market and pushed for an open, competitive economy with little government intervention. In other words 'the market decides' was the way many decisions were to be made. Criticism to this model has not been acceptable outside academic circles (Brown, 1997: 7) and the belief that there is no alternative to the free market has become dogma (James, 1992: 192-193). This belief has also led to the departure overseas of many New Zealanders to more lucrative markets (Brown, 1997: 14).

This world of free competition does not match with New Zealand's egalitarian myth. One way of circumventing this has been to present rural New Zealand as the 'real' New Zealand while what goes on in Auckland is considered to be atypical. A second method of circumvention has been to promote Kiwi ingenuity – New Zealanders have always been free marketers. New Zealand is supposedly a place where anyone can be successful (Brown, 1997: 8). However, there is a continuing suspicion about business. A recent survey by Industry New Zealand (INZ) (RSNZ News, 4 June 2003) found that few New Zealanders could see the link between quality of life and the country's economic performance. At the same time most were supportive of new growth industries, one of which was biotechnology. Fifty percent of those surveyed thought "it was more important for New Zealand to do what was right socially than what was right economically". Nearly one third "preferred people to remain modest about their success in business". The INZ general manager of marketing said, "A culture that fosters positive attitudes towards business people and business success is vital to improving New Zealand's standard of living and future prosperity".

Bell (1996: 176) asserts "nostalgia is a conservative way of avoiding tackling the hard things". Myths hide the unattractiveness that lies beneath the image (ibid: 80), such as the extent of poverty in New Zealand, the violent undercurrent demonstrated in such movies as *Once were warriors,* and the history of oppression of Māori.

It has been acknowledged by Simon Upton (former National Party Member of Parliament and former Minister of Research, Science and Technology) that the restructuring of the New Zealand economy has led to uncertainty but he hoped that the New Zealand culture would be a stabilising factor (Upton, 1994: 14-15). Some would say that the instability created by enterprise capitalism can never be balanced by culture. For example, George Soros, one of the world's richest capitalists, has proposed the formation of an open, global society (Soros, 2000, 1997) because he sees the capitalist system as deficient in five ways:

- There is an uneven distribution of benefits
- The financial system is unstable
- There is an incipient threat of global monopolies and oligopolies
- The state is becoming unable to ensure economic stability
- There are questions around values and social cohesion (Soros, 1997: 4-5).

Brown (1996: 16) asserts that though different sectors of New Zealand use the myths of identity for their own purposes, this is no reason for discouraging them because they do important work. Such myths play a significant part in social cohesion, providing a source of shared values.

This study has produced another question. Can the response to particular biotechnologies be predicted in any way by considering certain attributes of myths about the Aotearoa New Zealand/Kiwi, probably Pakeha, identity? (The question of Māori identity and its association with biotechnology is outside the scope of this report.) New Zealanders have a certain view of how New Zealand should be – a sense of place. Would a particular biotechnology threaten this? Would New Zealand still be regarded as 'clean' and 'green'? There is a certain warmth of feeling towards sheep. People do not want to see them 'messed about with'. New Zealanders regard themselves as egalitarian and suspect people who want to make a lot of money and hence there is the suspicion that all business is out to make a profit at any cost. There is a desire that everyone should benefit from a biotechnology – all New Zealanders equally and if possible all people in the world, particularly the third world. Yet at the same time New Zealanders view themselves as innovative and there is a pride in New Zealanders who have achieved (and competed) anywhere in the world – in sport, science, in the arts, in business and so on – as long as they do not demand wealth or display their wealth. They approach the world with a sense of humour in spite of the odds against them, as exemplified in the bestowing of the name 'fart tax' to Government attempts to raise funding for research into the reduction of greenhouse gases. This name exudes rurality[51] and is a poke at the ignorance and lack of common touch of the Government.

To many people New Zealand means white sheep on green pasture with a snowy mountain backdrop. This picture has implications for any biotechnology to do with sheep (rather than dairy cows or other farming animals), agriculture in general, the form the landscape takes, and the environment. It is also associated with the maintenance of, or making into reality the ideals behind New Zealand's 'clean and green' image.

A most important question for participants was the one of who benefits from the biotechnology. The response to this question could be closely linked to the egalitarian principle of many in New Zealand society, the concern that the less well off in society should be cared for and that there should be free access to health and education. This would also link to the anti-business feeling amongst participants and the perception that New Zealanders should not stand out from each other, 'skite' or make showy demonstrations of their wealth.

The pragmatic nature of New Zealanders and their feelings that things should be used and useful, could link to the association of a biotechnology with putting something that would otherwise be wasted to good use, and hopefully make it 'clean' as well. Attached to this pragmatic image is New Zealand as a nation of 'do-it-yourselfers'. There is a pride in the scientific achievements of New Zealanders, particularly if they are recognised overseas. There is also an awareness and ownership of how much New Zealand is dependent on

[51] And the 'bugger' advertisements that became so popular.

exporting primary products and the expertise developed in this area. Hence there is an expectation that in spite of New Zealand being a small country we can foot it with others overseas who have far greater resources for research. If a biotechnology promises that this image could be maintained and that New Zealand will therefore 'keep up' with the rest of the world and 'progress' it acts as a counter to those who want New Zealand to remain the same. It may be that even the same individual will experience such an ambivalence.

Where does the use of GM in biotechnology fit according to participants in these focus groups? The least acceptable exemplars were those involving GM applications which would eventually move into the environment, i.e., move outside the laboratory and further than field trials. Perhaps this gives an indication that biotechnologies that use the knowledge gained from genetic technologies but which do not use this technique in products that move outside the laboratory, may be more acceptable. Another focus could be on biotechnologies that take account of, incorporate or enhance some of the New Zealand identity myths and meanings. Such biotechnologies may find greater acceptance in New Zealand and contribute something unique to the world.

This chapter has summarised and discussed the different factors that made a biotechnology more or less acceptable to members of the focus groups in this study. The way in which people make meaning was then discussed with reference to how people understand and make meaning of new biotechnologies. The chapter concluded by applying 'meaning making' to certain qualities or myths that constitute or construct the New Zealand identity.

9.5 Conclusion

At the FRST symposium on the impact of emerging biotechnologies (Wellington, 5-6 September 2003) one young man said to me privately, the fact is that the public do not want GM and you can spend a lot of time finding out why but nothing will change that basic fact.[52] There are two issues in this attitude. Firstly, is he correct? Secondly, he clearly felt there was no point in conducting social science research in this arena. This report provides evidence (along with other research) demonstrating that public support of GM and other biotechnologies is not a simple for or against it issue and hence is worthy of study in order to seek some understanding of its complexity and its association with choices to be made about New Zealand's economic, social and environmental future.

Steve Thompson, CEO of the Royal Society of New Zealand, in a recent 'comment' in Royal Society Alert 286 (21 August 2003), writes that New Zealand needs to develop some way of incorporating science into policy making.

> The UK's Parliamentary Office of Science and Technology (POST) notes that policy should rarely be made on the basis of scientific evidence alone, but must include political, social, economic and environmental factors … science should not be used selectively, or as a scapegoat or to justify predetermined decisions, framing issues as scientific when really they are moral or judgemental, and downplaying uncertainties.

He goes on to say that New Zealand lacks such a framework for advice and suggests that scientific committees "should not be asked to make political decisions as to what levels of risk would be acceptable; their findings should be made public, and uncertainties made explicit".

[52] The name and organisational affiliation of this person is not given to maintain confidentiality.

The Royal Commission on Genetic Modification (RCGM) stated that it would like to see some shared framework of New Zealand values on which regulatory decisions about genetic modification could be based. It listed seven values that it viewed as important from the submissions it had received: the uniqueness of Aotearoa/New Zealand, the uniqueness of our cultural heritage, sustainability, being part of a global family, the well-being of all, freedom of choice and participation (RCGM, 2001: 11-13).

Underlying all myths about New Zealand identity and values is an increasing uncertainty (Bell, 1996). The link between myth and reality is not clear. Schiller, as far back as 1792, argued that we need a "constructed reality, strong enough to furnish sanction for action, but not so strong as to harden into dogma" (cited in Brown, 1997: 3). Such a mythology would enable "New Zealanders who are not members of established or prestigious groups" to "feel a sense of belonging" (ibid.: 11).

This report has focused mainly on specifics – certain factors that play a part in public acceptability of biotechnology. Such an approach may well have obscured another underlying and more universal debate. What kind of a world do we want? What kind of a New Zealand do we want? How can the benefits of living in our society and world be shared more equitably? (Expanding on Cronin and Marchant, 2002: 42.) The public experience of alienation and living with uncertainty that the PABE report describes so well, is alive and well in New Zealand, as these focus group data demonstrate. The myths about New Zealand identity and how this ties in with individual identity are continually under challenge and emerging biotechnologies are part of this challenge. The major stakeholders in biotechnology development, scientists, companies, regulators and Government members, could moderate this challenge by inviting the public in. The questions raised by everyday people about biotechnology are big questions, questions about what sort of a world we want to live in. Everyone has the right to be part of such decision-making. They have much to contribute.

References

Adelsward, V. (2001). Our attitude to GMOs in the field. *Sveriges-Utsadesforenings-Tidskrift* 111(1): 7-13.

Baragwanath, L. (2003). *Fortress-dwellers to global players? Globalisation and New Zealand: description, discourse and action.* Unpublished Ph.D. thesis, Lincoln University.

Barbour, R.S. and Kitzinger, J. (eds) (1999). *Developing focus group research: politics, theory and practice.* Sage: London.

Bauman, Z. (1991). *Modernity and ambivalence.* Polity: Cambridge.

Bauman, Z. (2001). *The individualized society.* Polity: Malden, MA.

Bauman, Z. (2001). *Community: seeking safety in an insecure world.* Polity: Cambridge; Blackwell: Malden, MA.

Bauman, Z. (2002). *Society under siege.* Polity: Malden, MA.

Beck, Ulrich (1992). *Risk Society: towards a new modernity.* London: Sage Publications.

Bell, C. (1996). *Inventing New Zealand: everyday myths of pakeha identity.* Penguin: Auckland.

Boulter, D. (1997). Scientific and public perception of plant genetic manipulation – a critical review. *Critical Reviews in Plant Sciences* 16(3): 231-251.

Brown, R. (1997). *Cultural questions: New Zealand identity in a transnational age.* Kakapo Books: London.

Cohen, S. & Taylor, L. (1992). *Escape attempts: the theory and practice of resistance to everyday life* (2nd ed. 1st pub. 1976). London: Routledge.

Colborn, T., Dumanoski, D. and Myers, J.P. (1996). *Our stolen future.* Abacus.

Committee of inquiry into allegations concerning the treatment of cervical cancer at National Women's Hospital and into other related matters (1988). The report of the cervical cancer inquiry. Government Printing Office: Auckland.

Coney, S. (1988). The unfortunate experiment: The full story behind the inquiry into cervical cancer treatment. Penguin: Auckland.

Coney, S. (1993). Unfinished business: What happened to the Cartwright report? Women's Health Action: Auckland.

Conrich, I. and Davy, S. (1997). *Views from the edge of the world: New Zealand Film.* Kakapo Books: London.

Cronin, K. and Marchant, J. (2002). *Towards a dialogue in science communication*. Research report for the Royal Society of New Zealand, June 2002.

De Cheveigné, S. (2002). Biotechnology policy: can France move from centralized decision making to citizen's governance? *Science Communication* 24(2): 162-172.

Frewer, L. J., Howard, C. and Aaron, J. (1998). Consumer acceptance of transgenic crops. *Pesticide Science* 52: 388-393.

Frewer, L. J., Howard, C. and Shepherd, R. (1997). Public concerns in the United Kingdom about general and specific applications of genetic engineering: risk, benefit and ethics. *Science, Technology and Human Values* 22(1): 98-124.

Frewer, L.J., Shepherd, R. and Sparks, P. (1994) Biotechnology and food production: knowledge and perceived risk. *British Food Journal* 96(9): 26-32.

Gallopin, G.C., Funtowicz, S., O'Connor, M. and Ravetz, J. (2001). Science for the twenty-first century: from social contract to the scientific core. *International Social Science Journal* June 2001: 219- 229.

Gamble, J. and Gunson, A. (2002). *The New Zealand public's attitudes regarding genetically modified food: May and October 2001 - full report*. Report to stakeholders.

Gamble, J., Muggleston, S., Hedderley, D., Parminter, T. and Richardson-Harman, N. (2000). *Genetic engineering: the public's point of view*. Report to stakeholders, February 2000.

Gaskell, G. (2000). *Agricultural biotechnology and public attitudes in the European Union. AgBioForum*, University of Missouri, Spring/Summer 2000, available on http://www.mindfully.org/GE/EU-Attitudes.htm.

Gerrard, S. (2000). Environmental risk management. In T. O'Riordin (ed.) *Environmental science for environmental management* (pp. 435-468), Prentice Hall: Englewood Cliffs, NJ.

Giddens, A. (1990). *The consequences of modernity*. Polity Press: Cambridge, UK.

Giddens, A. (1991). *Modernity and self-identity: self and society in the late modern age*. Polity Press: Cambridge, UK.

Goffman, E. (1959). *The presentation of self in everyday life*. Harmondsworth, England: Penguin.

Goffman, E. (1961b). *Role distance*. New York: Bobbs Merrill.

Green, W. (2001). *Key lessons from the history of science and technology: knowns and unknowns, breakthroughs and cautions*. Office of the Parliamentary Commissioner for the Environment, Wellington, NZ. March 2001. Downloaded on 18-7-03 from www.pce.govt.nz.

Grove-White, R., Macnaghten, P., Wynne, B. (2000). *Wishing up: the public and new technologies.* Research report for the Study of Environmental Change, Lancaster University.

Haraway, Donna J. (1991). *Simians, cyborgs, and women: the reinvention of nature.* Routledge: New York.

Hogan, J. (2003). Dolly firm in trouble after transgenic milk fails to flow. *Nature* 423(6943): 907.

Holling, C.S. (1998). Two cultures of ecology. *Conservation Ecology* 2(2): article 4. Available on line from www.consecol.org/vol2/iss2/art4.

Hunt, L.M. (2004). Land-use change, grass grubs, DDT, production and the farmer: the arrival of agricultural chemicals in New Zealand. *New Zealand Sociology*. In process.

James, C. (1992). *New territory: the transformation of New Zealand 1984-1992.* Bridget Williams Books: Wellington, N.Z.

Lujan, J.L. and Moreno, L. (1994). Public perception of biotechnology and genetic engineering in Spain – tendencies and ambivalence. *Technology in Society* 16(3) 335-355.

Macer, D. (1994). Perception of risks and benefits of in-vitro fertilization, genetic engineering and biotechnology. *Social Science and Medicine* 38(1): 23-33.

Mackay, S.. Nicolson, R. and Brinsdon, S. (2000). *Public views on the biotechnology question.* Report for the Independent Biotechnology Advisory Council, August 2000.

Macnaghten, Philip (2001) *Animal Futures: Public Attitudes and Sensibilities Towards Animals and Biotechnology in Contemporary Britain*. Report by the Institute for Environment, Philosophy and Public Policy for the Agricultural and Environmental Biotechnology Commission, October 2001, 49pp.

Marris, C., Wynne, B., Simmons, P. and Weldon, S. (2001). *Public perceptions of agricultural biotechnologies in Europe.* Final report of the PABE research project funded by the Commission of European Communities, December 2001.

Ministry of Research Science and Technology (MoRST) (2003). *New Zealand Biotechnology Strategy: A Foundation for Development with Care.* MoRST: Wellington, N.Z.

Napolitano, C.L. and Ogunseitan, O.A. (1999). Gender difference in the perception of genetic engineering applied to human reproduction. *Social Indicators Research* 46(3): 191-204.

Norton, J. (1998). Throwing up concerns about novel foods, in Hindmarsh, R., Lawrence, G., and Norton, J. *Altered genes: reconstructing nature: the debate.* Allen and Unwin: St Leonards, NSW.

Norton, J., Lawrence, G., and Wood, G. (1998). The Australian public's perception of genetically-engineered foods. *Australasian Biotechnology* 8(3): 172-182.

Priest, H.S. (2001). *A grain of truth: the media, the public, and biotechnology.* Rowman and Littlefield: Lanham MD.

Raynor, S. (1992). Cultural theory and risk analysis, in Krimsky, S. and Golding D. (Eds) *Social Theories of Risk*. Praeger: Westport, Connecticut.

Royal Commission on Genetic Modification (2001). Report of the Royal Commission on Genetic Modification: Report and Recommendations 2001. Wellington, N.Z.: Royal Commission on Genetic Modification.

RSNZ News is downloaded from http://w.w.w.rsnz.org/news, a daily source of science related news for members of the Royal Society of New Zealand.

Sandman, P. (1993). *Responding to community outrage – strategies for effective risk communication.* American Industrial Hygiene Association: Fairfax VA, USA.

Shaw, A. (2002). It just goes against the grain. *Public Understanding of Science* 11(3): 273-291.

Slovic, P. (1993) Perceived risk, trust and democracy. Risk Analysis: 13: 675 – 683. Plenum Press: New York.

Slovic, P. (2000). *The perception of risk.* Earthscan: London.

Soros, G. (1997). Towards a global open society: international portfolio investors. *Vital Speeches of the Day* 64(1): 13-15. Downloaded on 19/8/03 from http: proquest.umi.com.

Soros, G. (2000). The age of open society. *Foreign Policy* 119: 52-54.

Straughan, R. (1992). *Ethics, morality and crop biotechnology*. Bracknell, UK: Occasional Publication, ICI Seeds.

Taylor, B., Green, W. and Cooper, R. (2003). *Illuminated or blinded by science? A discussion paper on the role of science in environmental policy and decision-making.* Office of the Parliamentary Commissioner for the Environment, Wellington, NZ. July 2003. Downloaded on 16-7-03 from www.pce.govt.nz.

University of Auckland (2003). Downloaded from www.health.auckland.ac.nz/anatomy/staff on 25-03-03.

US Food and Drug Administration (USDA) (2000). *Report on consumer focus groups on biotechnology.* Centre for Food Safety and Applied Nutrition, Office of Scientific Analysis and Support, October 20 2000.

Upton, S. (1994). The need for a conservative rudder, in *New Zealand Books* 4(4).

Von Schiller, F. (1792). On the sublime, in *Naïve and sentimental poetry and on the sublime,* trans Elias J.A. (1966). Frederick Ungar: New York.

Wynne, B. (1992). Risk and social learning – reification to engagement, in Krimsky, S. and Golding D. (Eds) *Social Theories of Risk*. Praeger: Westport, Connecticut.

Zwick, M.M. (2000). Genetic engineering: risks and hazards as perceived by the German public. *New Genetics and Society* 19(3): 269-281.

Appendix 1: Tables of Acceptability Rankings Collected for Each Exemplar

Exemplar 1: Reduction of Methane Production in Sheep

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	1	5	1	2	1	0	10
Auckland 2	3	1	2	1	3	1	11
Auckland 3	1	3	1	3	2	0	10
Christchurch 1	7	2	3	0	0	0	12
Christchurch 2	2	1	3	3	1	0	10
Dunedin 1	1	4	6	1	0	0	12
Dunedin 2	1	1	2	4	1	0	9
Nelson	7	0	2	0	1	0	10
Waimate	2	0	2	4	3	0	11
Waipukurau	0	1	2	2	5	0	10
Wellington	5	1	2	3	1	0	12
Total	30 (26%)	19 (16%)	26 (22%)	23 (20%)	18 (15%)	1 (1%)	117

Exemplar 2: Throat Lozenge

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	4	2	3	1	0	0	10
Auckland 2	4	1	3	0	3	0	11
Auckland 3	5	3	2	0	0	0	10
Christchurch 1	3	3	5	1	0	0	12
Christchurch 2	6	2	1	0	1	0	10
Dunedin 1	5	4	1	1	1	0	12
Dunedin 2	6	3	0	0	0	0	9
Nelson	4	3	1	0	2	0	10
Waimate	3	4	1	2	1	0	11
Waipukurau	5	2	2	1	0	0	10
Wellington	5	3	2	1	1	0	12
Total	50 (43%)	30 (26%)	21 (18%)	7 (6%)	9 (8%)	0 (0%)	117

Exemplar 3: Synthetic Toad Gene in Potato

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	0	1	2	2	5	0	10
Auckland 2	1	1	7	1	1	0	11
Auckland 3	1	5	2	1	1	0	10
Christchurch 1	0	1	1	5	5	0	12
Christchurch 2	2	4	2	0	2	0	10
Dunedin 1	0	0	1	7	4	0	12
Dunedin 2	0	2	1	2	4	0	9
Nelson	0	1	4	4	1	0	10
Waimate	2	2	1	1	5	0	11
Waipukurau	0	2	2	2	3	1	10
Wellington	1	0	3	1	7	0	12
Total	7 (6%)	19 (16%)	26 (22%)	26 (22%)	38 (32%)	1 (1%)	117

Exemplar 4: Stem Cells for Alzheimer's Disease

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	2	1	3	2	2	0	10
Auckland 2	1	4	2	1	3	0	11
Auckland 3	2	2	1	1	4	0	10
Christchurch 1	2	5	2	1	2	0	12
Christchurch 2	3	0	1	2	4	0	10
Dunedin 1	6	4	1	0	1	0	12
Dunedin 2	2	2	2	1	2	0	9
Nelson	3	1	2	1	3	0	10
Waimate	5	2	3	1	0	0	11
Waipukurau	2	4	2	1	1	0	10
Wellington	4	0	0	2	6	0	12
Total	32 (27%)	25 (21%)	19 (16%)	13 (11%)	28 (24%)	0 (0%)	117

Exemplar 5: GM Bacteria to Clean Up DDE

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Focus Group	most acceptable …. least acceptable						
Auckland 1	1	2	2	4	1	0	10
Auckland 2	1	2	4	1	2	1	11
Auckland 3	3	3	0	1	3	0	10
Christchurch 1	0	1	1	5	5	0	12
Christchurch 2	4	2	1	2	1	0	10
Dunedin 1	0	0	2	4	6	0	12
Dunedin 2	0	2	2	1	4	0	9
Nelson	1	1	3	4	1	0	10
Waimate	6	0	1	2	2	0	11
Waipukurau	3	4	3	0	0	0	10
Wellington	5	4	0	1	2	0	12
Total	24 (21%)	21 (18%)	19 (16%)	25 (21%)	27 (23%)	1 (1%)	117

Comparisons Between Exemplars

Rank	**1**	**2**	**3**	**4**	**5**	**Missing**	**Total**
Scenario	most acceptable…. least acceptable						
Reduction of methane production in sheep	30 (26%)	19 (16%)	26 (22%)	23 (20%)	18 (15%)	1 (1%)	117
Throat lozenge	50 (43%)	30 (26%)	21 (18%)	7 (6%)	9 (8%)	0 (0%)	117
Toad gene in potato	7 (6%)	19 (16%)	26 (22%)	26 (22%)	38 (32%)	1 (1%)	117
Stem cells for Alzheimer's Disease	32 (27%)	25 (21%)	19 (16%)	13 (11%)	28 (24%)	0 (0%)	117
GM bacteria to clean up DDE	24 (21%)	21 (18%)	19 (16%)	25 (21%)	27 (23%)	1 (1%)	117