Uptake and Persistence of 1080 in Watercress and Puha
Scope

• Give a brief on 1080 in NZ
• Outline research with two communities to assess risk of 1080 uptake in plants
• Results of this research
• Discussion and risk assessment
• Further information -1080 database
Aerial application of 1080

- Mainly for possum and rabbit control
- Helicopter or fixed-wing aircraft
- 1080 in cereal or carrot
- Public acceptability?
Public acceptability

• For our research, Maori community team
• Maori often voice strong concern about aerially-applied 1080
• Key concerns are
  – Toxin movement through ecosystems
  – Risks to non-target species
• Question raised: if 1080 bait landed by food plants, could 1080 end up in that food?
Project aim

• To determine the uptake and persistence of 1080 in watercress and puha
Our approach

• Collaborative
  – Kaikoura Runanga
  – Lake Waikaremoana Hapu Restoration Trust
  – Tuhoe Tuawhenua Trust

• Selected study sites
• Medical Officer of Health permission
• Set up experiments, sampling
• Sample analysis
• Risk analysis
Watercress
Study site
Field experiment

- Cage in sediment for 10 watercress plants
- Bait placed in cage to hold in position
- Watercress sampled at 0, 1, 3, 7, 10, 17 days
- Frozen on dry ice, 1080 analysis
Gas Chromatography
Results

Values show maximum in plants with 1080 bait at each time point.
Risk to Humans - Watercress

- LD$_{50}$ for humans estimated at 2 mg/kg
- A 70 kg person = 140 mg 1080 for an LD$_{50}$

\[
\frac{140 \text{ mg}}{0.000063 \text{ mg/g}} = 2,200,000 \text{ g}
\]

- Maximum 1080 concentration 63 ppb, 70 kg person eat 2.2 tonnes for an LD$_{50}$
- Therefore negligible risk of poisoning from eating watercress after an aerial 1080 operation
## Previous Plant Studies

<table>
<thead>
<tr>
<th>Plant</th>
<th>Concentration (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Myriophyllum triphyllum</em></td>
<td>25</td>
</tr>
<tr>
<td><em>Elodea canadensis</em></td>
<td>8</td>
</tr>
<tr>
<td>Broadleaf</td>
<td>6</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>8</td>
</tr>
<tr>
<td>Pikopiko</td>
<td>0</td>
</tr>
<tr>
<td>Karamuramu</td>
<td>5</td>
</tr>
</tbody>
</table>
Puha
• Caged 10 puha plants
• Bait in smaller cage at base of each plant
• Sampled at 0, 3, 7, 14, 28, 38 days
• Frozen on dry ice, 1080 analysis
Results

Values show maximum in plants with 1080 bait at each time point.
Risk to Humans - Puha

- LD$_{50}$ for humans estimated at 2 mg/kg
- A 70 kg person = 140 mg 1080 for an LD$_{50}$

\[
\frac{140 \text{ mg}}{0.000015 \text{ mg/g}} = 9,333,333 \text{ g}
\]

- Maximum 1080 concentration 15 ppb, 70 kg person eat 9.3 tonnes for an LD$_{50}$
- Therefore negligible risk of poisoning from eating puha after an aerial 1080 operation
But........MDL

- MDL of 3 ppb imposed by lab
- When removed, 59 of 60 samples had 1080
- Includes plants before bait, non-toxic controls
- Appears that puha contains trace 1080

<table>
<thead>
<tr>
<th>Day</th>
<th>Range (ppb)</th>
<th>Mean (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 – 1.6</td>
<td>0.38</td>
</tr>
<tr>
<td>3</td>
<td>0.5 – 15.4</td>
<td>4.17</td>
</tr>
<tr>
<td>7</td>
<td>0.4 – 2</td>
<td>0.99</td>
</tr>
<tr>
<td>14</td>
<td>0.3 – 9.2</td>
<td>2.37</td>
</tr>
<tr>
<td>28</td>
<td>2.5 – 5.1</td>
<td>3.75</td>
</tr>
<tr>
<td>38</td>
<td>0.2 – 0.6</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Does naturally occur

- Common tea brands 0.2 – 1.2 ppb
- Guar gum (dairy products) 7 – 14 ppb
- Puha on day zero 0 – 1.6 ppb
- First time seen in wild NZ plant
Conclusions - Watercress

- Watercress takes up 1080, but also eliminates it.
- 1080 seen at low concentrations – 63 ppb.
- No 1080 detected above the MDL after day 10.
- Zeros were zeros.
- Negligible risk of secondary poisoning to humans.
Puha can take up 1080, but also eliminates it.
1080 seen at low concentrations in puha -15 ppb.
Negligible risk of secondary poisoning to humans.
No 1080 detected above the MDL after day 38.
MDL removed, 59 of 60 samples showed 1080 at concentrations comparable to tea leaves.
Appears that 1080 occurs naturally in puha.
– First time seen for NZ plant.
Final Remarks

• New work progressing:
  – Wider 1080 survey of NZ plants
  – Other NZ plant toxins as alternatives to 1080

• Note website on 1080 impacts on Taonga Species
Website Approach

• Find all existing ‘peer-reviewed’ material on this subject
• Review it
• Summarise this information in an accessible format
• Make all literature available (where legal)

www.lincoln.ac.nz/1080
Impacts of 1080 on Taonga Species

You are here: Impacts of 1080 on Taonga Species > Foodweb > Birds that eat insects

Birds that eat insects

- Brown Kiwi
- Little Spotted Kiwi
- Great Spotted Kiwi
- Kokako
- Whio (Blue Duck)
- Pateke (Brown Teal)
- Titipounamu (Rifleman)
- Hiromiro (Tomtit)
- Weka
- Matata (Fernbird)
- Tui
- Pukeko
- Kaka
- Toutouwai (Robin)
Brown Kiwi

- Known to have eaten cereal baits (Pierce & Montgomery 1992), but did not eat carrot baits even when starved for 24 hours in captivity (McLennan et al. 1992)
- Of 40 brown kiwi radio-tagged during 1080 cereal and jam operations, all survived (Spurr & Powlesland 1997)
- Large-scale stoat trapping in association with aerial 1080 needed to protect kiwi (Brown & Urlich 2005)

Pierce RJ., Montgomery PJ. 1992. The fate of birds and selected invertebrates during a 1080 operation. 121. Wellington, Department of Conservation


Spurr & Powlesland 1997 (PDF 149 KB)

Brown & Urlich 2005 (PDF 464 KB)
Acknowledgements

- Animal Health Board
- Landcare Research
- Lake Waikaremoana Hapu Restoration Trust
- Tuhoe Tuawhenua Trust
- Kaikoura Runanga