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Abstract of a thesis submitted in partial fulfillment of the requirements for
the Degree of Master of Applied Science

A Nutritional and Toxicological Study of New Zealand *Cookia sulcata*

By Jinlin Shi

Cookia sulcata, a marine snail that belongs to the class of gastropoda, family of *Turbinidae* and Subfamily of *Astraeiane*, is frequently found on the open coast at low tide or hidden in rocks in many parts of New Zealand (North, South, Stewart and Chatham islands) (Minson, 1972; Powell, 1979). Despite turban snails being popular and expensive delicacies in many countries and there are several reports documenting the use of sea snails for food by Maori in NZ, very little is known about the nutritional and toxicological status of marine snails. In this research, 94 snails (weight range; 23.2 to 162.6 g) were collected from Te Oka Bay, Christchurch, New Zealand to investigate the nutritional and toxicological status of *C. sulcata*. The snail size is a very important parameter when they are gathered for food and it also indicates the age of the animal. This may have great a great effect on nutrients or contaminant accumulation in the animal. A strong positive correlation was found between the whole animal weight and size measurement of *C. sulcata*. Hence, the whole animal weight was used to separate the snails into 2 groups, small (≤ 60 g whole animal weight) and large (> 60 g whole animal weight) to investigate effects of variation in size on the nutritional (proximate, amino acid, fatty acid, vitamin E, cholesterol) and toxicological (macro-, trace- and toxic- elements, organochlorines) parameters. The mean moisture content was 77.7 to 78.0 (% fresh weight) in small and large snails, respectively. Only fat and ash contents (% fresh weight) were higher in the group of small snails compared with the large snails. The proximate compositions of *C. sulcata* varied slightly from those reported for marine molluscs. The moisture content, lipid, ash and carbohydrate of *C. sulcata* were within the general range, but the protein concentration was higher than that reported in marine molluscs. The major amino acids in *C. sulcata* muscle were glutamic acid (13.9 g/100g protein), arginine (10.2

g/100g protein), glycine (9.7 g/100g protein) and taurine (9.5 g/100g protein). The amino acid profile of *C. sulcata* was quite different compared to land snails. There was no difference in the amino acid profile related to the snail size. *C. sulcata* had relatively high amounts of SUFA (44.4 %), and lesser amounts of MUFA (12.9 %) and PUFA (1.3 %). The major fatty acids detected in *C. sulcata* were C16:0 (25.0 %), C20:4 (11.4 %), C18:0 (8.9 %), and C22:5 (5.5 %), and these accounted for more than 60% of the total fatty acids. The fatty acid profile of *C. sulcata* differed to that reported for land snails and may be related to several factors such as diet and environmental different. Snail size had a significant effect on C16:0 (27.3 and 22.6 % fatty acid in small and large snails respectively) and C18:3 n6 (0.1 and 0.2 % fatty acid in small and large snails respectively) levels. The vitamin E present in *C. sulcata* was identified as one form, α -tocopherol at concentrations of 2.16 and 3.71 mg/100g fresh weight for small and large snails, respectively. The average cholesterol level in *C. sulcata* was 1.33 mg/100g fresh weight, which was much lower than in other more common molluscs such as oysters and scallops. Out of 21 minerals investigated in *C. sulcata* muscles, only P and As concentrations in *C. sulcata* muscles were affected by size. Compared with the Recommended Dietary Intake (RDI), *C. sulcata* is a good source of Fe and Zn. The potential toxicological aspects of *C. sulcata* were investigated in the present study. The results indicated that none of the toxic elements in *C. sulcata* were over the maximum allowable level in the Australia New Zealand Food Standard and the organochlorine pesticides concentrations of *C. sulcata* were below the detection limit.

Overall, *C. sulcata* was similar or superior to the traditional major meat sources (e.g. beef, lamb and pork) and other marine shellfish and hence *C. sulcata* could be utilized as an alternative meat source in human diet. At a normal serving size, *C. sulcata* is a relatively safe seafood. The large amounts of taurine, Fe and Zn in the muscle of *C. sulcata* indicate the potential to utilize this meat for special dietary applications.

Key Words: *Cookia sulcata*, nutrition, toxicology, proximate composition, fatty acids, amino acids, cholesterol, vitamin E, minerals, organochlorine pesticides, size variation

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