Aflatoxin levels in foodstuffs in Fiji and Tonga islands

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Abstract. Fungal growth is a major problem of food storage in humid environments, as occur in South Pacific countries for parts of the year. Major crops, including edible nuts, copra and root crops, are susceptible to Aspergillus growth and therefore potential contamination with aflatoxin. Liver cancer occurs in Fiji and Tonga, with the occurrence in Fijians being significantly higher than in the Indian population.

Thirty-three peanut samples from farmers were analysed for aflatoxin and 50% of the samples from Fiji were positive but only 9% from Tonga, reflecting different storage practices. Local copra, cassava, and maize samples were found contaminated, with only the maize at a serious level. Twenty-five plate food samples from Fiji showed low contamination. When starch foods from the Fijian diet left after cooking were analysed to follow potential aflatoxin development only sweet potatoes showed some contamination.

Introduction

Fungal growth is a major problem of food storage in humid environments. In the South Pacific, most countries have warm, moist, climatic conditions for at least part of the year. One of the major storage fungi is Aspergillus, and two species flavus and parasiticus are known to produce a toxic metabolite called Aflatoxin, which is implicated as a major environmental cause of liver cancer (hepatocellular carcinoma). Experimentally, aflatoxins have been found to have an extraordinarily potent chronic effect as carcinogens in animals, with a diet containing as little as 0.4 μg of aflatoxin per kg feed causing liver carcinoma in rats within 81 weeks [1]. Many cases of the acute disease aflatoxicosis in animals have been reported after consumption of contaminated animal feed [2] and an outbreak of human hepatitis occurred in India, with some deaths, after consumption of maize heavily contaminated with Aspergillus flavus [3].

Aflatoxins were discovered as toxic agents in 1960, during investigations
of the cause of death of about 100,000 young turkeys following consumption of contaminated peanut meal. The structures of the four aflatoxins produced by the mould were identified in 1965 [4]. They were found to have blue fluorescence \((B_1, B_2)\) and green fluorescence \((G_1, G_2)\) under long wave ultra-violet light [5]. The aflatoxin \(B_1\) is the most abundant and most toxic (Fig. 1). Several studies have been made since, showing a strong statistical correlation between the number of human liver cancer cases and consumption level of aflatoxin in Africa, e.g. Kenya [6] and Mozambique [7]. It has been implicated in the aetiology of Encephalopathy and fatty degeneration of the viscera (EFDV), as in Thailand [8]. However, little work has been carried out on aflatoxin contamination in foods in the South Pacific Region.

Results of aflatoxin analyses have shown that it can be found in edible nuts, copra, beans, dried leaves, maize and root crops, all of which are used as food in the South Pacific Islands. Liver cancer is a common form of cancer in this region and is on the increase. Medical records [9] in Fiji showed that in 5 years (1978–1982) there were 73 hospital admissions with 23 deaths due to liver cancer, with the occurrence in the Fijians being significantly higher \((8:1)\) than Indians, almost 5 per 100,000 population [10].

\textit{Aspergillus flavus} has been identified in Fiji by the Ministry of Primary Industries, growing on onion (associated with neck rot), coconut, maize and peanuts. In this study we concentrated on peanuts, grown as an important cash crop in Fiji and Tonga, the staple starch foods maize, kumala (sweet potato), breadfruit, cassava and taro, and also copra and animal feeds, contamination of which might lead to contamination of animal products for human consumption such as milk.

**Material and methods**

In Fiji, 1 kg samples of peanuts were collected by Extension Officers of the Ministry of Primary Industries, directly from the farmers in Viti Levu and Vanua Levu. Poultry Officers collected chicken feed, also from farmers. In Tonga, Officers of the Ministry of Agriculture assisted with the collection of peanuts, and copra samples were obtained from the Copra Mill, some of which had come from outlying islands.

Plate food samples were obtained from two villages near Suva, Fiji, and the starch staple was analysed separately from the rest of the meal. Samples