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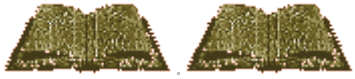

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SAFETY EVALUATION OF MYCOTOXINS IN FOOD

SAFETY EVALUATION OF CERTAIN MYCOTOXINS IN FOOD, (WHO Food Additives Series 47), World Health Organization, Avenue Appia 20, 1211 Geneva 27, Switzerland, Publication Date 2001, vi + 701 pages, ISBN (FAO) 92 5 104664 6, ISBN (WHO) 92 4 166047 3: Price: Not mentioned

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The book under review is a compendium of monographs prepared at the 56th meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA), held from 6 to 15 February 2001, at Geneva, Switzerland. It has been published by the World Health Organization as WHO Food Additives Series (No.47), and constitutes a contribution to the International Programme on Chemical Safety (IPCS) which was established in 1980. The IPCS is a joint venture of the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), and the WHO. The overall objective is to establish the scientific basis for assessing the risk to human health and the environment from exposure to noxious chemicals and food contaminants, and to provide technical assistance in the safe management of such substances. The 56th report of the Joint FAO/WHO Expert Committee on Food Additives was published subsequent to this volume in the WHO Technical Reports Series in 2002.

The monographs contained in this volume are based on material that was prepared by working groups before the meeting in February 2001, and special acknowledgements have been made at the beginning of each section to the members of these working groups. The overall editing has been done by E. Heseltine. This volume summarizes the data that were reviewed on the following contaminants which are all mycotoxins: aflatoxin M_1, fumonisins B_1, B_2, and B_3, ochratoxin A, deoxynivalenol, and T-2 and HT-2 toxins. In fact a very exhaustive review of data has been done on all these contaminants, including information on metabolism and toxicity, epidemiology, analytical methods for their estimation in food products, sampling protocols, effects of processing, levels and patterns of food contamination, and prevention and control.

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Aflatoxins are well known contaminants of plant products, as well as milk or milk products obtained from livestock that have ingested contaminated feed. Extensive studies have already been done on several types of aflatoxins, especially aflatoxin B_1 which is a potent carcinogen. This carcinogenic potency is substantially higher in carriers of hepatitis B virus, and hence reduction of intake of aflatoxins in populations with a high prevalence of HbSAg+ individuals would result in a greater reduction in liver cancer rates than reduction of aflatoxin intake in populations with low

HBsAg positivity. The present work discussed in this monograph is in relation to aflatoxin M_1, the toxicity of which had not been adequately tested so far. Aflatoxins M_1 and M_2 are the hydroxylated metabolites of aflatoxins B_1 and B_2. Apart from direct intake of aflatoxin M_1 from dietary sources, it is known that up to 6% or more of aflatoxin B_1 in animal feed is transformed to aflatoxin M_1 in milk.

...All in all, this compendium of monographs deals effectively and exhaustively with the toxicity of several mycotoxins in contaminated foods and food products, and makes important recommendations. It is a vital addition to the field of mycotoxicology, and as is the case with most WHO publications, the book bears the stamp of authority, being the product of deliberations of distinguished teams of experts...

The main sources of aflatoxins in feeds are peanut (groundnut) meal, maize, and cottonseed meal. Many methods of analysis have been evolved for the determination of aflatoxin M_1 in milk and milk products. In fact, with modern methods of analysis, aflatoxin M_1 can be determined at concentrations well below 0.05 mg/kg of milk. This value is currently the legal limit in several countries that have stringent regulations for aflatoxin M_1. The authors suggest that the most effective means for controlling aflatoxin in the food supply is to reduce the amount of aflatoxin B_1 in the feed of dairy cows. This is important because (apart from the well recognised carcinogenic potential of aflatoxin B_1), aflatoxin M_1 has been found to be carcinogenic in animals. Concentration of aflatoxin B_1 in feed can be reduced by good manufacturing and storage practices. If preventive measures fail, the concentration of the toxin in feed can be reduced by blending, or physical or chemical treatment. The former includes the use of heat, irradiation, etc., while the most effective chemical treatment involves the use of ammonia.

Fumonisins are mycotoxins produced by fungi of the genus *Fusarium*. The main species that produce significant quantities of fumonisins are *F.verticillioides* and the related *F.proliferatum*. Fumonisin contamination is most commonly encountered in maize leading to kernel rot. Intake of fumonisins B_1, B_2, and B_3 can lead to hepatorenal toxicity. In all animal species studied, fumonisins are poorly absorbed from the digestive tract and are rapidly distributed and eliminated. The liver is the main target organ, especially for fumonisin B_1. The kidneys are also affected in many animal species studied. The authors have thoroughly discussed the biochemical modes of action of toxicity resulting from intake of contaminated maize. The importance of toxicological studies on fumonisins assumes great importance for India in light of the outbreak of human disease (involving gastrointestinal symptoms) resulting from consumption of mouldy sorghum. Further, the authors indicate a possible association of fumonisins with oesophageal and liver cancer. The available evidence for an association between the intake of fumonisins and human cancer is limited to a few correlation studies. The Committee stressed the need for further research on the toxicity of fumonisins.

Ochratoxin A (a mycotoxin produced by certain *Penicillium* and *Aspergillus* species) is a contaminant of cereals and cereal products in Canada and Europe, and there are indications of its nephrotoxic potential in animals. It is also a renal carcinogen, though the exact mechanism of carcinogenecity is not known. As of now, although an association between the intake of ochratoxin A and nephropathy in humans has been postulated, there is no clear evidence of the same. The

authors recommend further studies and surveys to determine the actual risk to humans, and the steps needed to control contamination. The authors have also indicated the need for further studies on the toxicity of trichothecenes, especially deoxynivalenol which has been implicated in incidents of human disease, and T-2 and HT-2 toxins which have been indirectly linked to outbreaks of gastrointestinal distress.

All in all, this compendium of monographs deals effectively and exhaustively with the toxicity of several mycotoxins in contaminated foods and food products, and makes important recommendations. It is a vital addition to the field of mycotoxicology, and as is the case with most WHO publications, the book bears the stamp of authority, being the product of deliberations of distinguished teams of experts. Despite the considerable volume of information contained in the book, it is amazingly compact in size. It should be a mandatory addition to all libraries stocking books on toxicology.



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Dr.V.V.Pillay has been in the vanguard of the movement among medical professionals in India to develop the neglected field of Toxicology. He has published extensively in both the scientific and lay press on matters relating to Toxicology, as well as his chosen discipline - Forensic Medicine. Dr.Pillay has authored 6 books on Forensic Medicine and Toxicology, and has received an award for one of them (Modern Medical Toxicology), generally considered to be a trend setter among books on the subject in India. He has reviewed several books on Toxicology for the Internet Journal of Forensic Medicine and Toxicology. Dr.Pillay received a scroll of honour in appreciation of work done in the field of Toxicology from the Medicolegal Society, All India Institute of Medical Sciences, New Delhi. He has established a state-of-the-art Poison Control Centre, recognized by the World Health Organization at the institute where he is currently employed (AIMS, Cochin). Among his most sought-after publications is a 700 page reference work on Toxicology.

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