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Toxins (Natural)

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I. INTRODUCTION

Natural toxins are the toxins produced mainly by some microorganisms, microscopic plants and animals, and some higher plants and animals. These toxins vary widely in their structures, toxicity, distribution, and diversity. In the course of their evolution, humans must have learned by trial and error to avoid plants and animals that cause acute toxicity. However, through various dietary sources some of these toxins can enter the human body and cause long-term defects. Toxins such as hemagglutinin produced by castor beans and kidney beans cause short-term effects, whereas safrole produced by black pepper and pyrrolizidine alkaloids produced by plants in the family Compositae are carcinogenic. Various carcinogenic toxins such as mycotoxins are produced by many species of fungi.

Poisonous animals whose tissues are toxic when eaten by humans are restricted almost entirely to the marine world. More than 1000 species of marine organisms are either toxic or poisonous. Shellfish poisoning [paralytic shellfish poisoning (PSP), neurotoxic shellfish poisoning (NSP), diarrhetic shellfish poisoning (DSP), and amnesic shellfish poisoning (ASP)] caused by the consumption of shellfish contaminated with these toxins as well as fish poisoning (ichthyotoxism) caused by the consumption of toxic fish species are common toxicities. Thin-layer chromatography (TLC) has been used for the analysis of various natural compounds, and this chapter briefly discusses the application of TLC in the separation and detection of some natural toxins in food.

II. NATURAL TOXINS IN FOOD AND FEED

A. Mycotoxins

Grains, cereals, and cereal products are exposed to the growth and development of a great number of molds that synthesize biologically active toxins known as mycotoxins. There are two major types of mycotoxins that have direct or indirect harmful effects on human health. They are aflatoxins (G₁, B₁, and M₁) and ochratoxins (A, B, and C) (1).

High-performance liquid chromatography (HPLC), thin-layer chromatography (TLC), and enzyme-linked immunosorbent assay (ELISA) are the main analytical methods for mycotoxins. TLC has been widely used since the early 1960s for the qualitative and quantitative analysis of mycotoxins.

1. Aflatoxins

Aflatoxins B₁, B₂, G₂, and G₁ are the four naturally occurring aflatoxins that have acute toxicity and carcinogenic effects. These toxic metabolites are produced mainly by *Aspergillus flavus* and the closely related *Aspergillus parasiticus*. Within animal systems these toxins can produce sec-