AN OVERVIEW OF AFLATOXICOSIS OF POULTRY: ITS CHARACTERISTICS, PREVENTION AND REDUCTION

R.R. Dalvi

Toxicology Program, School of Veterinary Medicine, Tuskegee University, Tuskegee, Alabama 36088 (U.S.A.)

(Accepted 9 January 1986)

ABSTRACT


Aflatoxicosis represents one of the serious diseases of poultry, livestock and other animals. The cause of this disease in poultry and other food-producing animals has been attributed to the ingestion of various feeds contaminated with A. flavus. This toxigenic fungus is known to produce a group of extremely toxic metabolites, of which aflatoxin B₁ (AFB₁) is most potent. Avian species especially chicks, goslings, ducklings and turkey poults are most susceptible to AFB₁ toxicity. The toxic effects of AFB₁ are mainly localized in liver as manifested by hepatic necrosis, bile duct proliferation, icterus and hemorrhage. Chronic toxicity in those birds is characterized by loss of weight, decline in feed efficiency, drop in egg production and increased susceptibility to infections. The incidence of hepatocellular tumors, particularly in ducklings, is considered to be one of the serious consequences of aflatoxicosis. Even though prevention and avoidance are the best way to control aflatoxicosis, natural contamination of crops with A. flavus is sometimes unavoidable. Such aflatoxin-contaminated feeds can be decontaminated using various methods which mainly focus on physical removal or chemical inactivation of the toxins in the feeds. Moreover, dietary additives such as activated charcoal, phenobarbital, cysteine, glutathione, betacarotene, fisetin and selenium have also been reported to be effective in the reduction of aflatoxicosis in poultry.

INTRODUCTION

The aflatoxins are a group of extremely toxic metabolites produced by the common molds Aspergillus flavus and parasiticus. These fungi are ubiquitous and as a result likelihood of their contaminating foodstuffs and animal feeds is quite high. The occurrence of aflatoxins in agricultural commodities depends on such factors as region, season and the conditions under which a particular crop is
grown, harvested or stored. Crops grown under warm and moist weather in tropical or subtropical countries are especially more prone to aflatoxin-contamination than those in temperate zones. Groundnuts and groundnut meal are by far the two agricultural commodities that seem to have the highest risk of aflatoxin contamination (Wyllie and Morehouse, 1977; Patterson, 1983). Corn, cottonseed, Brazil nuts, copra, various tree nuts, and pistachio nuts are the other commodities quite susceptible to the invasion of aflatoxin-producing fungi. Although these commodities are important as substrates, the moisture content of the substrate and temperature are the main factors regulating the fungal growth and toxin formation. A moisture content of 18% for starchy cereal grains and 9-10% for oil-rich nuts and seeds has been established for maximum production of the toxin (WHO, 1979). On the other hand, the minimum, optimum and maximum temperatures for aflatoxin production have been reported to be 12°, 27°, and 40-42°C, respectively (Christensen and Nelson, 1976).

Frequent contamination of corn and other commodities with high levels of aflatoxins has been a serious problem all over the world resulting in significant economic losses to farmers and a health hazard to farm animals and humans as well. Farm animals are susceptible to aflatoxin poisoning to a varying degree. For most species, oral LD50 values of aflatoxin B1 vary from 0.03 to 18 mg/kg body weight (Table 1). Among the food-producing animals, chick embryo, goslings, ducklings and turkey poults have been reported to be most susceptible as opposed to female rats being most resistant (Newberne, 1974; WHO, 1979; Cavalheiro, 1981; Malkinson et al., 1982). Furthermore, within poultry, certain breeds appear to be more sensitive than others. Exposure of chickens to as low as 0.2-1 ppm of aflatoxins in diet has been shown to result in poor growth rates, reduced feed efficiency, marked drop in egg production, liver damage, bile duct proliferation and most importantly decreased resistance to common infectious diseases including coccidiosis (Smith and Hamilton, 1970; Newberne, 1973; Pier and Heddleston, 1970). This has led to a public concern expressed not only about the effects that aflatoxin-contaminated feeds may have on the growth and health of poultry, but also about the possible transmission of toxic residues into meat and eggs resulting in a potential hazard to human health. The purpose of this paper is to discuss important characteristics of acute and chronic toxicity of aflatoxins, parti-