EDITORIAL

AFLATOXINS - A THREAT NOT SO OBVIOUS

Aflatoxins are biological poisons produced by fungi present on crops, in fresh or dried fruits and spices. *Aspergillus flavus* and *Aspergillus parasiticus*, are two main producers of aflatoxins. These fungi are abundant in warm and humid regions of the world. The discovery of these fungal toxins was a result of research carried out in United Kingdom to investigate sudden death of 100,000 turkeys in 1960. Since then these toxins have been recognized as ubiquitous contaminants of food stuff, particularly in many developing countries.[1]

Several metabolites (mycotoxins) of many other fungi have toxic properties. Because of abundance and toxicity 4 types of these toxins, namely Aflatoxin B1 and B2 (AFB1, AFB2), and Aflatoxin G1 and G2 (AFG1, AFG2) are more important. AFB1 is the most toxic and a potent carcinogen. Among the risk factors of cancer after age, alcohol and diet, comes the carcinogens (cancer causing substances). International agency for research on cancer has classified aflatoxins in group I i.e. a substance known to be definitely carcinogenic.[2]

Being in the temperate region, Pakistan has hot and humid climate which favors growth of fungi on crops as well as harvested food grains and other edibles. Food storage conditions are far from satisfactory. Considering all this, the importance of food contamination with aflatoxins and consequent effects on health cannot be overemphasized. Besides their effect on the liver, aflatoxins also affect child growth, reproductive health and immune system. Role of aflatoxins on national health is to be highlighted in the proceeding paragraphs.

Aspergillus species frequently affect cereals (corn, wheat, rice), oilseeds (cotton seed, soybean, sunflower and peanut), spices (black pepper, chili pepper, turmeric, ginger, coriander) and tree nuts (coconut, walnut, almond, and pistachio). Contamination occurs both pre and post harvest. Human exposure occurs by eating foods contaminated with these toxins. A metabolite of aflatoxin (AFM1) accumulates in the milk and meat of animals being fed on fodder and feed prepared with ingredients contaminated with the fungus. Consumption of such contaminated milk and meat is another source of human exposure to aflatoxins. A recent study reported that more than 70% of 974 samples of milk from Punjab were found to contain > 0.5µg/L aflatoxin M1 (AFM1).[3]

These fungi grow on plants and their toxins penetrate the crops, fruits and nuts. Aflatoxins are sparingly soluble in water. Washing contaminated edibles cannot be relied upon for removing these toxins. Melting point of different aflatoxins is well above 200°C. Therefore temperatures attained during cooking procedures (boiling, frying, and baking) do not completely inactivate affaltoxins.[4]

Prolonged exposure to even small amounts of aflatoxins is dangerous because being sparingly water soluble, these toxins are not excreted and accumulate in the liver. Microsomal enzymes of cytochrome P450 are involved in the metabolism of these toxins in humans. These enzymes convert aflatoxins to a reactive oxygen species (aflatoxin-8, 9-epoxide). This molecule binds to proteins and causes acute poisoning (aflatoxicosis). It also binds to DNA and induces liver cancer.

Studies from different countries have established a direct link between presence of aflatoxins in food and primary liver cancer. Chronic infection with hepatitis B and C viruses and aflatoxins are classified as class I carcinogens.[5] National surveys in recent years describe the prevalence of Hepatitis B and C as 2.8% and 4.3% respectively.[6] Number of liver cancer cases in Pakistan is constantly on the rise.[7] Most of this liver cancer is a result of Hepatitis B, C or D related cirrhosis. Nevertheless, Hepatitis B and C negative cases of liver cancer are not uncommon either.

Diagnosis of cancer, particularly liver cancer is made very late, at least in Pakistan. Therapeutic options are limited, expensive and not easily available to population in general. According to a report issued by Pakistan bureau of Statistics, total per capita expenditure on health in the year 2015-16 was $45 (Rs.4688 approx.). This includes expenditure by the federal and provincial governments; and the private sector. In 2018, Pakistan government spent <1 % of GDP on health.

There is high prevalence rate of hepatitis B, C and tuberculosis. Infections with HIV are increasing[8] and food safety mechanisms are almost non-existent.

Considering these facts and keeping in view inadequate health care facilities in the country and poor prognosis of liver cancer, one sees a gloomy picture of national health in coming decades.

Introduction of modern scientific methods in agriculture, provision of properly designed, purpose built storage sites for wheat, corn, rice and other edibles; and scientific management of these sites will reduce the contamination of these food staples with Aspergilus and other fungi.

For food industry, introduction of a law for mandatory statement of "Aflatoxin Free" or "Aflatoxin Tested" on all packaged products (chicken, dairy, meat, food grains, spices etc) will also be a good measure for reducing the risk. Increasing awareness of masses about dangers of consuming unsafe and unhygienic food is also very important. Besides other means, using electronic media for the purpose may have very good results.

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Professor Dr. Khursheed Hashmi
Department of Pathology
Liaquat National Hospital &
Medical College Karachi