

Aflatoxin and Chromosomal Studies

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Aspergillus flavus is known to be a common fungal contaminant on groundnuts, groundnut cake, and meal. Four metabolites have been designated as comprising the toxins produced by the fungus. Collectively, the B₁, B₂, G₁, and G₂ toxic factors have come to be called aflatoxin; the B₁ form being considered the most common naturally occurring form.

Since its discovery in a 1960 outbreak of "Turkey X" disease,¹ aflatoxin has been shown to have carcinogenic activity. Liver carcinomas have appeared in laboratory rats^{2,3} and trout⁴ fed diets containing aflatoxin. Comparative studies with other species - viz. pig⁵, cow⁶, duck⁷, chicken⁸, monkey⁹, and guinea pig¹⁰ - fed similar toxic diets, have revealed lesions of liver cell damage and/or bile duct hyperplasia.

Theron postulated that aflatoxin has a direct action on the liver cell membrane and membranes of intracytoplasmic structures.⁷ Juhasz and Greczi demonstrated with tissue cultures of calf kidney that extracts of the toxin affect both the cellular nuclei and cytoplasm.¹¹

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Lilly, using roots of seedlings of Vicia faba (Sutton's prolific "Longpod"), demonstrated the induction of chromosomal aberrations by aflatoxin.¹² She observed a highly significant increase in abnormal anaphases of roots given treatments with aflatoxin. Significantly, most of the abnormalities consisted of chromosomal fragmentation with occasional bridges. Lilly¹² claims that Withers (personal communication) induced chromosomal breakage in human red blood cells in culture, using aflatoxin.

The present author proposes the hypothesis that aflatoxin's action may cause chromosomal aberration(s) under conditions of in vivo animal experimentation. Using animals given appreciable quantities of aflatoxin, he suggests that such studies may furnish evidence of chromosomal changes (e.g. via bone marrow cultures), besides the already cited pathologic lesions. However, the quantitative level(s) of aflatoxin necessary to induce chromosomal alterations, in vivo, may be higher than the amount(s) needed to produce tissue effects. In any event, no study appears to have been published giving the results of investigations of the action of aflatoxin on animal chromosomes.

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