REDUCING AFLATOXICOSIS IN ANIMALS AND HUMANS THROUGH THE USE OF AFLATOXIN SEQUESTERING CLAY (NS)

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ABSTRACT OF PRESENTATION:

Mycotoxins are toxic chemical by-products of fungi that frequently occur as contaminants of food. In historical context, the mycotoxin problem from moldy foods is longstanding, unavoidable and seemingly inextricable. Hazardous mycotoxins that have been implicated in disease and death in man and animals include the aflatoxins, trichothecenes, fumonisins, zearalenone, ochratoxins, and ergots. Of these, aflatoxin B_1 is a direct acting mutagen and a potent carcinogen.

Outbreaks of aflatoxicoses in animals and humans have been well-documented in areas where warm, humid climates are conducive to the growth of *Aspergillus* fungi and the production of toxic metabolic products. Our research has focused on the development of innovative sorption strategies for the detoxification of the aflatoxins. In particular, we have employed isothermal analyses and molecular modeling techniques to characterize and design clay-based materials for the enterosorption (and inactivation) of aflatoxins.

The findings are of direct relevance to human health in rural communities and developing countries, where occurrence of these agents and human exposure are often elevated. One aim of the laboratory is to understand the surface chemistry and mechanisms involved in the interactions of processed clay minerals with the toxins. A calcium montmorillonite clay (i.e., NovaSil or NS) has been shown to prevent the adverse effects of aflatoxins in various animals when included in the diet.

Studies have also confirmed that NS does not protect animals against other mycotoxins, and it does not interfere with the utilization of important vitamins and micronutrients in the diet. Results have shown that NS clay binds aflatoxins with high affinity and capacity in the gastrointestinal tract, resulting in a notable reduction in exposure from these poisons.

This same technology, which should be culturally acceptable in developing countries, may one day be applicable and sustainable for use in diverse human foods. The NS clay remedy is novel, inexpensive and easily disseminated. Since clay minerals are structurally and chemically diverse, many are ineffective and/or nonselective for the aflatoxins.

Based on our research, all aflatoxin sequestering clays should be rigorously evaluated *in vitro* and *in vivo*, and should meet the following criteria: 1) favorable thermodynamic characteristics of ligand sorption, 2) tolerable levels of priority metals and dioxins/furans based on JECFA/WHO recommendations, 3) efficacy in multiple animal species, 4) safety in long-term studies, and 5) negligible interactions with vitamins and micronutrients.