Deadly Carcinogen Unraveled

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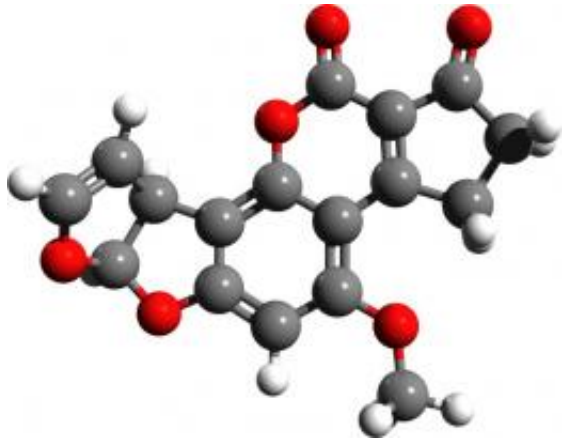

3-D chemical structure of an aflatoxin molecule. Image: Wikimedia Commons

(PhysOrg.com) -- Using the bright X-ray beam of the Stanford Synchrotron Radiation Lightsource, researchers have unveiled the mystery behind one of the deadliest toxins that causes liver cancer.

Aflatoxins are common contaminants of foods such as nuts and grains, which make up staple diets in many developing countries. These toxins are produced by mold and other fungi during food production, and are considered by the U.S. Food and Drug Administration to be an unavoidable food contaminant. Aflatoxin molecules are characterized by the presence of multiple aromatic rings. Chronic ingestion of one type of aflatoxin leads to liver tumors that are a major cause of death in Asia, Africa, and Central America.

This toxin wreaks havoc on an important gene that prevents cancer. Without the protective effect of this gene, aflatoxin further compromises immunity, interferes with body metabolism, and causes severe malnutrition. It is urgently important to find inexpensive strategies that help protect the world population from aflatoxin food contamination.

A group led by researcher Sheryl Tsai of the University of California at Irvine, in collaboration with the Townsend lab of The Johns Hopkins University, trained SSRL's X-ray beam on a crystallized enzyme in the polyketide synthase family, which is a component of the multi-step process of toxin synthesis. The researchers were able to determine the three-dimensional structures of a region responsible for producing a precursor of the toxin.

When analyzed in light of the biochemical data, these structures revealed for the first time how the region folds an incoming linear carbon chain called a polyketide to form two aflatoxin rings in an amazing feat of origami.

The researchers propose that understanding how aflatoxin is made will lead to ways in which people can reduce prevalence of the toxin and drastically reduce terminal illness in developing countries.

More information: www-ssrl.slac.stanford.edu/res … hive/fungal_pks.html

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