Analysis of Aflatoxins using surface enhanced Raman scattering

Samuel Mabbott, Yun Xu and Royston Goodacre

School of Chemistry and Manchester Interdisciplinary Biocentre, University of Manchester, 131 Princess Street, Manchester, M1 7DN, United Kingdom

Aflatoxins (AFs) are the most important mycotoxins due to their extremely high toxicity, carcinogenic activity in animals and frequent occurrence in various foods and feedstuffs. AFs are produced in nature only by some strains of *Aspergillus flavus*, most strains of *A. Parasiticus* and *A. Nomius.*

This poster will focus on the qualitative identification and quantitative analysis of Aflatoxins B_1 and B_2. The structures of the two Aflatoxins differ due to the presence of a double bond situated between carbons 8 and 9 of the bisfuran (Figure 1). Existence of the double bond increases the toxicity of the Aflatoxin greatly. *In vivo* AFB_1 is metabolised by cytochrome P-450 causing the formation of hydroxylated derivatives. The metabolite with the greatest mutagenicity and carcinogenicity is AFB1-8.9-epoxide capable of binding efficiently to the N7 position of Gua, present in both RNA and DNA[1].

Spectroscopic analysis of the toxins was undertaken using surface enhanced Raman scattering (SERS) on a portable Delta Nu Raman spectrometer containing a 633 nm laser. SERS is a technique widely exploited to increase the number of Raman scattering events observed from an analyte. SERS will be facilitated using citrate and hydroxylamine reduced silver nanoparticles. Discrimination and quantification of the aflatoxins is described using two multivariate chemometric methods, principal components analysis (PCA) and partial least square analysis (PLS).

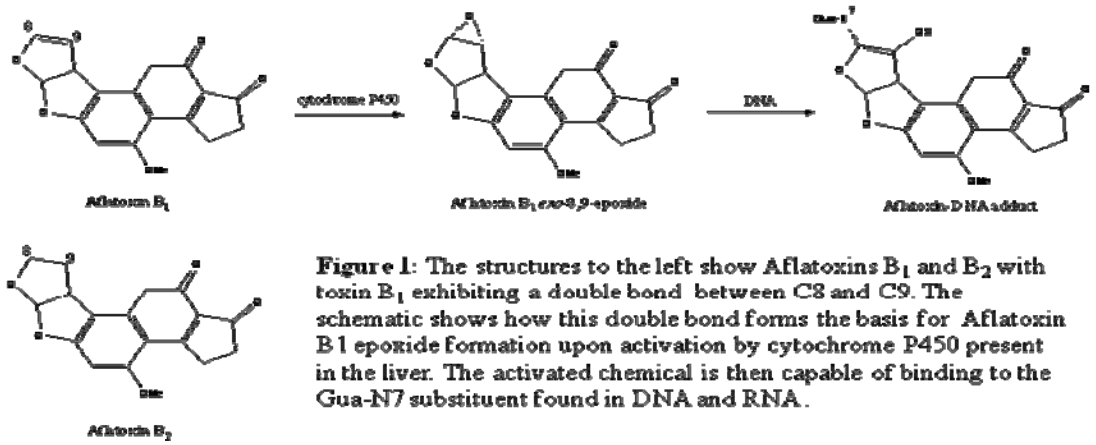

Figure 1: The structures to the left show Aflatoxins B_1 and B_2 with toxin B_1 exhibiting a double bond between C8 and C9. The schematic shows how this double bond forms the basis for Aflatoxin B1 epoxide formation upon activation by cytochrome P450 present in the liver. The activated chemical is then capable of binding to the Gua-N7 substituent found in DNA and RNA.

References:

[1] Johnson, W. W. and F. P. Guengerich, *Abstracts of Papers American Chemical Society* 214, 1-2 (1997).