

Urine as a biomarkers of exposure to *Fusarium* mycotoxins

Area of research interest: [Chemical hazards in food and feed](#)

Study duration: 2005-03-01

Project code: C03044

Conducted by: LIGHT Laboratories, School of Medicine, University of Leeds

[Back to top](#)

Background

Consumers' exposure to mycotoxins is usually estimated by combining consumption of foods with levels of mycotoxin contamination in similar foods. A more accurate method of estimating exposure may be to measure consumption more directly. It is known that a proportion of ingested mycotoxins leave the body via the urine. The National Diet and Nutrition Survey (NDNS), which takes urine samples for individuals and also stores information about their diet, was used to measure levels of selected *Fusarium* toxins - deoxynivalenol (DON) and fumonisins (FB) in the urine and from these infer levels of exposure.

[Back to top](#)

Research Approach

Phase 1 of this study focused on understanding the level and distribution of DON and FB in urines from UK adults previously collected as part of the UK adult NDNS. Phase 2 focused on the further validation of the urinary measure for DON as a biomarker of exposure, by the recruitment of UK adults who kept a personal food diary, and provided urine and food samples during a 12 day survey. The volunteers were divided in three groups: consumption of normal diet, partial dietary intervention in which consumption of bread was permitted and full intervention in which consumption of wheat based foods was not permitted at all.

[Back to top](#)

Results

Phase 1 of the study showed that cereal intake was significantly associated with urinary DON, assessed using an LC-MS method. A method was also developed to measure urinary fumonisins with a level of detection at 0.02 ng/ml, however, no urinary fumonisins were detected in the NDNS urine samples.

Phase 2 of the study showed that urinary DON was significantly associated with DON intake and the variation in urinary DON correlated to DON intake. Cereal consumption, in particular bread, significantly contributed to the levels of urinary DON observed in UK adults. The transfer of DON to urine was estimated to be 72.3% and it was cleared from urine within a 24 to 48 hour period.

Using the mean estimated DON intake from phase 1 (0.2 µg/kg bw/day and the estimated DON transfer to urine of 72.3%, 2/300 were predicted to exceed the recommended Tolerable Daily Intake (TDI) for DON. It should be noted that these individuals were a stratified sample based on cereal consumption.

Overall the data indicate that urinary DON was sensitive enough to measure DON exposure at the individual level in the UK population.

[Back to top](#)

Published Papers

1. Turner, P.C., White, K.L.M., Burley, V.J., Hopton, R.P., Rajendram, A., Fisher, J., Cade, J.E. & Wild, C.P. (2010). A comparison of deoxynivalenol intake and urinary deoxynivalenol in UK adults. *Biomarkers*, Published on-line doi:10.3109/1354750X.2010.495787,1-10.
2. Turner, P.C., Hopton, R.P., White, K.L.M., Fisher, J., Cade, J.L., & Wild, C.P. (2011) Assessment of deoxynivalenol metabolite profiles in UK adults. *Food Chem Toxicol.* 49(1), 132-135 doi: 10.1016/j.fct.2010.10.007

Research report

England, Northern Ireland and Wales

PDF

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