

**The Society of Food Hygiene and Technology,
Yorkshire & North East Branch Meeting**

Wednesday 24th November 2010, Highfield House, Doncaster, S. Yorks

Mycotoxins in food

(i) Hazards, Detection & Controls

With carcinogenic attributes and an association with renal failure, mycotoxins, (metabolites of moulds), are a potentially serious contaminant in a variety of food products. They are of particular concern in dried fruit and nut processing where extensive controls of supplied products are necessary to ensure that only high quality products reach the EU food market.

Nicola Farmer, the presenter at this event, is the manager of Mycotoxin Laboratory (UK) Ltd, an independent laboratory specialising in the analysis in food of the most common mycotoxins, (aflatoxin and ochratoxin A); the company is UKAS accredited and works to EN ISO/IEC 17025:2005. Nicola has accrued 33 years experience working in a Technical role within the Food Industry; she has extensive experience of auditing fruit and nut suppliers around the world; she is a BRC Third Party Auditor to the Global Standard for Food Safety. Nicola shared her specialist knowledge and experience regarding mycotoxins in food at this event.

Nicola informed the meeting that 25% of the world's food crops are affected by mycotoxins. Different moulds produce different mycotoxins, over 400 mycotoxins have been identified. Food commodities are most susceptible pre-harvest due to the spores being present in the soil. The degree of contamination varies with ambient temperature, Aw, pH, moisture content, relative humidity, insect activity and soil type. Distribution within food is random with hotspots occurring within a batch or shipment. When sampling it is essential that a representative sample is taken in accordance with robust samplings plan if mycotoxins are to be detected. Aflatoxins, produced by the mould *Aspergillus flavus*, occur in different types, B1, B2 (fluoresce blue) and G1, G2 (fluoresce green). B1 is the most toxic of all mycotoxins, it is also a carcinogen. M1, a metabolite of B1 can be found in milk if B1 is present in the feed of cows. Mycotoxins of different types have various other attributes – embryotoxic, immunosuppressive, genotoxic/mutagenic and oestrogenic – properties vary with the type of mycotoxin.

A wide range of food commodities are affected by mycotoxins e.g. almonds, peanuts, brazil nuts, walnuts, corn, dried fruit, soya beans, rice, spices, animal feed, tea, cocoa and coffee are all subject to Aflatoxin contamination whereas Ochratoxins can be found in wheat, barley, oats, rye, wine, beer, coffee, dried fruit, spices, chocolate, pig kidney, cocoa and liquorice, whilst Patulin is found in only apples, apple juice and cider.

Mycotoxins have been the subject of 665 RASFF¹ Alerts in 2009, of these 638 (96%) were due to Aflatoxin contamination in nuts, nut products and seeds, 27 (4%) were due to Ochratoxins in other food products. Of the RASFF alerts due to fruit and vegetables 63% were due to Aflatoxins in figs.

In the control of mycotoxins knowing the origin of food can be indicative of good agricultural practices, the use HACCP or other food safety systems and appropriate testing of products by an accredited laboratory. Imports controls and traceability checks

form part of current legislation, specific limits for mycotoxins are found in current EU legislation for a host of food products, the levels vary considerably with different mycotoxins. Once present it is very difficult to reduce mycotoxin contamination, mycotoxins are generally heat resistant. Limited success has been achieved in reducing levels in some foods using high temperature in the presence of ammonia. Processing such as density separation and hand picking of discoloured grains can reduce some mycotoxin contamination but it is not totally reliable.

Current EU limits for mycotoxins are based on Tolerable Daily Intake for total aflatoxins, aflatoxin B1, aflatoxin M1, ochratoxin A, patulin and toxins produced by *Fusarium* moulds. Legislation is generally enforced by regulatory bodies carrying out routine checks and surveillance studies. Sampling levels are specified in the legislation and take account of the heterogeneous nature of the contaminants. Test kits are available for rapid screening but more detailed analysis involves techniques such as high performance liquid chromatography (HPLC). Further information on mycotoxins is available on the Food Standards Agency website and Europa.eu.

(ii) Dealing with a flood in a food factory

Nicola has had first hand experience of dealing with the aftermath of a major flooding incident at a Food Processing factory in her role as Technical Manager at Conversion Services Ltd (CSL). She outlined the contingency measures taken after a flood at CSL, Swinton, South Yorkshire on 25th June 2007 when double the monthly rainfall fell in a day. Severe consequences of the rainfall were seven people killed in the north east and 23,000 people homeless, in addition the M1 was closed for 3 days, the local electricity substation was closed and the gas distribution network was disrupted.

CSL is a specialist processor and supplier of treenuts and dried fruits; they offer a range of tailored processing solutions e.g. re-cleaning, dicing, sieving and grading to change customer's raw material into a ready to use ingredient. All the products in their warehouse at the time of the flooding were actually owned by a number of clients.

The factory was located in a valley between the Don River and the Dearne and Dove canal. The sewage works located nearby was flooded and storm drains overflowed. Both the peanut processing plant and the treenut and dried fruit processing factory were flooded with water containing raw sewage to a depth of over 30cms. The procedure in the Emergency Crisis Management document was followed, insurers were contacted initially, then the suppliers. The temperature of 20°C and the humid atmosphere were ideal for the formation of mycotoxins and growth of microbial contamination.

As all electrical sockets were below the water line, there was no power, fork lift trucks were inoperable, and packaging was ruined. Using PPE clean stock was segregated by hand from the contaminated stock and moved to a separate location. Loss adjusters of numerous clients were called to decide on the best action and the total value of the loss.

The health risks from the contaminated stock were considerable, much food had been contaminated with flood water and muddy deposits, there was a risk of using water that was non potable, microorganisms were present, mycotoxins could develop in the moist food products and rodents had been driven above ground. Much of the stock was condemned as not fit for consumption and disposed of, although some was recovered, removed to a dry site and subjected to microbiological analysis.

Only recovered product (which was all vacuum packed) that met the microbiological specification had any potential future use and was tested for Aflatoxin. Surprising quantities of products were found to be contaminated with Listeria in addition to Enterobacteriaceae and high aerobic plate counts. Aflatoxins were found in some of the recovered product at unsatisfactory levels.

The loss adjusters suggested the use of hygiene specialists to clean the factory premises, however, with quotes varying from £29,000 to £71,000 Nicola took the decision to use a company she trusted (Trebor Bassett), despite the fact that it delayed the process for two weeks. Six and a half weeks after the flood the factory was confirmed clean using ATP swabbing techniques.

Key learning points from the event were that all works must be recorded on digital camera as evidence for insurers and loss adjusters; an accurate and regularly reviewed crisis management document is essential; insurers and loss adjusters must be kept informed; recovered stock should be isolated as soon as possible; the availability of specialist resources should be determined; a tender document should be created for the clean up process to minimise the variation in proposed costs. Nicola reported that, thankfully, no business was lost through the event; she offered her expertise to anyone else who found themselves in a similar situation: nicola@mycotoxinlaboratory.co.uk

(1. Rapid Alert System for Food and Feed in Europe)

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