

Retail survey of T-2 and HT-2 toxin levels in oat based products

Executive Summary

Background and Introduction

Fungi can cause plant diseases in the crop and spoilage in the grain store, leading to the production of toxic chemicals called mycotoxins. The mycotoxins T-2 and HT-2 are produced when cereal crops become infected with species of the *Fusarium* fungus during the flowering stage. T-2 and HT-2 toxins are predominantly found in cereals, particularly oats.

In 2011, the European Food Safety Authority's (EFSA) Scientific Panel on Contaminants in the Food Chain (CONTAM panel)) published a scientific opinion on the human and animal health risks associated with T-2 and HT-2 toxins present in food and feed¹. Whilst these have the potential to cause adverse effects on the immune system and on the production of blood cells EFSA concluded that dietary exposure to T-2 and HT-2 toxins was not a health concern based on the available data. Following the conclusions of the CONTAM panel, the European Commission published a Recommendation in 2013² to monitor the occurrence of T-2 and HT-2 toxins in cereals and products made from cereal grains. The recommendation required Member States to collect occurrence data over several years to take into account the large year to year variation in toxin levels observed in cereal crops. The Recommendation also set indicative levels for various categories of food and feed, where exceedance of the stated levels requires a follow up investigation.

The Commission Recommendation also considered and requested further information on the effects of processing during food manufacture on T-2 and HT-2 toxin levels in the finished retail product and possible links between farming practices and toxin levels present in the harvested oat crop.

Retail Survey of oat-based products from the UK market

Following the 2014 UK oat harvest, the British Oat and Barley Millers Association (BOBMA) alerted the Food Standards Agency to the relatively higher levels of T-2 and HT-2 toxins found in the UK oat crop, compared to previous crop years. Industry monitoring data showed some samples exceeded the indicative level for oats set out in the Recommendation.

¹ EFSA Panel on Contaminants in the Food Chain (CONTAM) Scientific Opinion on the risks for animal and public health related to the presence of T-2 & HT-2 toxin in food and feed 2011;9(12): 2481

² Commission Recommendation on the presence of T-2 & HT-2 toxin in cereals and cereal products (2013/165/EU) OJ L 294,6.11.2013, p44-44

The Food Standards Agency commissioned a retail survey to investigate the effect of higher levels of the T-2 and HT-2 toxins in the 2014 UK oat crop on dietary exposure. The survey collected a wide range of finished retail products expected to be derived from the 2014 UK oat crop. Two hundred samples were collected from a broad range of retailers across the UK and included porridge oats, oat-based breakfast cereals, oat biscuits, oatmeal, black pudding and oatbread. These products cover different processing conditions during manufacture, which could provide information on the effects of processing. A comparison of the provenance of the products within the UK was not undertaken in this survey due to the limitations of the dataset. The details of the sampling are given in the contractor's sampling report provided at Annex 2.

The samples were analysed using LC-MS/MS achieving a validated limit of quantification (LoQ) of 1µg/kg. T-2 and HT-2 toxin were found above the LoQ in one hundred and seventy eight of the two hundred samples (89%) (T-2 toxin and HT-2 toxin levels were summed). The toxin levels reported in the survey are included in the contractor's analytical report.

The results show that the sum of T-2 and HT-2 toxin levels for all the samples were below the indicative levels set out in Recommendation 2013/165/EU. The details of the analysis used in the survey are given in the contractor's technical report provided at Annex 3. A statistical analysis of organic versus conventionally produced products was not feasible due to the very small sample sizes involved.

Dietary Exposure from oat-based products.

The Tolerable Daily Intake (TDI) is an estimate of the daily exposure that can occur over a lifetime without appreciable health risk and has been established as a protective level for all age groups included in the survey.

Dietary exposures to T-2 and HT-2 toxin for various age groups of the population were estimated using the retail survey results for the specified food groups and consumption data from the National Diet and Nutrition Survey (NDNS) together with the Diet and Nutrition Survey of Infants and Young Children (DNSIYC). Details are provided in Annex 1.

Investigation of HT-2 and T-2 mycotoxins in oats from the 2014 harvest: Project Report No 555, Agricultural and Horticultural Development Board, Cereals and Oilseeds.

To address one aspect of Recommendation 2013/165/EC the Food Standards Agency co-funded an investigation of farming practices for the 2014 oat crop, together with the British Oat and Barley Millers Association and Agriculture and Horticulture Development Board, Cereals and Oilseeds Division. The report is provided at Annex 4. This study focused on farming practices and weather data and how these factors might interact and influence the variations observed in T-2 and HT-2 levels from one oat harvest to the next. This work complimented the retail survey, to better understand how the mycotoxin levels fluctuate between harvest years in the UK and how changes in existing farming practices may bring about a reduction in fusarium colonisation at the flowering stage of the oat crop.

The study identified strategies to reduce the risk of exceedances in the oat crop including switching to spring oat varieties instead of winter varieties and reducing the number of cereal rotations over a given period. However, the authors acknowledged that there are large economic barriers preventing growers adopting such practices.

Conclusion.

The survey of oat based products expected to be derived from the 2014 harvest showed that T-2 and HT-2 toxin were present at low levels in a wide range of oat based food types available at retail. The estimated overall dietary exposure to T-2 and HT-2 from consumption of oats and oat-based products was well below the Tolerable Daily Intake (TDI) of 100 ng/kg/ body weight for all age groups ranging from 4 months to adults aged 19 years and above, including high level consumers. Therefore, the results of this survey do not indicate a risk to consumer health.

Strategies to reduce the levels of T-2 and HT-2 toxins in the UK oat crop are available to growers, but implementation could result in a significant economic burden with no perceived benefit given that toxin levels do not represent a food safety concern.

References

[1] EFSA (2011). EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on the risks for animal and public health related to the presence of T-2 & HT-2 toxin in food and feed. EFSA Journal 2011;9(12):2481. [187 pp.] doi:10.2903/j.efsa.2011.2481.

Available online: <http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2011.2481/full>

[2] Commission Recommendation on the presence of T-2 & HT-2 toxin in cereals and cereal products (2013/165/EU) OJ L 294, 6.11.2013, p44-44

Annex 1: T-2 and HT-2 risk assessment

T-2 and HT-2 are mycotoxins produced by various *Fusarium* species that invade crops under moist cool conditions. They are found in cereal grains and products thereof. They have the potential to have adverse effects on the immune system and the production of blood cells. A tolerable daily intake (TDI) of 100 ng/kg bodyweight (bw) for the sum of T-2 and HT-2 toxins has been established to protect against these effects (EFSA, 2011).

Exposure to the sum of T-2 and HT-2 has been estimated from the results of the retail survey of T-2 and HT-2 in oat-based products together with consumption data from the National Diet and Nutrition Survey (NDNS) and the Diet and nutrition survey of infants and young children (DNSIYC) (see Table 1). The mean and 97.5th percentile exposures for all age groups are well below the TDI.

Since this survey focussed only on oat-based products, it is likely that there would be other sources of T-2 and HT-2 in the diet. EFSA (2011) found that grains and grain-based foods, in particular bread, fine bakery wares, grain milling products, and breakfast cereals, made the largest contribution to T-2 and HT-2 exposure. The total exposures estimated by EFSA were also below the TDI. Therefore it is likely that exposure from oat-products combined with exposure from other foods would lead to at most a minimal exceedance of the TDI.

Overall it can be concluded that the results of this survey do not indicate a risk to the health of consumers.

Table 1: UK population groups exposure to sum of T-2 and HT-2 in all oat products (Biscuits and oatcakes; Black Pudding; Drinking Oats; Flapjacks and oatly snack bars; Muesli oat breakfast cereals and granola; Oat Bread; Oatbran; Porridge oats)

Age Group	No of consumers	Mean exposure (ng/kg bw/day)		97.5 percentile exposure (ng/kg bw/day)	
		LB*	UB*	LB*	UB*
4 to 18 month olds ¹	14 54	13.6	13.9	54.5	55.6
1.5 to 3 year-olds ²	21 6	10.0	10.3	33.5	34.3
Children aged 4 to 6 years ²	20 6	8.3	8.6	28.6	29.8
Children aged 7 to 10 years ²	24 4	6.0	6.2	19.9	20.4
Children aged 11 to 18 years ²	40 6	3.3	3.4	11.5	11.9
Adults aged 19+ years ²	10 29	3.5	3.6	12.1	12.9

* LB: Lower bound – values below the limit of quantification (LOQ) are treated as zero. UB: Upper bound - values below the LOQ are treated as the LOQ for each toxin.

References

¹ Diet and nutrition survey of infants and young children (DNSIYC), 2011. Available at:
<http://transparency.dh.gov.uk/2013/03/13/dnsiyc-2011/>

² National Diet and Nutrition Survey (NDNS): results from Years 1 to 4 (combined) of the rolling programme for 2008 and 2009 to 2011 and 2012 -
<https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-results-from-years-1-to-4-combined-of-the-rolling-programme-for-2008-and-2009-to-2011-and-2012>

Annex 2: Final Report, Retail Survey of T-2/HT-2 toxins in Oat Based Products, FS102126, May 2015. HallMark Veterinary and Compliance Services.

[Link to pdf final report](#)

Annex 3: Final Report, Retail Survey of T-2/HT-2 toxin levels in Oat Based Products, FS102126, Nov 2015. Fera Science Ltd, York (UK).

[Link to pdf final report](#)

Annex 4: Investigation of HT2 and T2 mycotoxins in Oats from the 2014 harvests, Project Report No 555

<http://cereals.ahdb.org.uk/publications/2016/march/01/investigation-of-ht2-and-t2-mycotoxins-in-oats-from-the-2014-harvest.aspx>