

FINAL REPORT

Retail Survey of T-2 / HT-2 Toxin Levels in Oat Based Products

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**Irene Leon, Joanna Stratton, Julie Clough,
Monika Sehnalova and Susan MacDonald**

Fera Science Ltd., York (UK)



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1. Executive Summary

T-2 toxin and HT-2 toxin are trichothecene mycotoxins produced by various *Fusarium* species. In response to Commission Recommendation on the presence of T-2 and HT-2 toxin in cereals and cereal products (2013/165/EU) [1] the UK has previously submitted data to EFSA for raw cereals. This survey produced data for UK retail products under Commission Recommendation 2013/165/EU and looked at the 2014 UK oat crop where there were findings of higher than usual levels of T-2 and HT-2 toxins in whole oats, to assess the potential transfer or reduction of T-2 and HT-2 toxins in processed consumer products compared to raw oats.

Hallmark Ltd was sub-contracted by the FSA to supply two hundred oat based cereal products of UK provenance for this survey. Samples were delivered to Fera. Samples were collected from four different locations in the UK, England, Scotland, Northern Ireland and Wales to look at regional differences in mycotoxin occurrence.

Fera acted as analytical contractor to the FSA looking at the presence of T-2 and HT-2 toxins based on accredited methodology using immunoaffinity column clean-up and LC-MS/MS determination. Performance criteria in Commission Regulation (EC) No 401/2006 were applied to the analytical results.

Commission Recommendation 2013/165/EU on the presence of T-2 and HT-2 toxin in cereals and cereal products provides indicative levels for these mycotoxins and states that these are not food safety levels. The indicative levels are based on occurrence data and EFSA Scientific Opinion published in 2011 and updated in 2013 [2].

Four samples were found to have levels of Sum T-2 and HT-2 toxin above recommended indicative levels when compared to Commission Recommendation 2013/165/EU. However they were below the recommended indicative level when measurement uncertainty was applied. The highest level of the Sum T-2 and HT-2 toxins found was 124.3 µg/kg for a sample of micro oats rolled oat flakes.

The results of this survey have been submitted to EFSA for its Data Collection Framework (DCF) for chemical contaminants.

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2. Glossary

EFSA	European Food Safety Authority
EU	European Union
Fera	Food and Environment Research Agency (UK) an Executive Agency of Defra until 31 st March 2015 and Fera Science Ltd from 1 st April 2015.
FSA	UK Food Standards Agency
HT-2 toxin	15-Acetoxy-3 α ,4 β -dihydroxy-8 α -(3-methylbutyryloxy)-12,13-epoxytrichothec-9-ene
LC-MS/MS	Liquid Chromatography tandem Mass Spectrometry
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantification
m/z	Mass to charge ratio
RSD	Relative Standard Deviation
S/N	Signal to noise ratio
T-2 toxin	The trichothecene (2 α ,3 α ,4 β ,8 α)-4,15-bis(acetyloxy)-3-hydroxy-12,13-epoxytrichothec-9-en-8-yl 3-methylbutanoate
UPLC-MS/MS	Ultra Performance Liquid Chromatography tandem Mass Spectrometry

3. Introduction

Mycotoxins are toxic compounds produced by fungi which frequently contaminate cereal crops. They commonly enter the food chain through contaminated food and feed crops, mainly cereals. They can occur in a wide range of foods, often with no visible signs of mould spoilage to the food. They have a wide range of chemical properties and toxicities to humans and food-producing animals.

T-2 toxin (T-2) and HT-2 toxin (HT-2) are trichothecene mycotoxins produced by various *Fusarium* species. HT-2 toxin is a major metabolite of T-2 toxin. The Scientific Panel on Contaminants in the Food Chain (CONTAM panel) of the European Food Safety Authority (EFSA) adopted an opinion on a request from the European Commission, on the risks for animal and public health related to the presence of T-2 and HT-2 in food and feed [2]. The European Commission decided it was appropriate to collect more data on T-2 and HT-2 in cereals and cereal products and more information on the effects of food processing (i.e. cooking) and agronomic factors on the presence of T-2 and HT-2 as well as the large year to year variation in occurrence of T-2 and HT-2. In order to do this and to take into account the conclusions of the EFSA scientific opinion the Commission published Recommendation 2013/165/EU [1]. This Recommendation requires that Member States supply data on T-2 and HT-2 occurrence annually to EFSA and gives a table of Indicative levels for T-2 and HT-2 in a range of cereal products. It also states it is necessary to obtain more information on the different factors which lead to relatively high levels of T-2 and HT-2 in cereals and cereal products in order to be able to identify measures to be taken to avoid or to reduce their presence in cereals and cereal products. To do this investigations have to be undertaken where repeated exceedances of Indicative Levels occur in order to collect information on the factors resulting in these high levels.

The UK has submitted data to EFSA for a range of mycotoxins over the last few years with a focus on T-2 and HT-2 in response to Commission Recommendation 2013/165/EU. All data submitted has been for raw cereals; no data has been submitted for processed foods or retail products.

In the 2014 UK oat crop there were findings of higher than usual levels of T-2 and HT-2 in whole oats [3]. Coupled with a lack of data for UK retail products it was decided to analyse a range of oat based retail products to provide scientific data for two outcomes. Firstly, to determine the extent of the presence of T-2 and HT-2 toxins present in processed oat products produced from the 2014 UK oat harvest and secondly to produce a data set for UK retail products to be submitted to EFSA in response to Commission Recommendation (2013/165/EU).

Information was sought on potential transfer or reduction of T-2 and HT-2 toxins in processed consumer products compared to raw oats. This study looks at two hundred retail oat based products for the presence of T-2 and HT-2 toxins based on accredited methodology using immunoaffinity column clean-up and LC-MS/MS determination.

Hallmark Ltd was sub-contracted by the FSA to supply two hundred oat based cereal products of UK provenance for this survey. Sampling took place in March and April 2015. Fera acted as analytical contractor to the FSA.

Samples were collected from four different locations in the UK by Hallmark Ltd: England, Scotland, Northern Ireland and Wales. Current data for raw oats suggests that crops from Scotland and Northern Ireland may contain higher levels than crops from more Southern regions [3]. Where possible, sampling data identified the country of origin for porridge oat products (Scotland or England).

A proportion of organic samples was included to assess differences between these and conventionally produced oats. A small category of miscellaneous oat containing products were also included e.g. black pudding (six samples). These required a method validation step.

All samples in this survey were intended for human consumption; there were no animal feed samples.

Commission Recommendation on the presence of T-2 and HT-2 toxin in cereals and cereal products (2013/165/EU) provides indicative levels for these mycotoxins and states that these are not food safety levels. The indicative levels are based on occurrence data and the EFSA Scientific Opinion published in 2011 and updated in 2013 [2].

Performance criteria in Commission Regulation (EC) No 401/2006 [4] were applied to the analytical results generated. This regulation sets out that the Limit of Quantification (LOQ) should not be higher than 5 µg/kg for T-2 and HT-2 toxin individually. The analysis carried out here aimed for a working LOQ of 1 µg/kg for each toxin.

Results will be submitted to EFSA for its Data Collection Framework (DCF) for chemical contaminants. Data will be supplied following the necessary requirements to meet EFSA's Standard Sample Description (SSD) for Food and Feed.

4. Aims and Objectives

4.1. Scope

In 2014 the industry data for the oat harvest showed higher than usual levels for T-2 and HT-2 toxin. In addition the data also indicated a difference between crop from Scotland and the North of England, compared to southern regions, with higher levels detected in the samples from the North [3]. It has been noted in the past that T-2 and HT-2 levels vary between harvests, with some years very little or no T-2 and HT-2 detected, while in other years the levels are much higher. The reasons or the cause of this year on year variation are not known. What is also not well understood is how the levels in the crops from the higher years may be transferred to consumer products and whether this could lead to increased consumer exposure. Current understanding is that the cleaning and other processes involved in the production of oat products would result in finished products that contained relatively low levels of T-2 and HT-2 toxins, however there is no recent data to support this. This current study was carried out to address this gap in the knowledge; to determine the levels of T-2 and HT-2 toxins present in processed oat products of UK provenance, produced from the 2014 UK oat crop and to assess whether findings of higher than usual levels of T-2 and HT-2 toxins in whole oats crop resulted in transfer of T-2 and HT-2 to retail products. This data will be used to calculate T-2 and HT-2 dietary intake for UK consumers of these products.

In addition this data on T-2 and HT-2 toxins in processed foods and retail products was submitted to EFSA in response to Commission Recommendation 2013/165/EU [1] to complement raw cereal data already submitted.

4.2 Sampling

Hallmark Ltd was sub-contracted by the FSA to supply two hundred oat based cereal products of UK provenance for this survey.

Samples were collected from four different locations in the UK; England, Scotland, Northern Ireland and Wales, by Hallmark Ltd., to look at regional differences. Sampling took place in March and April 2015.

A proportion of organic samples was included to assess differences between these and conventionally produced oats. A small category of miscellaneous oat containing products were also included e.g. black pudding and oat milk (six samples).

4.3 LC-MS/MS Analysis

The samples were analysed using state of the art LC-MS/MS due to the high sensitivity and selectivity of the instrumentation.

4.4 Validation

A validation exercise was performed to demonstrate the fitness-for-purpose of the analysis methods used for the survey.

A small category of miscellaneous products (mostly black pudding) required validation analyses to be performed for the method. An assessment of the method was undertaken for these matrices and in-house validation to verify LOQ, recovery and repeatability was carried out.

4.5 Quality Control

With each batch of samples, a procedural blank, matrix blank, matrix blank spike, in-house reference material and randomly selected sample matrix spike was included.

Samples were grouped and extracted according to matrix type wherever possible.

4.6 Reporting of Results

Results were submitted to EFSA in accordance with the EFSA Guidance on standard sample description and submitted via the Evidence Management Unit's (DATA) call for continuous collection of chemical contaminants occurrence data in food and feed with standard sample description details specified in the most recent EFSA Guidance.

5. Materials and Methods

5.1 Sampling

Hallmark Ltd was issued by Fera with unique LIMS sample number codes to assign to samples. Samples were submitted to Fera using the unique LIMS number.

Detailed sampling information was collected by Hallmark Ltd.

Samples were stored under suitable dry conditions until homogenised. Packed products were stored at ambient conditions unless the label specified otherwise or it was prudent to do so.

5.2 Sample Preparation

Dry samples were homogenised by a variety of methods including by milling using a centrifugal mill (Retsch) or Fritsch mill (1 to 4 mm). Ring sieve size was dictated by sample consistency. Where the texture of samples made this difficult (e.g. cereal bars) food processors were used (Robot Coupe or Magimix).

5.3 Chemicals and Reagents

For extraction, a mixture of methanol (HPLC grade, Sigma-Aldrich, Gillingham, UK) and water (18.2 MΩ/cm Purelab Ultra laboratory purification system, Elga, Marlow, UK) was used, along with sodium chloride (ACS reagent, anhydrous, 99 %, Fluka, Sigma Aldrich, UK).

Sample clean-up was performed using immunoaffinity columns (Easi-Extract® T-2 & HT-2, R-Biopharm Rhône, Glasgow, UK).

Methanol and ammonium formate (UPLC/MS grade, Biosolve, Dieuze, France via Greyhound, Birkenhead, UK) and water (18.2 MΩ/cm Purelab Ultra laboratory purification system, Elga, Marlow, UK) were used for mobile phase preparation for LC-MS/MS analysis.

5.4 Extraction and Clean Up

A portion (25 g) of sample was weighed. If required (for recovery calculation), the sample was spiked by adding a mixture of T-2 and HT-2 in acetonitrile (250 µL of a 1 µg/mL solution, spiking level equivalent to 10 µg/kg). Sodium chloride (2.5 g) was added and the sample was extracted with 90:10 (v/v) methanol:water (125 mL) for 2 minutes using an Ultra-Turrax disperser. The extract was then filtered through Whatman® 113V filter paper. An aliquot (7 mL) of extract was diluted with water (28 mL) and, if turbid, filtered through glass microfibre filter paper. A portion of the extract (25 mL) was then loaded onto the immunoaffinity column. The immunoaffinity columns were washed with water (20 mL) and then air was passed through to dry the columns. The columns were eluted with two portions (1 mL each) of methanol. The samples were then evaporated to dryness at 40 °C under nitrogen

and reconstituted in 50:50 (v/v) methanol:water (1 mL). The amount of matrix in the final extract was equivalent to 1.0 g sample/mL.

5.5 LC-MS/MS Analysis

The extracts (5 µL) were analysed on a UPLC-MS/MS system consisting of an Acquity UPLC system (autosampler, degasser, injector, pumps and column oven) and a TQ-S triple quadrupole MS/MS system (Waters, Milford, MA, USA). Separation was performed using an Acquity HSS T3 column (particle size 1.8 µm, dimensions 100 x 2.1 mm) (Waters, Milford, MA, USA) maintained at 40 °C. The mobile phases were 1 mM ammonium formate in water (A) and methanol (B). The mobile phase composition started at 5 % B for 0.2 min then was increased linearly to 95 % B at 3 min and remained at 95 % B until 6.6 min before being re-equilibrated at 5 % B for 1.4 min. The flow rate was 0.4 mL/min from 0.0-4.0 min and 6.6-8.0 min and 0.5 mL/min from 4.0-6.6 min.

The mass spectrometer was operated in MRM mode, using positive electrospray ionisation. The capillary voltage was 1 kV, desolvation temperature 500 °C; desolvation gas flow rate 1000 L/h, nebuliser gas flow 7 bar, source temperature 150 °C and cone gas flow rate 100 L/h. The analyser was tuned for unit mass resolution. The transitions monitored are shown in Table 1 with the analyte-dependent cone voltage and collision energy parameters. Quantification ions are in **bold**. Multiple confirmation ions were acquired due to the presence of interferences in some transitions and the most appropriate ion was chosen when the data was analysed.

Analyte	Parent m/z	Fragment m/z	Cone Voltage / V	Collision Energy / eV
T-2 toxin [M+NH ₄] ⁺	484.25	305.1	20	13
		215.0		18
		185.0		21
T-2 toxin [M+Na] ⁺	489.21	327.1	50	23
		245.1		27
HT-2 toxin [M+NH ₄] ⁺	442.24	263.1	20	11
		215.1		8
		169.0		9
HT-2 toxin [M+Na] ⁺	447.20	345.1	20	15
		285.1		17

Table 1. MRM conditions for T-2 and HT-2

MassLynx and TargetLynx software (Waters, Milford, MA, USA) were used for data acquisition and evaluation. Peak detection and integration were manually verified by the operator. Quantification was based on a multi-level calibration using solvent standards containing T-2 and HT-2 at concentrations corresponding to 1.0, 2.0, 5.0, 10, 25, 50, 100 and 250 µg/kg in the sample. Confirmation of identity was by retention time (within 2.5 % of the mean of the standards) and ion ratio (within 20 % of the mean of the standards).

5.6 Validation

Several cereal products were identified and screened for levels of T-2 and HT-2 toxins. A suitable blank matrix was identified in an oat based infant cereal product. A black pudding sample was also screened to represent the non-cereal samples included in the study.

The validation was performed by spiking each matrix in replicate at two levels (5 µg/kg and 10 µg/kg). Both matrices (infant oat cereal and black pudding) were also analysed without spiking, as well as a procedural blank.

A suitable cereal based in-house reference material was identified as a semi reference material generated in a National Reference Laboratory (NRL) exercise run by Fera. Sealed foil sachets of Fusarium Toxins in Cereal NRL02 (NRL02) were used in the validation exercise for this survey.

The linearity of the LC-MS/MS measurement was established through eight calibration standards in solvent, covering the relevant concentration range (1 µg/kg to 250 µg/kg). From these initial in-house validations, the linearity, recovery, repeatability, selectivity and LOQ were derived. In addition, the stability of retention time and ion ratios in solvent standards and extracts were determined.

The Limit of Detection (LOD) is defined here as the level corresponding to a signal-to-noise ratio (S/N) of three. Noise is 'peak-to-peak noise' as manually determined from extracted ion chromatograms.

In this study, the Limit of Quantification (LOQ) is defined as the lowest level for which it has been demonstrated that the criteria for average recovery and repeatability are met. The target LOQ for this study was 1 µg/kg.

5.7 Quality Control

Performance criteria in Commission Regulation (EC) No 401/2006 [4] were applied to the analytical results generated.

With each batch of samples, a procedural blank, matrix blank, matrix blank spike, in-house reference material and randomly selected sample matrix spike was included. There is a lack of suitable Certified Reference Materials.

Samples were grouped and extracted according to matrix type wherever possible.

The randomly selected sample matrix spiked sample included with each batch aimed to assess method performance over different commodities. This was typically a random sample representative of the commodities being analysed in the batch. The fortification level for these samples was set at 10 µg/kg.

5.8 Reporting of Results

Data was reported to EFSA under the correct EFSA reporting format.

6. Results

6.1 Sampling

Samples were supplied by Hallmark Ltd. Twenty two samples were unassayable due to sampling issues and were replaced with equivalent samples. Fera requested one resample due to a storage issue which was resolved. The total of two hundred samples for analysis was reached.

6.2 LC-MS/MS Analysis

Consistency of retention times was monitored. Deviations of individual ion ratios relative to the reference were acceptable. Identification of analytes was based on retention time and ion ratio of coinciding peaks for at least two diagnostic transitions in the correct abundance ratio. The ion ratio of the two diagnostic ions (least abundant/most abundant) in the samples should be consistent.

Linearity requirements in the range equivalent to 1-250 µg/kg were met.

Examples of extracted ion chromatograms for a solvent calibration standard at a level corresponding to 1 µg/kg (LOQ level), procedural blank sample (infant oat cereal), and a randomly selected sample spiked at 10 µg/kg are shown in Figures 1 to 3.

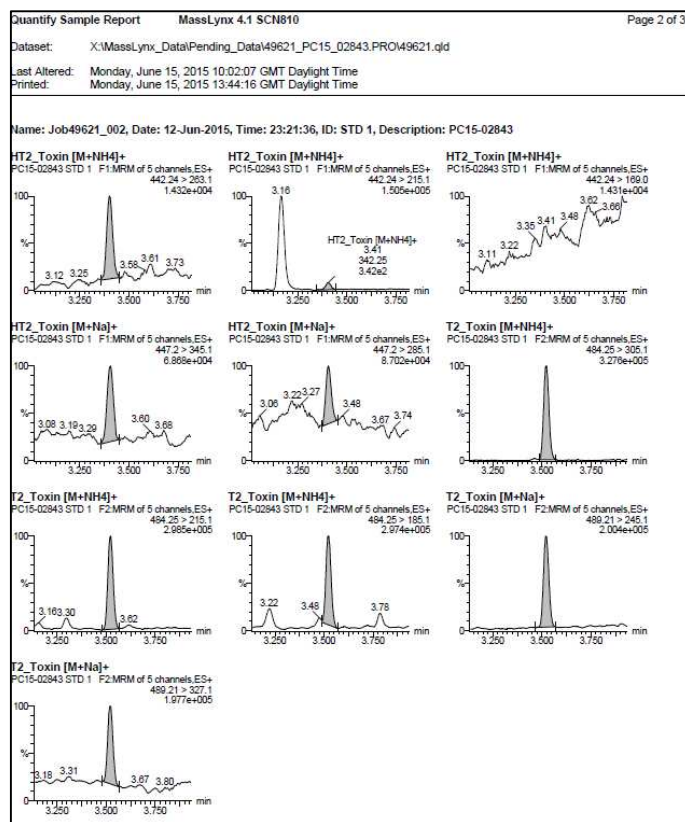


Figure 1. Calibration Standard at 1 µg/kg (LOQ)

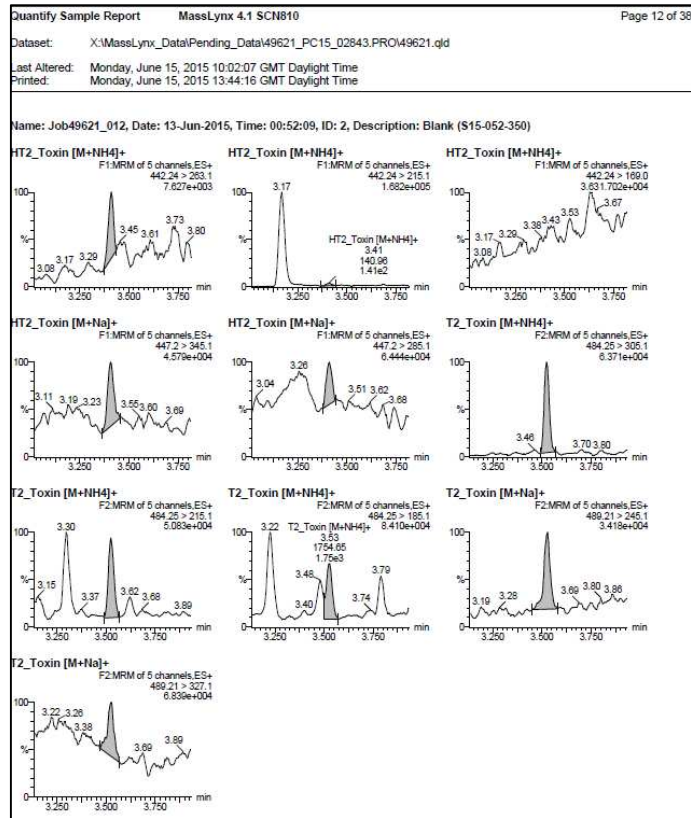


Figure 2. Procedural Blank Sample (<1 µg/kg)

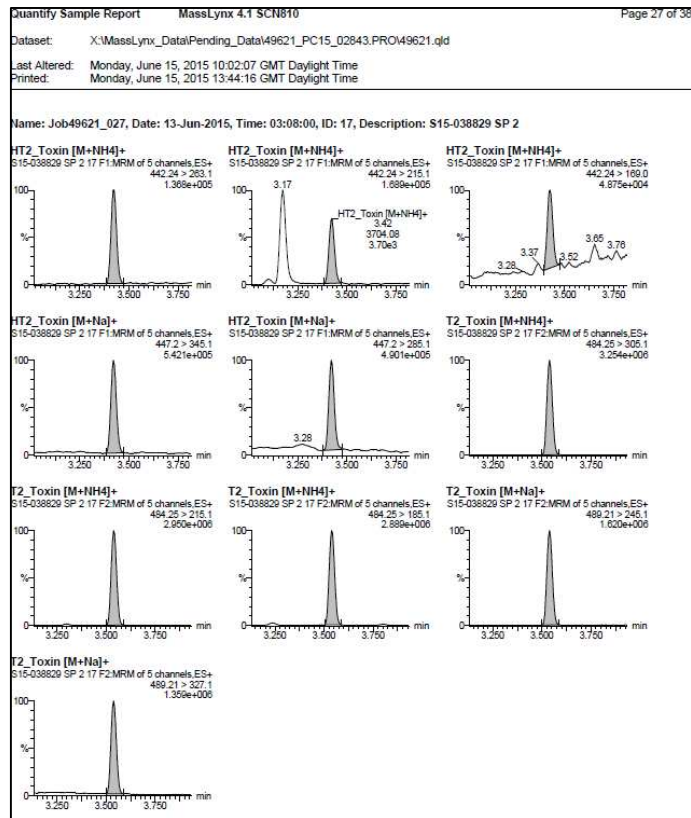


Figure 3. Randomly Selected Sample Fortified at 10 µg/kg

6.3 Validation

The analyte LC-MS/MS retention times within the validation sequence were consistent.

Table 2 gives the recoveries for T-2 and HT-2 toxins spiked in replicate into two matrices fortified at two different levels.

Spike Recoveries				
Matrix	HT-2 Spike (µg/kg)	HT-2 Recovery (%)	T-2 Spike (µg/kg)	T-2 Recovery (%)
Infant oat cereal (n=6)	5	97	5	109
	5	114	5	127
	5	69	5	92
	5	78	5	95
	5	88	5	104
	5	77	5	98
Average (%)	-	87	-	104
RSD (%)	-	17	-	11

Infant oat cereal (n=6)	10	82	10	100
	10	85	10	96
	10	83	10	102
	10	93	10	107
	10	87	10	102
	10	90	10	105
Average (%)	-	87	-	102
RSD (%)	-	5	-	4

Black pudding (n=3)	5	93	5	97
	5	86	5	97
	5	78	5	89
Average (%)	-	85	-	94
RSD (%)	-	7	-	4

Black pudding (n=3)	10	88	10	94
	10	96	10	111
	10	89	10	110
Average (%)	-	91	-	105
RSD (%)	-	4	-	7

Table 2. Recoveries obtained for T-2 and HT-2 toxins in two matrices at two levels

Table 3 shows the fit for purpose concentration range for 'Semi reference material Fusarium Toxins in Cereal NRL02' used in the validation exercise for this survey.

Analyte	n	X($\mu\text{g}/\text{kg}$)	σp	Derived from	'Fit for purpose' concentration range ($\mu\text{g}/\text{kg}$)
T-2 toxin	3	167	34.9	Horwitz	97.2 - 237
HT-2 toxin	3	235	46.8	Horwitz	141 - 329

X: consensus mean in $\mu\text{g}/\text{kg}$.
 σp : the standard deviation for proficiency

Table 3. 'Semi reference material Fusarium Toxins in Cereal NRL02'

Results for in-house reference material 'Semi reference material Fusarium Toxins in Cereal NRL02' are given in Table 4.

In-house Reference Material NRL02		
	HT-2 ($\mu\text{g}/\text{kg}$)	T-2 ($\mu\text{g}/\text{kg}$)
'Fit for purpose' concentration range ($\mu\text{g}/\text{kg}$)	141 - 239	97.2 - 237
(n=3)	228 226 227	95.3 100.7 97.8
Average (%)	227	97.9
RSD (%)	0.4	2.3

Table 4. In-house reference material validation results

6.4 Quality Control

Results for blank matrix sample and random sample matrix fortified at 10 $\mu\text{g}/\text{kg}$ for each batch were averaged to give a mean batch recovery to closely reflect commodity matrix differences.

In-house reference material 'Semi reference material Fusarium Toxins in Cereal NRL02' was included with each analytical batch of samples extracted.

Performance criteria in Commission Regulation (EC) No 401/2006 were applied to the analytical results generated.

Procedural blank samples extracted with each analytical batch were blank so it was not necessary to background correct samples.

Results are reported corrected for matrix blank and recovery.

Quality control data is summarised in Table 5.

Quality Control Data						
	Blank Spike Recovery (%)		Matrix Spike Recovery (%)		Batch Spike Recovery (n=2)* (%)	
	HT2	T2	HT2	T2	HT2	T2
(n=12)	92	78	76	90	84	83
	103	107	100	91	101	99
	92	81	80	85	86	83
	115	118	107	98	111	108
	110	121	94	99	102	110
	98	75	92	47	95	61
	86	101	158*	111*	86*	101*
	80	104	63	70	72	87
	85	112	131*	140*	85*	112*
	91	91	79	60	85	76
	81	116	102	129	92	123
	100	142	76	90	88	116
Average	94	104	87	86	92	95
RSD (%)	11	18	15	25	12	20

Batch recovery mean (n=2) except where *

Table 5. Summary of Quality Control Data

It was not possible to use the matrix spike in the mean batch recovery where the randomly selected sample contained T-2 and or HT-2 toxins at a level greater than the spike level. The blank spike recovery was used in these cases.

The average recovery and the reproducibility (RSD_R) s are summarised in Table 6.

Infant oat cereal blank matrix fortified at 10 µg/kg	Number	Average (%)	$RSD_R^{(a)}$ (%)	Exp. MU ^(b) (%)
HT-2 toxin	12	9.4	11	22
T-2 toxin	12	10.4	18	37

(a): relative standard deviation under reproducibility conditions

(b): expanded relative measurement uncertainty

Table 6. Average recovery and reproducibility of quality control samples

6.5 Results

Results are reported corrected for matrix blank and recovery.

The results obtained for the survey samples were only considered valid when the linearity and recoveries obtained for a particular batch were acceptable and when the procedural blank contained no T-2 or HT-2 toxins.

Table 7 gives an overview of levels found above the LOQ. Fully tabulated results are given in Appendix 1.

Total	HT-2 toxin	T-2 toxin
Number of samples	200	200
Number detected (> 1 µg/kg)	178	155
% detected (> 1 µg/kg) of Total Samples	89 %	78 %

Table 7. Occurrence of T-2 and HT-2 Toxins in Retail Survey Samples

Commission Recommendation on the presence of T-2 and HT-2 toxin in cereals and cereal products (2013/165/EU) gives indicative levels for different categories.

Category 3.1 gives the indicative level for oat bran and flaked oats

Category 3.5 gives the indicative levels for bread (including small bakery wares), pastries, biscuits, cereal snacks and pasta.

Levels in samples for the Sum T-2 and HT-2 toxins are given in Table 8 and compared to the relevant 2013/165/EU indicative levels for the categories for the six samples that contained the highest levels of T-2 and HT-2 toxins.

Sample	Product	Sum T-2 and HT-2 (µg/kg)	(2013/165/EU)	
			Indicative Level (µg/kg)	Category
S15-038846	Chunky Traditional Porridge	122.2	200	3.1
S15-038762	Micro Oats Rolled Oat Flakes	124.3		
S15-038804	Crunchy Canadian Maple Syrup Bars	31.7	25	3.5
S15-038865	Rough Scottish Oatcakes	26.6		
S15-038910	Scottish Oatcakes	28.9		
S15-038918	Oat Digestive Biscuit for Cheese	27.8		

Table 8. Levels of T-2 and HT-2 toxin compared to (2013/165/EU)

7. Discussion

7.1 LC-MS/MS Adducts

T-2 and HT-2 toxins were quantified as the ammonium adduct under positive electrospray ionisation.

Additionally the sodium adduct was also monitored and data was collected. However whilst some of the data initially looked promising ultimately this data was not considered as it did not routinely pass acceptance criteria.

7.2 Quality Control

Analyses were carried out in accordance with Commission Regulation (EC) No 401/2006 for recovery and repeatability. In addition Commission Recommendation 165/2013 sets out that the Limit of Quantification (LOQ) should not be higher than 5 µg/kg for T-2 and HT-2 toxin individually; the analysis carried out here aimed for a working LOQ of 1 µg/kg for each toxin. An LOQ of 1 µg/kg was widely achieved but where this was not analytically possible the LOQ was increased to 2 µg/kg.

A randomly selected sample matrix spiked sample was included with each batch to assess method performance over different commodities. This was typically a random sample representative of the commodities being analysed in the batch. The fortification level for these samples was set at 10 µg/kg. The randomly selected sample may naturally have a level of analyte at or above the fortification level in which case it was necessary to exclude it from the calculation of mean batch recovery. In these cases the samples were corrected to the blank matrix spike recovery only.

'Semi reference material Fusarium Toxins in Cereal NRL02' used as in-house reference material in this survey was produced in a closed proficiency test round. The number of data points contributing to the fit for purpose concentration range was low (only 3 laboratories). The material was characterised repeatedly in this survey (n=12). Whilst the HT-2 toxin values obtained compared well to the fit for purpose concentration range there was more variability in the T-2 toxin results. HT-2 toxin is a major metabolite of T-2 toxin. Conversion of T-2 toxin to HT-2 toxin may have occurred inhomogeneously on storage of the material. This may have resulted in a contribution and elevation of the HT-2 toxin level to keep it within the fit for purpose concentration range, a reduction in T-2 toxin concentration and the resulting scatter seen in the results for repeat extractions of T-2 toxin. Results for this in-house reference material still have value as they give assessment of repeated measure of T-2 and HT-2 toxins during the course of extractions.

7.3 Occurrence

HT-2 toxin was found at a level above the LOQ of 1 µg/kg in one hundred and seventy eight of the two hundred samples (89 %) and ranged up to 53.6 µg/kg in a sample of Micro Oats Rolled Oat Flakes (S15-038762). The sample packaging for this sample described it as 'Made in UK using oats from Various Countries', so the

exact source of the raw oats is not known. Eleven percent of samples did not contain HT-2 toxin above the LOQ.

Concentrations of T-2 toxin ranged from 1.1 µg/kg to 76.4 µg/kg found in a sample of porridge (S15-038846). Twenty three percent of samples (n=45) samples were below the T-2 toxin LOQ with eight seven percent % above the LOQ.

Six miscellaneous products that contained oats were also analysed consisting of four black pudding samples, one bread and one drinking oat sample. Concentrations for HT-2 toxin for black pudding ranged from 2.1 µg/kg (S15-038786) to 7.1 µg/kg (S15-039125). T-2 toxin content was seen at less than the LOQ (1 µg/kg) and up to 8.9 µg/kg for black pudding S15-039125. The oat content was not declared on any of the products however it was listed among the top four ingredients for all miscellaneous products.

T-2 toxin and HT-2 toxin data was summed to provide data that could be compared to Commission Recommendation 2013/165/EU. Sum Upper Bound and Sum Lower Bound values for T-2 and HT-2 toxins were also calculated for those samples where T-2 toxin and/ or HT-2 toxin were <LOQ at 1 µg/kg. Sum T-2 and HT-2 Lower Bound (µg/kg) was calculated by values <LOQ taken as zero and summed with concentration values found. Sum T-2 and HT-2 Upper Bound (µg/kg) was calculated by summing the LOQ with concentration values found.

22 of the 200 samples were <2 µg/kg Sum T-2 and HT-2 Upper Bound. This represented 11 % of samples. A further 23 samples had a level above the LOQ for HT-2 toxin but a level below the LOQ for T-2 toxin; the maximum Sum T-2 and HT-2 Upper Bound value for these samples was <6.5 µg/kg.

In summary, Sum T-2 and HT-2 Upper Bound concentrations between 2.7 µg/kg to 124.3 µg/kg (S15-038762) micro oats rolled oat flakes were found.

Commission Recommendation 2013/165/EU gives indicative levels for cereals and cereal products for human consumption. This includes indicative levels of 200 µg/kg for oat bran and flaked oats (section 3.1), 75 µg/kg for breakfast cereals including formed cereal flakes (section 3.4), 25 µg/kg for bread, pastries, biscuits, cereal snacks (section 3.5) and 15 µg/kg cereal-based foods for infants and young children under section 3.6. Four of the 200 samples analysed exceed the recommended indicative level. When MU was applied, all samples were below the recommended indicative levels.

8. Statistics

8.1 Measurement Uncertainty

The measurement uncertainty was estimated by the reproducibility of the measurement of the blank infant oat cereal matrix fortified at 10 µg/kg that was analysed with each batch. This also covered the contribution from sample inhomogeneity. The expanded measurement uncertainty was the combined variability multiplied by a coverage factor (k) of 2, and was 22 % for HT-2 toxin and 37 % for T-2 toxin.

9. Conclusions

A highly sensitive LC-MS/MS-based method for the determination of T-2 and HT-2 toxins in various oat based food matrices was successfully validated at levels down to an LOQ of 1 µg/kg.

Analyses were carried out in accordance with Commission Regulation (EC) No 401/2006. An LOQ of 1 µg/kg for each toxin was achieved which is lower than the target LOQ of 5 µg/kg for T-2 and HT-2 toxin individually set out in Commission Regulation (EC) No 401/2006.

22 of the 200 samples were <2 µg/kg Sum T-2 and HT-2 Upper Bound. This represented 11 % of samples. A further 23 samples (12 %) had a level above the LOQ for HT-2 toxin but a level below the LOQ for T-2 toxin; the maximum Sum T-2 and HT-2 Upper Bound value for these samples was <6.5 µg/kg.

Sum T-2 and HT-2 Upper Bound concentrations of T-2 toxin and HT-2 toxin were found above the LOQ in the remaining 155 samples between 2.7 µg/kg to 124.3 µg/kg (S15-038762) for micro oats rolled oat flakes. Purchased in Glasgow, this highest level sample was 'Made in UK using Oats from Various Countries'.

For some matrices, concentrations of the Sum T-2 and HT-2 (µg/kg) are approaching the indicative levels given in Commission Recommendation 2013/165/EU. Four of the 200 samples analysed exceeded the recommended indicative level. When MU was applied, all of these samples were below the recommended indicative level.

10. Further Work

Mycotoxin formation depends on various factors including climatic conditions, moisture content at storage, and product treatment. This survey reports results from sampling carried out in March and April 2015 and looks at products made from the 2014 UK oat harvest. Further analyses of samples derived from different crop years would be necessary to obtain information on seasonal variations.

11. References

- [1] COMMISSION RECOMMENDATION of 27 March 2013 on the presence of T-2 and HT-2 toxin in cereals and cereal products (Text with EEA relevance) (2013/165/EU)
- [2] Scientific Opinion on the risks for animal and public health related to the presence of T-2 and HT-2 toxin in food and feed
EFSA Journal 2011; 9(12):2481[187 pp.]. doi:10.2903/j.efsa.2011.2481
- [3] Presentation at T-2 and HT-2 toxin Stakeholder Meeting, held Food Standards Agency, Feb 2015.
- [4] COMMISSION REGULATION (EC) No 401/2006 of 23 February 2006 laying down the methods of sampling and analysis for the official control of the levels of mycotoxins in foodstuffs (Text with EEA relevance) (OJ L 70, 9.3.2006, p. 12).

12. Acknowledgements

Thanks to Fera sample preparation staff and Sharon Jardine for sample extractions.

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Appendix 1: T-2 and HT-2 Toxins in Oat Based Products – Results

Results are reported corrected for matrix blank and recovery.

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".

Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

T-2 and HT-2 Toxins in Oat Based Products: Results							
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 Lower Bound (µg/kg)	Sum T-2 and HT-2 Upper Bound (µg/kg)
S15-038782	Asda	Peanut butter granola bars	Glasgow City	<1	<1	0	<2
S15-038810	Asda Chosen By You	Oats & Honey Granola Bars	Swansea	<1	<1	0	<2
S15-038811	Hale & Hearty	Pure Oat Flapjack Supersnack	Swansea	<1	<1	0	<2
S15-038828	Organix Goodies	Cocoa & Raisin Soft Oaty Bars	Kent CC	<1	<1	0	<2
S15-038848	Nairn's	Gluten Free Biscuit Breaks oats and fruits	Greater Manchester South	<1	<1	0	<2

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results							
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 Lower Bound (µg/kg)	Sum T-2 and HT-2 Upper Bound (µg/kg)
S15-038863	M	Free From Flapjack Traybake	Greater Manchester South	<1	<1	0	<2
S15-038919	Sainsbury's freefrom	Oaty Flapjack Slices	Kent Cc	<1	<1	0	<2
S15-038927	Stoats	Blueberry & Honey Porridge Oat Bars	East Of Northern Ireland	<1	<1	0	<2
S15-038937	Rude Health	Oat & Spelt Thins	Online	<1	<1	0	<2
S15-038944	Clearspring	Organic Traditional Oatcakes	Online	<1	<1	0	<2
S15-039123	M-Free From	Gluten, Wheat & Milk free flapjacks	Kent Cc	<1	<1	0	<2
S15-039127	Nairn's	Gluten Free Chocolate Chip biscuits	Kent Cc	<1	<1	0	<2
S15-038805	Sainsbury's SO Organic	Granola	Swansea	<1	<1	0	<2
S15-038886	Neals Yard Wholefoods	Organic Muesli	Kent Cc	<1	<1	0	<2
S15-038949	Biona Organic	Granola Choco Coconut	Online	<1	<1	0	<2

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results							
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 Lower Bound (µg/kg)	Sum T-2 and HT-2 Upper Bound (µg/kg)
S15-038953	Alara	Organic Gluten Free Scottish Oats Granola	Online	<1	<1	0	<2
S15-038963	Sainsbury's	Express Pure Oats	Glasgow City	<1	<1	0	<2
S15-038831	Rude Health	Organic Oatmeal Porridge	Kent CC	<1	<1	0	<2
S15-038819	The Co-operative Loved By Us	Free From Porridge Oats	Swansea	<1	<1	0	<2
S15-038830	Waitrose LOVE life	Porridge Oats - Free from Gluten	Kent CC	<1	<1	0	<2
S15-038913	Nairn's Gluten Free	Instant Porridge Oats	Kent CC	<1	<1	0	<2
S15-038947	Alara	Pure Oats Gluten Free Porridge	Online	<1	<1	0	<2
S15-038939	Rude Health	Porridge Daily Oats Organic	Glasgow City	1.0q	<1	1.0q	<2
S15-038946	Your Piece Baking Company	Gluten Free Porridge Oats	Online	1.0q	<1	1.0q	<2
S15-038842	Nairn's	Gluten Free Biscuit Breaks Chocolate Chips	Greater Manchester South	1.1i	<1	1.1i	<2.1

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".
 Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results							
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 Lower Bound (µg/kg)	Sum T-2 and HT-2 Upper Bound (µg/kg)
S15-038790	Quaker Oats	Oat So Simple Morning Bar Golden Syrup	Glasgow City	1.2i	<1	1.2i	<2.2
S15-038861	Rude Health	Honey Puffed Oats	Greater Manchester South	1.2	<1	1.2	<2.2
S15-038954	Planet Organic	Organic Jumbo Oats	Online	1.2	<1	1.2	<2.2
S15-038766	Neals Yard Wholefoods	Gluten Free Oats	Glasgow City	1.7i	<1	1.7i	<2.7
S15-038829	Nairn's	Organic Oatcakes	Kent CC	1.8i	<1	1.8i	<2.8
S15-038884	Farmhouse Biscuits	Oat Flip Biscuits	Kent CC	1.8i	<1	1.8i	<2.8
S15-038950	Biona Organic	Granola Wild Berry Crisp	Online	1.8	<1	1.8	<2.8
S15-038955	Just Natural	Organic Oatmeal Fine	Online	1.8i	<1	1.8i	<2.8
S15-038769	Quaker Oats	Oats with Banana and Strawberry	Glasgow City	1.8i	<1	1.8i	<2.8
S15-038978	Asda	Oats and Honey Granola Bars	Greater Manchester South	1.9	<1	1.9	<2.9

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".
 Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results							
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 Lower Bound (µg/kg)	Sum T-2 and HT-2 Upper Bound (µg/kg)
S15-038974	Tesco	Oats Crispies	Greater Manchester South	1.9	<1	1.9	<2.9
S15-038841	Jordans	Organic Porridge	Greater Manchester South	2.0	<1	2.0	<3.0
S15-038878	Stoats	4 Apple and Cinnamon Porridge Oat Bars	Greater Manchester South	2.1i	<1	2.1i	<3.1
S15-038786	Malcolm Allan	Black Pudding	Glasgow City	2.1	<1	2.1	<3.1
S15-038902	Special K	Blueberry & Cranberry Multi-Grain Porridge	Kent CC	2.1	<1	2.1	<3.2
S15-038942	Rude Health	Drinking Oats	Online	2.6	<1	2.6	<3.6
S15-038793	Hovis	Hearty Oats Bread	Glasgow City	2.8	<1	2.8	<3.8
S15-038808	Sainsbury's SO Organic	Scottish Porridge Oats	Swansea	3.5	<1	3.5	<4.5
S15-038837	Shipton Mill	Organic Pinhead Oats	Online	3.8	<1	3.8	<4.8
S15-038821	Morrisons	Porridge Oats	Swansea	5.5	<1	5.5	<6.5

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".
 Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

The following samples have concentrations of T-2 and HT-2 above the LOQ (1 µg/kg).

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038835	Nairn's	Organic Oatcakes	Kent CC	2.1i	2.0	4.1i
S15-038849	Asda	Flapjack Mini Bites	Greater Manchester South	2.9i	1.4	4.3i
S15-038924	Sainsbury's	Oaty Biscuits	East Of Northern Ireland	2.9i	1.7	4.6i
S15-038892	Tesco	Oaties Biscuits	Kent CC	2.6i	2.1	4.7i
S15-038773	Tesco	Maple Syrup Oaty Granola bars	Glasgow City	4.8i	2.5	7.3i
S15-038867	Duchy Original	Organic Oaten Biscuits	Greater Manchester South	2.7i	2.2	4.9i
S15-038832	Macleans Hebridean Bakery	Hebridean Oatcakes	Glasgow City	2.5i	2.6	5.1i
S15-038785	Quaker Oats	Quaker Crunchy Bars Ginger Flavour	Glasgow City	3.6i	1.6	5.2i
S15-038803	Quaker Oats	Crunchy Bars Ginger	Swansea	3.7i	1.8	5.5i
S15-038809	Quaker Oats	Crunchy Bars Golden Syrup	Swansea	3.6i	1.9	5.5i

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".

Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038893	Quaker Oats	Maple & Pecan Flavour Crunchy Bars	Kent CC	3.5i	2.3	5.8i
S15-038890	Quaker Oats	Morning Bars Fruit Muesli Cereal Bars	Kent CC	4.5i	2.3	6.8i
S15-038815	Tesco	Honey Oaty Granola Bars	Swansea	3.4i	3.9	7.3i
S15-038770	Tesco	Scottish Rough Oatcakes	Glasgow City	4.3i	3.5	7.8i
S15-038833	Prewett's	Oatbran	Kent CC	5.4i	3.0	8.4i
S15-038932	Kelloggs	Kellogg's Nutri-grain Breakfast Granola Slices Honey	East Of Northern Ireland	6.6i	2.7	9.3i
S15-038905	Kelloggs	Nutri Grain Crunchy Breakfast Granola Slices Oats & Honey	Kent CC	5.8i	4.4	10.2i
S15-038772	Stoats	Raspberry and Honey Porridge Bar	Glasgow City	5.7i	5.1	10.8i
S15-038904	Stockan's	Thin Hand Baked Orkney Oatcakes	Kent CC	6.0i	4.9	10.9i
S15-038887	Nature Valley	Crunchy Cereal Bars Honey Flavour	Kent CC	8.1i	5.0	13.1i

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".

Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038812	Nairn's	Fine Milled Oatcakes	Swansea	4.3i	9.7	14.0i
S15-038888	Nature Valley	Crunchy Cereal Bars Variety pack	Kent CC	7.6i	10.5	18.1i
S15-038823	Scott's	Scottish Porage Oats Original	Kent CC	12.6i	6.2	18.8i
S15-038781	Nairn's	Oatcakes with Sunflower and Pumpkin Seeds	Glasgow City	9.1i	11.5	20.6i
S15-038824	by Sainsbury's	Express Porridge Golden Syrup Flavour Sachets	Kent CC	13.3i	13.5	26.8i
S15-038847	Nestle	Raisin Oats and More	Greater Manchester South	1.6	1.1	2.7
S15-038877	Tesco	Tesco Everyday Value Flapjack Traybake	Greater Manchester South	2.2	1.3	3.5
S15-038778	Kelloggs	Crunchy Nut Oat Granola with Chocolate	Glasgow City	2.4	1.3	3.7
S15-038802	The Bury Black Pudding Company	Traditional Black Pudding Slices	Swansea	2.6	1.3	3.9
S15-038894	Weetabix	Oat Cereal	Kent CC	2.1	1.9	4.0

LOQ HT-2 Toxin: 1 µg/kg LOQ T-2 Toxin: 1 µg/kg

Results which do not meet the acceptance criteria for identification in the LC-MS SOP are annotated "i".
Results which do not meet the acceptance criteria for quantification in the LC-MS SOP are annotated "q".

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038806	Nestle	Almond Oats & More	Swansea	3.2	1.2	4.4
S15-049826	Weetabix	Oatibix	Greater Manchester South	2.7	1.8	4.5
S15-038900	Tesco Finest	Red Berry Granola	Kent CC	2.5	2.2	4.7
S15-038897	Tesco	Honey Nut Cereal Clusters	Kent CC	3.4	1.6	4.9
S15-038962	Nestle	Raisin Oats and More	Glasgow City	2.4	2.5	4.9
S15-038938	The Food Doctor	Cacao & Tangerine Granola	Online	3.6	1.7	5.4
S15-038976	Kelloggs	Coco Pops Porridge	Greater Manchester South	3.7	1.9	5.6
S15-038920	Kelloggs	Oat Granola with Hazelnuts and Chocolate	Kent CC	3.9	1.7	5.6
S15-038916	Flahavans	Irish Porridge Oats Original	Kent CC	3.0	2.8	5.8
S15-038933	Kelloggs	Multi-grain Porridge Red Berries	East Of Northern Ireland	3.3	2.5	5.9

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038928	Nairn's	Cheese Oatcakes	East Of Northern Ireland	3.2	2.6	5.9
S15-038853	Mornflake	Classic Muesli Swiss Style	Greater Manchester South	3.7	2.2	5.9
S15-038765	Dorset Cereals	Dorset Cereals Chocolate Granola	Glasgow City	3.4	2.6	6.0
S15-049825	Grandma Wild's	Crumbly Oaties	Greater Manchester South	4.2	2.0	6.1
S15-038945	The Village Bakery Melmerby	Organic Oatcakes	Online	3.2	2.9	6.1
S15-038926	Tesco	Maple & Pecan Crisp	East Of Northern Ireland	4.0	2.3	6.3
S15-038813	Mornflake	Classic Granola Tropical	Swansea	4.4	2.0	6.4
S15-038917	Jordans	Baked Oat Bars with Honey and Almonds	Kent CC	4.3	2.1	6.4
S15-038856	Simon Howie	Perthshire The Wee Black Pudding	Greater Manchester South	3.9	2.6	6.5
S15-039126	Nairn's	Cheese Oatcakes	Kent CC	4.8	1.7	6.5

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038779	Kelloggs	Crunchy Nut Oat Granola Caramelised	Glasgow City	3.7	2.9	6.6
S15-038931	Kelloggs	Kellogg's Nutri-grain Breakfast Granola Slices Choc Chip	East Of Northern Ireland	4.4	2.3	6.8
S15-038929	Neals Yard Wholefoods	Organic Jumbo Oats	East Of Northern Ireland	4.8	2.0	6.8
S15-038820	Mornflake	Orchard Oat Granola	Swansea	4.2	2.6	6.8
S15-038977	White's	Oat Bran Medium Cut	Greater Manchester South	5.1	1.7	6.9
S15-038911	The Co-operative Loved by us	Tropical Granola	Kent CC	4.6	2.4	7.0
S15-038922	Mornflake	Classic Muesli Swiss Style	East Of Northern Ireland	4.1	2.9	7.0
S15-038895	Tesco	Strawberry and Yoghurt Cereal Clusters	Kent CC	4.3	2.9	7.1
S15-038964	Sainsbury's	Flapjack Bites	Glasgow City	5.0	2.2	7.2
S15-038951	Macleans Hebridean Bakery	Hebridean Triangular Oatcakes		4.8	2.4	7.2

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038834	Neals Yard Wholefoods	Flame Raisin Granola	Kent CC	4.7	2.6	7.3
S15-038948	Aberfeldy Oatmeal	Coarse Scotch Oatmeal	Online	5.7	1.7	7.5
S15-049828	Flahavans	Irish Porridge Oats Original	Greater Manchester South	3.5	4.0	7.5
S15-038866	M	Mega Maple and Pecan Clusters	Greater Manchester South	4.0	3.6	7.7
S15-039128	McVitie's	Milk Chocolate Hobnob Flapjacks	Kent CC	5.6	2.2	7.8
S15-039131	Weetabix	Oat Flake Cereal	Kent CC	4.3	3.9	8.2
S15-038789	Symington's	Oatburst Instant Porridge Maple Syrup Flavour	Glasgow City	5.4	2.9	8.3
S15-039124	M-Cake Shop	Fresh Baked Oat Flapjacks	Kent CC	6.5	1.9	8.3
S15-038761	Weetabix	Golden Oat Flakes	Glasgow City	4.6	3.9	8.6
S15-038843	Dorset Cereals	Honey Porridge	Greater Manchester South	5.2	3.3	8.6

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038973	Nestle	Nestle Almond, Oats and More Cereal	Greater Manchester South	3.9	4.8	8.7
S15-039134	Mornflake	Jumbo Oats	Kent CC	6.3	2.6	8.9
S15-038896	Dorset Cereals	Simply Oat Granola	Kent CC	6.3	3.1	9.4
S15-038852	Fuel	Original Porridge	Greater Manchester South	6.3	3.2	9.5
S15-038792	Nestle	Low Sugar Oat Cheerios	Glasgow City	5.3	4.3	9.5
S15-038957	Buy Wholefoods Online	Medium Oatmeal	Online	7.1	2.6	9.8
S15-038817	Quaker Oats	Wholegrain Rolled Oats	Swansea	5.8	4.0	9.8
S15-039129	M	Chunky Triple Chocolate Cereal Clusters	Kent CC	5.2	4.6	9.8
S15-038899	Tesco	Crunchy Oat Cereal with Coconut, Sultanas and Almonds	Kent CC	5.1	4.7	9.8
S15-038952	Alara	Organic Gluten Free Scottish Oats	Online	6.5	3.5	10.0

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-039132	Alpen	Fruit & Nut Porridge Sachets	Kent CC	7.6	2.4	10.0
S15-038940	Oomf	Bench Pressed Oats	Greater Manchester South	6.5	3.6	10.1
S15-038763	Co-op	Strawberry Granola	Glasgow City	5.4	4.8	10.2
S15-049827	Waitrose	Porridge Oats	Greater Manchester South	7.2	3.3	10.4
S15-038826	Jordans	Super Berry Granola Cereal	Kent CC	6.6	3.9	10.5
S15-038777	Nature Valley	Nature Valley Country Oat Bars with Chocolate	Glasgow City	6.9	3.8	10.7
S15-038941	RealFoods Online	Organically Produced Porridge Oat Flakes	Online	9.0	2.0	11.0
S15-038898	Tesco	Apple & Cinnamon Crisp	Kent CC	7.3	3.8	11.1
S15-038909	Nature Valley	Crunchy Oats & Honey Cereal Bar	Kent CC	7.2	4.4	11.5
S15-038906	Jordans	Raisin & Almond Crunchy Oat Granola	Kent CC	7.6	4.1	11.7

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038885	Perrin's Fine Foods	Muesli Base Deluxe	Kent CC	6.6	5.2	11.8
S15-039130	Jordans	Honey Baked Granola Cereal with Nuts	Kent CC	5.8	6.0	11.9
S15-038787	The Oat-So-Good Company	Sultana and Raisin Granola	Glasgow City	5.4	6.6	12.0
S15-038768	Tesco	Oat Bran Cereal	Glasgow City	7.1	6.3	13.4
S15-038854	Jordans	Crunchy Oat Granola Raisin and Almond	Greater Manchester South	8.2	5.2	13.4
S15-038788	The Oat-So-Good Company	Cranberry and Apricot Granola	Glasgow City	6.0	7.5	13.4
S15-038871	Tesco	Easy Oats Chunky Oats and Barley	Greater Manchester South	9.4	4.2	13.6
S15-038889	Ready brek	Porridge	Kent CC	7.8	6.4	14.1
S15-039135	M	Porridge Oats	Kent CC	9.5	4.6	14.1
S15-038836	Mrs Crimbles	Gluten Free Oat Flapjacks	Kent CC	10.4	4.0	14.4

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038784	Asda	Asda Blueberry Simply Porridge	Glasgow City	9.5	5.2	14.7
S15-038912	The Co-operative Loved by us	Porridge Oats	Kent CC	7.2	7.9	15.1
S15-038780	Jordans	Crunchy Oat Granola with Tropical Fruits	Glasgow City	9.9	5.7	15.5
S15-038959	Quaker Oats	So Simple Oats Porridge Original	Greater Manchester South	10.2	5.3	15.6
S15-049821	Sainsbury's	Granola with Raisins, Nuts and Honey	Greater Manchester South	8.2	7.4	15.7
S15-039125	Galtee	Traditional Black Pudding	Kent CC	7.1	8.9	16.0
S15-038855	Asda	Raisin, Honey and Almond Crunch Cereal	Greater Manchester South	7.3	8.7	16.1
S15-038859	Nature Valley	Crunchy Bars, Oats and Berries	Greater Manchester South	10.7	5.7	16.4
S15-038873	Weetabix	Ready Brek Super Smooth Porridge	Greater Manchester South	9.2	7.5	16.7
S15-038908	Oatburst	Maple Syrup Flavour Instant Porridge in a Pot	Kent CC	9.8	6.9	16.7

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038907	Asda Chosen by you	Golden Syrup Flavour Simply Porridge Oat Microwaveable Sachets	Kent CC	10.0	7.0	17.0
S15-049824	Nature Valley	Crunchy Oats and Honey Bars	Greater Manchester South	13.0	4.3	17.3
S15-038827	by Sainsbury's	Strawberry Granola	Kent CC	8.4	9.0	17.4
S15-038776	Patersons	Paterson's Rough Oatcakes	Glasgow City	9.1	8.5	17.6
S15-038875	Tesco Finest	Smoked Apple Oatcakes	Greater Manchester South	10.0	7.9	18.0
S15-038816	Tesco Finest	Scottish Porridge Oats	Swansea	14.9	3.2	18.1
S15-038891	Tesco	Scottish Rough Oatcakes	Kent CC	10.2	8.0	18.3
S15-038771	Stockan's	Thin Oatcakes	Glasgow City	9.5	9.0	18.5
S15-038961	Sainsbury's	Scottish Whole Rolled Chunky Oats	Glasgow City	11.9	6.6	18.5
S15-038956	Mornflake	Coarse Oatmeal Steel Cut	Online	13.4	5.3	18.6

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038822	M Savers	Porridge Oats	Swansea	13.1	6.1	19.3
S15-049823	Sainsbury's	Scottish Porridge Oats	Greater Manchester South	13.3	6.0	19.3
S15-038921	Asda	Smart Price Porridge Oats	East Of Northern Ireland	10.5	9.5	19.9
S15-038818	Scott's	Scott's Porage Oats Original	Swansea	10.1	10.4	20.5
S15-038775	Caithness Biscuits Ltd	Wee Oatcakes	Glasgow City	10.7	9.8	20.5
S15-038807	Sainsbury's	Ready Oats	Swansea	12.7	7.8	20.5
S15-038764	Waitrose	Porridge Oats with Wheatbran	Glasgow City	11.9	8.7	20.6
S15-038850	Asda	Ready Oats	Greater Manchester South	10.2	10.7	20.9
S15-038869	Waitrose Love Life	Rough Oatcakes	Greater Manchester South	12.3	9.3	21.7
S15-038791	Mornflake	Original Oats to go	Glasgow City	14.3	7.5	21.8

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-039133	Scott's	Scott's So Easy Creamy Porage Oats	Kent CC	13.8	8.5	22.3
S15-038901	Quaker Oats	Oat Granola	Kent CC	10.5	12.1	22.6
S15-038767	Quaker Oats	Cuppa Porridge - 5 Sachets-Golden Syrup	Glasgow City	13.7	9.1	22.8
S15-038965	Mornflake	Oatbran	Glasgow City	18.7	5.9	24.6
S15-038844	Mornflake	Medium Oatmeal Stone Ground	Greater Manchester South	19.5	5.6	25.1
S15-038903	Quaker Oats	Jumbo Whole Rolled Oats	Kent CC	13.1	12.8	25.9
S15-038865	M	Rough Scottish Oatcakes	Greater Manchester South	14.7	11.9	26.6
S15-038918	Sainsbury's Taste the Difference	Oat Digestive Biscuit for Cheese	Kent CC	16.1	11.7	27.8
S15-038981	Quaker Oats	Oats So Simple Caramel	Greater Manchester South	14.6	13.6	28.2
S15-038930	Prewett's	Medium Ground Oatmeal	East Of Northern Ireland	21.9	6.5	28.4

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038910	The Co-operative Loved by us	Scottish Oatcakes	Kent CC	13.0	15.9	28.9
S15-038845	Scott's	Porage Oats	Greater Manchester South	13.7	15.6	29.3
S15-049822	Mornflake	Medium Oatmeal Stoneground	Greater Manchester South	20.5	9.6	30.1
S15-038943	RealFoods Online	Fine Oatmeal	Online	19.3	11.1	30.4
S15-038804	Nature Valley	Crunchy Canadian Maple Syrup Bars	Swansea	20.4	11.4	31.7
S15-038923	Sainsbury's	Express Porridge Raspberry & Blue berry Individual Sachets	East Of Northern Ireland	17.1	14.9	32.0
S15-038914	Quaker Oats	Strawberry, Raspberry & Cranberry Flavour Porridge Oats Sachets	Kent CC	14.3	18.4	32.7
S15-038774	Scott's	Scott's Porage Oats	Glasgow City	20.8	13.2	33.9
S15-038958	Buy Wholefoods Online	Pinhead Oatmeal	Online	26.0	9.4	35.4
S15-038814	Asda Chosen By You	Wholegrain Scottish Porridge Oats	Swansea	19.3	19.3	38.6

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 1: Results Continued...

T-2 and HT-2 Toxins in Oat Based Products: Results						
Sample	Brand Name	Product Description	Point of Sampling	HT-2 toxin (µg/kg)	T-2 toxin (µg/kg)	Sum T-2 and HT-2 (µg/kg)
S15-038925	Quaker Oats	Oat So Simple	East Of Northern Ireland	29.5	21.3	50.8
S15-038825	by Sainsbury's	Express Porridge Original Sachets	Kent CC	26.5	26.0	52.4
S15-038915	Quaker Oats	Cuppa Porridge Sachets	Kent CC	20.8	34.6	55.3
S15-038846	Jordans	Chunky Traditional Porridge	Greater Manchester South	45.7	76.4	122.2
S15-038762	Co-op	Micro Oats Rolled Oat Flakes	Glasgow City	53.6	70.7	124.3

LOQ HT-2 Toxin: 1 µg/kg

LOQ T-2 Toxin: 1 µg/kg

Appendix 2: T-2 and HT-2 Toxins in Oat Based Products - Sample Descriptions

Samples are in numerical order based on LIMS number.

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038770	Oat Biscuit Products	Tesco	Scottish Rough Oatcakes	Tesco Stores Ltd	Scotland
S15-038771	Oat Biscuit Products	Stockan's	Thin Oatcakes	Stockan's Oatcakes Ltd	Scotland
S15-038772	Oat Biscuit Products	Stoats	Raspberry and Honey Porridge bar	Stoats	Scotland
S15-038773	Oat Biscuit Products	Tesco	Maple Syrup Oaty Granola bars	Tesco Stores Ltd	England
S15-038775	Oat Biscuit Products	Caithness Biscuits Ltd	Wee Oatcakes	Caithness Biscuits Ltd	Scotland
S15-038776	Oat Biscuit Products	Patersons	Paterson's Rough oatcakes	Paterson's	Scotland
S15-038777	Oat Biscuit Products	Nature Valley	Nature Valley Country Oat bars with Chocolate	General Mill International SARL	Spain
S15-038781	Oat Biscuit Products	Nairn's	Oatcakes with Sunflower and pumpkin seeds	Nairn's Oatcakes Ltd	Scotland
S15-038782	Oat Biscuit Products	Asda	Peanut butter granola bars	Asda Stores Ltd	Canada
S15-038785	Oat Biscuit Products	Quaker Oats	Quaker Crunchy bars ginger flavour	Quaker Oats	England
S15-038790	Oat Biscuit Products	Quaker Oats	Oat so Simple Morning bar golden syrup	Quaker Oats	UK
S15-038803	Oat Biscuit Products	Quaker Oats	Crunchy Bars Ginger	Quaker Oats	Not declared
S15-038804	Oat Biscuit Products	Nature Valley	Crunchy Canadian Maple Syrup Bars	General Mill International SARL	Spain
S15-038809	Oat Biscuit Products	Quaker Oats	Crunchy Bars Golden Syrup	Quaker Oats	Not declared
S15-038810	Oat Biscuit Products	Asda Chosen By You	Oats & Honey Granola Bars	Asda Stores Ltd	Canada
S15-038811	Oat Biscuit Products	Hale & Hearty	Pure Oat Flapjack Supersnack	Hale & Hearty Foods Ltd	UK
S15-038812	Oat Biscuit Products	Nairn's	Fine Milled Oatcakes	Nairn's Oatcakes Ltd	UK
S15-038815	Oat Biscuit Products	Tesco	Honey Oaty Granola Bars	Tesco Stores Ltd	UK
S15-038828	Oat Biscuit Products	Organix Goodies	Cocoa & Raisin Soft Oaty Bars	Organix Brands Ltd	Switzerland
S15-038829	Oat Biscuit Products	Nairn's	Organic Oatcakes	Nairn's Oatcakes Ltd	Scotland
S15-038832	Oat Biscuit Products	Macleans Hebridean Bakery	Hebridean Oatcakes	Macleans Hebridean Bakery Ltd	Scotland

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038835	Oat Biscuit Products	Nairn's	Organic Oatcakes	Nairn's Oatcakes Ltd	Scotland
S15-038836	Oat Biscuit Products	Mrs Crimbles	Gluten Free Oat Flapjacks	Mrs Crimbles	Not declared
S15-038842	Oat Biscuit Products	Nairn's	Gluten Free Biscuit Breaks Chocolate Chips	Nairn's Oatcakes Ltd	Not declared
S15-038848	Oat Biscuit Products	Nairn's	Gluten Free Biscuit Breaks oats and fruits	Nairn's Oatcakes Ltd	UK
S15-038849	Oat Biscuit Products	Asda	Flapjack Mini Bites	Asda Stores Ltd	UK
S15-038859	Oat Biscuit Products	Nature Valley	Crunchy Bars, Oats and Berries	General Mill International SARL	Spain
S15-038863	Oat Biscuit Products	M	Free From Flapjack Traybake	Wm Morrison PLC	Not declared
S15-038865	Oat Biscuit Products	M	Rough Scottish Oatcakes	Wm Morrison PLC	Not declared
S15-038867	Oat Biscuit Products	Duchy Original	Organic Oaten Biscuits	Waitrose Ltd	Not declared
S15-038869	Oat Biscuit Products	Waitrose Love Life	Rough Oatcakes	Waitrose Ltd	Not declared
S15-038875	Oat Biscuit Products	Tesco Finest	Smoked Apple Oatcakes	Tesco Stores Ltd	UK
S15-038877	Oat Biscuit Products	Tesco	Tesco Everyday Value Flapjack Traybake	Tesco Stores Ltd	UK
S15-038878	Oat Biscuit Products	Stoats	4 Apple and Cinnamon Porridge oat bars	Stoats	Not declared
S15-038884	Oat Biscuit Products	Farmhouse Biscuits	Oat Flip biscuits	Farmhouse Biscuits Ltd	UK
S15-038887	Oat Biscuit Products	Nature Valley	Crunchy cereal bars Honey flavour	General Mill International SARL	Spain
S15-038888	Oat Biscuit Products	Nature Valley	Crunchy cereal bars Variety pack	General Mill International SARL	Spain
S15-038890	Oat Biscuit Products	Quaker Oats	Morning Bars Fruit Muesli Cereal bars	Quaker Oats	Not declared
S15-038891	Oat Biscuit Products	Tesco	Scottish Rough Oatcakes	Tesco Stores Ltd	Scotland
S15-038892	Oat Biscuit Products	Tesco	Oaties Biscuits	Tesco Stores Ltd	UK
S15-038893	Oat Biscuit Products	Quaker Oats	Maple & Pecan flavour crunchy bars	Quaker Oats	Not declared
S15-038904	Oat Biscuit Products	Stockan's	Thin hand baked Orkney Oatcakes	Stockan's Oatcakes Ltd	Scotland
S15-038905	Oat Biscuit Products	Kelloggs	Nutri Grain Crunchy Breakfast Granola Slices Oats & Honey	Kellogg's	Not declared

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S-15038909	Oat Biscuit Products	Nature Valley	Crunchy Oats & Honey cereal bar	General Mills International SARL	Spain
S15-038910	Oat Biscuit Products	The Co-operative Loved by us	Scottish Oatcakes	The Co-operative Group Ltd	Scotland
S15-038917	Oat Biscuit Products	Jordans	Baked Oat Bars with Honey and Almonds	Jordans & Ryvita Company Ltd	Switzerland
S15-038918	Oat Biscuit Products	Sainsbury's Taste the Difference	Oat Digestive Biscuit for Cheese	Sainsbury's Supermarkets Ltd	Scotland
S15-038919	Oat Biscuit Products	Sainsbury's freefrom	Oaty Flapjack Slices	Sainsbury's Supermarkets Ltd	UK
S15-038924	Oat Biscuit Products	Sainsbury's	Oaty Biscuits	Sainsbury's Supermarkets Ltd	UK
S15-038927	Oat Biscuit Products	Stoats	Blueberry & Honey Porridge Oat Bars	Stoats	UK
S15-038928	Oat Biscuit Products	Nairn's	Cheese Oatcakes	Nairn's Oatcakes Ltd	Scotland
s15-038931	Oat Biscuit Products	Kelloggs	Kellogg's Nutri-grain breakfast granola slices choc chip	Kellogg's	UK
S15-038932	Oat Biscuit Products	Kelloggs	Kellogg's Nutri-grain Breakfast Granola slices honey	Kellogg's	UK
S15-038937	Oat Biscuit Products	Rude Health	Oat & Spelt Thins	Rude Health	Not declared
S15-038944	Oat Biscuit Products	Clearspring	Organic Traditional Oatcakes	Clearspring	Scotland
S15-038945	Oat Biscuit Products	The Village Bakery Melmerby	Organic Oatcakes	The Village Bakery Melmerby (Bells Of Lazonby)	EU
S15-038951	Oat Biscuit Products	Macleans Hebridean Bakery	Hebridean Triangular Oatcakes	Macleans Hebridean Bakery Ltd	Scotland
S15-038964	Oat Biscuit Products	Sainsbury's	Flapjack bites	Sainsbury's Supermarkets Ltd	UK
S15-038978	Oat Biscuit Products	Asda	Oats and Honey Granola Bars	Asda Stores Ltd	Canada
S15-039123	Oat Biscuit Products	M-Free From	Gluten, wheat & Milk free flapjacks	Wm Morrison PLC	Not declared
S15-039124	Oat Biscuit Products	M-Cake Shop	Fresh baked Oat flapjacks	Wm Morrison PLC	UK
S15-039126	Oat Biscuit Products	Nairn's	Cheese Oatcakes	Nairn's Oatcakes Ltd	Scotland
S15-039127	Oat Biscuit Products	Nairn's	Gluten Free Chocolate Chip biscuits	Nairn's Oatcakes Ltd	Scotland

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-039128	Oat Biscuit Products	McVitie's	Milk Chocolate Hobnob flapjacks	McVitie's	Not declared
S15-049824	Oat Biscuit Products	Nature Valley	Crunchy Oats and Honey bars	General Mill International SARL	Spain
S15-049825	Oat Biscuit Products	Grandma Wild's	Crumbly Oaties	Grandma Wild's	England
S15-049826	Oat Biscuit Products	Weetabix	Oatibix	Weetabix Ltd	UK
S15-038761	Oat cereals	Weetabix	Golden oat flakes	Weetabix Ltd	England
S15-038763	Oat Cereals	Co-op	Strawberry granola	The Co-operative Group Ltd	England
S15-038765	Oat cereals	Dorset Cereals	Dorset Cereals Chocolate Granola	Dorset Cereals Ltd	Not declared
S15-038778	Oat cereals	Kelloggs	Crunchy nut oat granola with chocolate	Kellogg's	England
S15-038779	Oat cereals	Kelloggs	Crunchy nut oat granola caramelised	Kellogg's	England
S15-038780	Oat cereals	Jordans	Crunchy Oat granola with tropical fruits	Jordans & Ryvita company Ltd	UK
S15-038792	Oat cereals	Nestle	Low sugar Oat Cheerios	Nestle	UK
S15-038805	Oat cereals	Sainsbury's SO Organic	Granola	Sainsbury's Supermarkets Ltd	UK
S15-038806	Oat cereals	Nestle	Almond Oats & More	Nestle	Not declared
S15-038813	Oat cereals	Mornflake	Classic Granola Tropical	Mornflake	Not declared
S15-038820	Oat cereals	Mornflake	Orchard Oat Granola	Mornflake	Not declared
S15-038826	Oat cereals	Jordans	Super Berry Granola Cereal	Jordans & Ryvita Company Ltd	UK
S15-038827	Oat cereals	by Sainsbury's	Strawberry Granola	Sainsbury's Supermarkets Ltd	Not declared
S15-038834	Oat cereals	Neals Yard Wholefoods	Flame Raisin Granola	NBTY Europe Ltd	Not declared
S15-038843	Oat cereals	Dorset Cereals	Honey Porridge	Dorset Cereals Ltd	Not declared
S15-038847	Oat cereals	Nestle	Raisin Oats and More	Nestle	Not declared
S15-038853	Oat cereals	Mornflake	Classic Muesli Swiss Style	Mornflake	More than one country
S15-038854	Oat cereals	Jordans	Crunchy Oat Granola Raisin and Almond	The Jordans and Ryvita Co Ltd	UK

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038855	Oat cereals	Asda	Raisin, Honey and Almond Crunch Cereal	Asda Stores Ltd	UK
S15-038861	Oat cereals	Rude Health	Honey Puffed Oats	Rude Health	Not declared
S15-038866	Oat cereals	M	Mega Maple and Pecan Clusters	Wm Morrison PLC	Not declared
S15-038871	Oat cereals	Tesco	Easy Oats Chunky Oats and Barley	Tesco Stores Ltd	UK
S15-038886	Oat cereals	Neals Yard Wholefoods	Organic Muesli	NBTY Europe Ltd	UK
S15-038894	Oat Cereals	Weetabix	Oat Cereal	Weetabix Ltd	Not declared
S15-038895	Oat cereals	Tesco	Strawberry and yoghurt cereal clusters	Tesco Stores Ltd	UK
S15-038896	Oat cereals	Dorset Cereals	Simply Oat Granola	Dorset Cereals Ltd	Not declared
S15-038897	Oat cereals	Tesco	Honey nut cereal clusters	Tesco Stores Ltd	UK
S15-038898	Oat cereals	Tesco	Apple & Cinnamon crisp	Tesco Stores Ltd	UK
S15-038899	Oat cereals	Tesco	Crunchy Oat Cereal with Coconut, Sultanas and Almonds	Tesco Stores Ltd	Belgium
S15-038900	Oat cereals	Tesco Finest	Red Berry Granola	Tesco Stores Ltd	UK
S15-038901	Oat cereals	Quaker Oats	Oat Granola	Quaker Oats	Not declared
S15-038906	Oat cereals	Jordans	Raisin & Almond Crunchy Oat Granola	Jordans & Ryvita Company Ltd	UK
S15-038911	Oat Cereals	The Co-operative Loved by us	Tropical Granola	The Co-operative Group Ltd	UK
S15-038920	Oat cereals	Kelloggs	Oat Granola with Hazelnuts and Chocolate	Kellogg's	Not declared
S15-038922	Oat cereals	Mornflake	Classic Muesli Swiss Style	Mornflake	UK
S15-038926	Oat cereals	Tesco	Maple & Pecan Crisp	Tesco Stores Ltd	UK
S15-038938	Oat Cereals	The Food Doctor	Cacao & Tangerine Granola	The Food Doctor	UK
S15-038949	Oat Cereals	Biona Organic	Granola Choco Coconut	Biona Organic	EU
S15-038950	Oat Cereals	Biona Organic	Granola Wild Berry Crisp	Biona Organic	EU
S15-038952	Oat Cereals	Alara	Organic gluten free Scottish Oats	Alara Wholefoods Ltd	Scotland

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038953	Oat Cereals	Alara	Organic Gluten Free Scottish Oats Granola	Alara Wholefoods Ltd	Scotland
S15-038962	Oat cereals	Nestle	Raisin Oats and More	Nestle	England
S15-038963	Oat cereals	Sainsbury's	Express Pure Oats	Sainsbury's Supermarkets Ltd	UK
S15-038973	Oat Cereals	Nestle	Nestle Almond, Oats and More Cereal	Nestle	Not declared
S15-038974	Oat Cereals	Tesco	Oats Crispies	Tesco Stores Ltd	Belgium
S15-039129	Oat cereals	M	Chunky Triple Chocolate cereal clusters	Wm Morrison PLC	Not declared
S15-039130	Oat cereals	Jordans	Honey baked Granola cereal with nuts	Jordans & Ryvita company Ltd	UK
S15-039131	Oat cereals	Weetabix	Oat flake cereal	Weetabix Ltd	Not declared
S15-049821	Oat cereals	Sainsbury's	Granola with Raisins, Nuts and Honey	Sainsbury's Supermarkets Ltd	UK
S15-049828	Oat cereals	Flahavans	Irish Porridge Oats Original	E. Flahavan & Sons Ltd	Ireland
S15-038787	Oat Cereals	The Oat-So-Good Company	Sultana and Raisin Granola	The Oat-So-Good Company	Wales
S15-038788	Oat Cereals	The Oat-So-Good Company	Cranberry and Apricot Granola	The Oat-So-Good Company	Wales
S15-038817	Oat Cereals	Quaker Oats	Wholegrain Rolled Oats	Quaker Oats	Not declared
S15-038818	Oat Cereals	Scott's	Scott's Porage Oats Original	Scotts Porage Oats	Not declared
S15-038885	Oat Cereals	Perrin's Fine Foods	Muesli Base Deluxe	Perrin's Fine Foods	UK
S15-038933	Oat Cereals	Kelloggs	Multi-grain Porridge Red Berries	Kellogg's	UK
S15-038768	Oatmeal	Tesco	Oat Bran Cereal	Tesco Stores Ltd	England
S15-038831	Oatmeal	Rude Health	Organic Oatmeal Porridge	Rude Health	Scotland
S15-038833	Oatmeal	Prewett's	Oatbran	Prewett's	UK
S15-038837	Oatmeal	Shipton Mill	Organic Pinhead Oats	Shipton Mill	UK
S15-038844	Oatmeal	Mornflake	Medium Oatmeal Stone Ground	Mornflake	UK
S15-038930	Oatmeal	Prewett's	Medium Ground Oatmeal	Prewett's	UK

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038943	Oatmeal	RealFoods Online	Fine Oatmeal	Realfoods Online	UK
S15-038948	Oatmeal	Aberfeldy Oatmeal	Coarse Scotch Oatmeal	Alberfeldy Oatmeal	Scotland
S15-038955	Oatmeal	Just Natural	Organic Oatmeal Fine	Just Natural Ltd	UK
S15-038956	Oatmeal	Mornflake	Coarse Oatmeal Steel Cut	Mornflake	England
S15-038957	Oatmeal	Buy Wholefoods Online	Medium Oatmeal	Buy Wholefoods Online	UK
S15-038958	Oatmeal	Buy Wholefoods Online	Pinhead Oatmeal	Buy Wholefoods Online	UK
S15-038965	Oatmeal	Mornflake	Oatbran	Mornflake	England
S15-038977	Oatmeal	White's	Oat bran medium cut	White's Oats Ltd	Not declared
S15-049822	Oatmeal	Mornflake	Medium Oatmeal Stoneground	Mornflake	UK
S15-038762	Oats	Co-op	Micro Oats Rolled Oat Flakes	The Co-operative Group Ltd	England
S15-038764	Oats	Waitrose	Porridge Oats with Wheatbran	Waitrose Ltd	England
S15-038766	Oats	Neals Yard Wholefoods	Gluten Free Oats	NBTY Europe Ltd	England
S15-038767	Oats	Quaker Oats	Cuppa Porridge - 5 sachets-Golden Syrup	Quaker Oats	England
S15-038769	Oats	Quaker Oats	Oats with Banana and Strawberry	Quaker Oats	England
S15-038774	Oats	Scott's	Scott's Porage oats	Scotts Porage Oats	Scotland
S15-038784	Oats	Asda	Asda Blueberry Simply Porridge	Asda Stores Ltd	England
S15-038789	Oats	Symington's	Oatburst instant porridge maple syrup flavour	Symingtons Ltd	UK
S15-038791	Oats	Mornflake	Original Oats to go	Mornflake	UK
S15-038807	Oats	Sainsbury's	Ready Oats	Sainsbury's Supermarkets Ltd	UK
S15-038808	Oats	Sainsbury's SO Organic	Scottish Porridge Oats	Sainsbury's Supermarkets Ltd	UK
S15-038814	Oats	Asda Chosen By You	Wholegrain Scottish Porridge Oats	Asda Stores Ltd	UK
S15-038816	Oats	Tesco Finest	Scottish Porridge Oats	Tesco Stores Ltd	UK

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038819	Oats	The Co-operative Loved By Us	Free From Porridge Oats	The Co-operative Group Ltd	Not declared
S15-038821	Oats	Morrisons	Porridge Oats	Wm Morrison PLC	Not declared
S15-038822	Oats	M Savers	Porridge Oats	Wm Morrison PLC	Not declared
S15-038823	Oats	Scott's	Scottish Porage Oats Original	Scotts Porage Oats	Not declared
S15-038824	Oats	by Sainsbury's	Express Porridge Golden Syrup Flavour Sachets	Sainsbury's Supermarkets Ltd	Scotland
S15-038825	Oats	by Sainsbury's	Express Porridge Original Sachets	Sainsbury's Supermarkets Ltd	Scotland
S15-038830	Oats	Waitrose LOVE life	Porridge Oats - Free from Gluten	Waitrose Ltd	Not declared
S15-038841	Oats	Jordans	Organic Porridge	Jordans & Ryvita company Ltd	UK
S15-038845	Oats	Scott's	Porage Oats	Scotts Porage Oats	UK
S15-038846	Oats	Jordans	Chunky Traditional Porridge	Jordans & Ryvita company Ltd	UK
S15-038850	Oats	Asda	Ready Oats	Asda Stores Ltd	UK
S15-038852	Oats	Fuel	Original Porridge	The Fuel Station	UK
S15-038873	Oats	Weetabix	Ready Brek Super Smooth Porridge	Weetabix Ltd	Not declared
S15-038889	Oats	Ready brek	Porridge	Weetabix Ltd	Not declared
S15-038902	Oats	Special K	Blueberry & Cranberry Multi-Grain Porridge	Kellogg's	Not declared
S15-038903	Oats	Quaker Oats	Jumbo Whole Rolled Oats	Quaker Oats	Not declared
S15-038907	Oats	Asda Chosen by you	Golden Syrup flavour simply porridge oat microwaveable sachets	Asda Stores Ltd	UK
S15-038908	Oats	Oatburst	Maple Syrup flavour instant porridge in a pot	Symingtons Ltd	UK
S15-038912	Oats	The Co-operative Loved by us	Porridge Oats	The Co-operative Group Ltd	UK
S15-038913	Oats	Nairn's Gluten Free	Instant Porridge Oats	Nairn's Oatcakes Ltd	Scotland

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038914	Oats	Quaker Oats	Strawberry, Raspberry & Cranberry flavour Porridge Oats Sachets	Quaker Oats	UK
S15-038915	Oats	Quaker Oats	Cuppa Porridge Sachets	Quaker Oats	UK
S15-038916	Oats	Flahavans	Irish Porridge Oats Original	E. Flahavan & Sons Ltd	Ireland
S15-038921	Oats	Asda	Smart Price Porridge Oats	Asda Stores Ltd	UK
S15-038923	Oats	Sainsbury's	Express porridge raspberry & blue berry individual sachets	Sainsbury's Supermarkets Ltd	UK
S15-038925	Oats	Quaker Oats	Oat so simple	Quaker Oats	UK
S15-038929	Oats	Neals Yard Wholefoods	Organic Jumbo Oats	NBTY Europe Ltd	UK
S15-038939	Oats	Rude Health	Porridge Daily Oats Organic	Rude Health	Scotland
S15-038941	Oats	RealFoods Online	Organically Produced Porridge Oat Flakes	Realfoods Online	UK
S15-038946	Oats	Your Piece Baking Company	Gluten Free Porridge Oats	Your Piece Baking Company	UK
S15-038947	Oats	Alara	Pure Oats Gluten Free Porridge	Alara Wholefoods Ltd	EU
S15-038954	Oats	Planet Organic	Organic Jumbo Oats	Planet Organic	UK
S15-038959	Oats	Quaker Oats	So Simple Oats Porridge Original	Quaker Oats	UK
S15-038961	Oats	Sainsbury's	Scottish Whole Rolled Chunky Oats	Sainsbury's Supermarkets Ltd	Scotland
S15-038976	Oats	Kelloggs	Coco pops Porridge	Kellogg's	Not declared
S15-038981	Oats	Quaker Oats	Oats so Simple Caramel	Quaker Oats	Not declared
S15-039132	Oats	Alpen	Fruit & Nut Porridge Sachets	Weetabix Ltd	Not declared
S15-039133	Oats	Scott's	Scott's So Easy Creamy Porage Oats	Scotts Porage Oats	Not declared
S15-039134	Oats	Mornflake	Jumbo Oats	Mornflake	UK
S15-039135	Oats	M	Porridge Oats	Wm Morrison PLC	UK
S15-049823	Oats	Sainsbury's	Scottish Porridge Oats	Sainsbury's Supermarkets Ltd	UK
S15-049827	Oats	Waitrose	Porridge Oats	Waitrose Ltd	Not declared
S15-038940	Oats	Oomf	Bench Pressed Oats	Oomf Ltd	UK

Appendix 2: Sample Description Continued...

T-2 and HT-2 Toxins in Oat Based Products: Sample Descriptions					
Sample	Group Name	Brand Name	Product Description	Manufacturer Name	Country of Origin
S15-038786	Other Products	Malcolm Allan	Black Pudding	Malcolm Allan	Scotland
S15-038793	Other Products	Hovis	Hearty Oats Bread	Hovis	England
S15-038802	Other products	The Bury Black Pudding Company	Traditional Black Pudding Slices	The Bury Black Pudding Company	UK
S15-038856	Other Products	Simon Howie	Perthshire The Wee Black Pudding	Simon Howie Foods -The Scottish Butcher	UK
S15-038942	Other Products	Rude Health	Drinking Oats	Rude Health	Not declared
S15-039125	Other Products	Galtee	Traditional Black pudding	Galtee	Republic of Ireland