

73/05      March/05

## **SURVEY OF SPICES FOR AFLATOXINS AND OCHRATOXIN A**

### **Summary**

This survey was undertaken following a notification from Hungary reporting levels of the naturally occurring mycotoxin aflatoxin, above the EC limits, in paprika. The main aim was to check that UK consumers were not being exposed to high levels of aflatoxins in spices such as paprika. The spices sampled included paprika, chilli powder and cayenne pepper. Samples were also analysed for ochratoxin A, to inform discussions on a future EC limit for this mycotoxin in spices.

A total of 61 samples of spices were collected from a wide cross-section of warehouses, packing establishments, supermarkets and smaller shops. Samples from warehouses and packing establishments were collected by local authority officers, and retail products were collected from supermarkets and smaller retailers by Ventress Technical Services. All samples were analysed for the mycotoxins by RHM Technology.

Three samples were found to exceed the legal limits of 5 micrograms/kilogram ( $\mu\text{g}/\text{kg}$ ) for aflatoxin B1 and 10  $\mu\text{g}/\text{kg}$  for total aflatoxins when the measurement uncertainty was taken into account. A further sample exceeded the legal limit for aflatoxin B1. All manufacturers and suppliers of products that exceeded the limits for aflatoxins have, as requested, withdrawn the affected batches from the food chain.

Two samples were found to contain levels of ochratoxin A which could result in consumers exceeding the tolerable daily intake. One of these samples also contained aflatoxins above the legal limit. Both of these products have been withdrawn from the food chain.

The survey results provide an opportunity to review procedures in the spice supply chain to ensure that products meet existing limits for aflatoxins and to ensure the industry is well placed to comply with future EC limits for ochratoxin A.

## **Background**

### *Mycotoxins*

Mycotoxins are naturally-occurring toxins produced by certain fungi that can grow on foods such as cereals, nuts, dried fruits, spices and legumes under certain environmental conditions. Most mycotoxins are chemically stable and survive food processing. The most commonly observed mycotoxins include the aflatoxins (B1, B2, G1 and G2) and ochratoxin A.

Aflatoxins have been shown to cause cancer of the liver in laboratory animals and to directly damage DNA. They are also considered to cause liver cancer in humans, particularly in a number of developing countries, where high levels of aflatoxins are found in some staple foods. For this type of carcinogen, known as a genotoxic carcinogen, it is not possible to determine a threshold level below which the toxin is considered to have no effect. However, the risk from consuming food containing very low levels of mycotoxins is considered to be small.

TDI's have been proposed for ochratoxin A by scientific committees, such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA), based on the assumption that there is a threshold level, below which the toxins are considered to not cause an adverse effect. Ochratoxin A has been shown to damage, and cause cancer of, the kidneys in laboratory animals. Because of uncertainties about the mechanism of carcinogenicity of ochratoxin A and concerns over the potential genotoxicity of ochratoxin A, in 1998, SCF considered that exposure to ochratoxin A should be towards the lower end of the range of the tolerable daily intakes proposed by other bodies, i.e. below 5 nanograms per kilogram body weight per day (ng/kg bw/day).

### *Aflatoxins in Hungarian paprika*

In October 2004 the Hungarian food safety authorities alerted EU Member States that a consignment of paprika on the Hungarian market contained aflatoxins above the EC permitted limits. This incident and others led the Hungarian Authorities to issue a ban on the use of ground red pepper (paprika). In the UK, regular checks are carried out to ensure products comply with legislation. These checks are carried out by port health authorities (PHAs) at the point of import and trading standards officers and environmental

health officers at manufacturer's premises and at retail level. Processors are also expected to carry out quality controls on their products before they are put on sale, in order to ensure that their products meet the legal limits. Following the notification from Hungary, the Agency requested PHAs to test all consignments of chilli powder, paprika and cayenne pepper imported into the UK for aflatoxins.

In order to ensure that UK consumers were not being exposed to high levels of mycotoxins in spices such as paprika, already on the market, the Agency has undertaken its own survey of aflatoxins in paprika and the related products chilli powder and cayenne pepper. Samples were collected for this survey from both warehouses and retail outlets. Samples were also analysed for ochratoxin A, a mycotoxin that can also be formed in spices, to inform future negotiations in Brussels regarding limits for ochratoxin A in spices.

### **Legislation**

Limits for mycotoxins such as aflatoxins and ochratoxin A in foods are set by EC Regulation 466/2001<sup>1</sup>, as amended, setting maximum limits for certain contaminants in foodstuffs. The most recent amendments to this Regulation include new limits for aflatoxin B1 and ochratoxin A in infant foods and for ochratoxin A in coffee, wine and grape juice.

EC Regulation 472/2002<sup>2</sup> amending EC Regulation 466/2001 sets limits of 5 µg/kg for aflatoxin B1 and 10 µg/kg for total aflatoxins in certain spices (dried, whole or ground *Capsicum* spp., including chillies, chilli powder, cayenne pepper and paprika, white and black pepper, nutmeg, ginger and turmeric. Directive 2002/27<sup>3</sup>, lays down procedures for the sampling and analysis of spices for official control. This legislation is implemented in England by the Contaminants in Food (England) Regulations 2004 [Statutory Instrument 2004 No. 3062]. There are equivalent Regulations for Scotland, Wales and Northern Ireland.

There are currently no legal limits for ochratoxin A in spices, however, a Commission Working Group has been discussing a limit for ochratoxin A for spices such as paprika, pepper, chilli powder, cayenne pepper, nutmeg and ginger. In July 2003 The European Commission issued a document (SANCO/0063/2003-rev2) for consultation setting out draft limits for ochratoxin A in a variety of commodities, including spices. The Agency circulated this document to interested parties in the UK in August 2003. Negotiations on limits for ochratoxin A are expected to resume when the European Food Safety Authority (EFSA) provides its opinion on the toxicity of ochratoxin A.

## Sampling

Sampling of spices at retail level was carried out by Ventress Technical Services Ltd and sampling at warehouses, distributors and packers by local authority officers within their area of responsibility. Sampling from warehouses allowed larger and more representative samples to be taken.

Studies have demonstrated that aflatoxins and other mycotoxins are seldom uniformly distributed throughout most food and feed commodities. For this reason, sampling procedures have been established in order to obtain the most accurate estimation of mycotoxin contamination in foods at different points in the supply chain. Procedures for appropriate sampling of products on retail sale are different from those appropriate for sampling of bulk consignments. The latter are set by Commission Directives 98/53/EC EC<sup>4</sup> and 2002/26/EC<sup>5</sup> laying down the methods of analysis for the official control of the levels of aflatoxins and ochratoxin respectively in foodstuffs. Sampling protocols were devised in accordance with these Directives.

### *Sampling from warehouses, distributors and packers*

Local authority sampling officers took a total of 34 samples of spices. 15 samples of paprika, 18 samples of chilli powder and 1 sample of cayenne pepper. The weight of samples ranged from 400g to 5 kg. Further details of the samples taken by the local authorities are given in Table 1.

### *Retail sampling*

The sampling plan for the retail samples took into account, where possible, the market share of different retailers and brands, while keeping duplication of samples already collected from warehouses and across regions of the UK to a minimum. A wide range of brands and retailers was covered in order to ensure that the survey was representative of the supply of products available to consumers in the UK. The samples were selected at random from a variety of retail outlets, including supermarkets and smaller shops in London, Leeds, Birmingham, Cambridge and Stevenage.

A total of 27 samples were taken from shops: 11 paprika, 13 chilli powder and 3 cayenne pepper products. The absence of a particular brand from this survey means only that the product was not included in the sampling. For mycotoxins surveys carried out by the

Agency, a representative retail sample, in this case a minimum of 400 g in weight, is taken. Where the product was sold in packs of less than 400 g, a number of retail packs were purchased, ensuring that all came from the same batch, and these were mixed thoroughly before taking a sample for analysis. Details of the retail products sampled are listed in Table 1.

Of the 61 products sampled in the survey, 5% (3 samples) were labelled as being produced from organically-grown ingredients. However, whether a product was labelled as organic or not was not taken into account while interpreting the results of this survey.

### **Methodology**

All the samples were delivered to RHM at the required storage temperature and upon receipt were stored at -16°C until required for analysis. All samples were analysed within the shelf life of the product. Samples were processed and analysed in the same manner regardless of whether they were sampled from a warehouse or at the retail level.

Samples that were made up of multiple cartons/bottles were combined and mixed thoroughly prior to being homogenised with water to a uniform slurry consistency. The homogenised samples were then split equally among 3 containers ('A', 'B' and 'C') and stored at -16°C. Sample A was used for these analyses and samples B and C were retained frozen, one for the analysis by the manufacturer/retailer at their request if required and the other for referee purposes.

The analysis was carried out by RHM using validated UKAS accredited methods using high performance liquid chromatography (HPLC). Details of these methods have been published by RHM<sup>6</sup>. The limit of quantification (LOQ) is the minimum level of analyte that can be detected reliably. Details of LOQ are summarised in Table 2. All results were corrected for recovery. A summary of these recovery values is shown in Table 3.

All samples found to contain aflatoxins above the legal level or ochratoxin A were analysed in duplicate and the results confirmed using a different method of analysis.

### **Quality Assurance**

Quality assurance for the analysis was monitored by RHM using naturally contaminated in-house reference materials. RHM also participate in UK and EU proficiency schemes, collaborative and inter-comparison trials. All analyses were conducted with spiked

samples; i.e. a known amount of aflatoxin or ochratoxin was added to each batch of samples of each matrix, prior to extraction. These samples were used to assess recovery, with recoveries between 70 and 110% classed as valid.

### **Measurement uncertainty**

The analytical results contain a variability known as measurement uncertainty (MU). For any analytical method each result is reported as the best estimate for the sample and it is always qualified by a measurement of uncertainty, eg x micrograms/kilogram ( $\mu\text{g}/\text{kg}$ )  $\pm$  y micrograms/kilogram. It is within this range of values that the analyst is 95% sure that the true value lies. Legislation setting limits for aflatoxins in certain foodstuffs requires that this measurement uncertainty be taken into account when comparing the levels of mycotoxins observed with legal limits.

For this survey the calculation of MU was carried out using RHM's in-house data and a standard coverage factor of 2, equivalent to a confidence factor of 95%. The MU associated with samples that tested positive for aflatoxins and ochratoxin A is listed in the results table.

### **Results**

All the analytical results reported by this survey are given as the best estimate values, corrected for recovery, but do not take into account the measurement uncertainty. Food Standards Agency surveys of contaminants are usually reported in this manner since these best estimate values are used to calculate dietary intakes of the various contaminants. Taking into account measurement uncertainty may lead to underestimates of exposure. However, when comparing results to legal limits, the Agency takes action when the best estimate, minus measurement uncertainty, exceeds the regulatory limit.

The full analytical results of the survey are detailed in Table 4. The survey found that for samples taken from warehouses, 3 of the 34 samples, all chilli powder, were above the maximum permitted level for aflatoxins when the measurement uncertainty was taken into account. In addition to the above, a single sample of chilli powder contained aflatoxin B1 above the legal limit as well as high levels of ochratoxin A .

For the 27 samples of retail products taken, 1 sample of cayenne pepper exceeded the limit for aflatoxin B1, when the measurement uncertainty was taken into account..

Ochratoxin A was reported with levels between 0.2 and 152.2 µg/kg (see below).

### **Dietary exposure estimates**

In order to assess the risk to public health from consumption of mycotoxins, the exposure of consumers to these toxins can be compared to safety guidelines such as Tolerable Daily Intakes (TDIs).

No TDI can be set for aflatoxin as it is not possible to determine a threshold level below which this toxin is considered to have no effect. The regulatory limits for aflatoxin are set to ensure that any risk from total dietary intake is very low. Occasionally eating foods containing aflatoxin at levels marginally above the regulatory limit will not increase that very low risk.

For ochratoxin A, total dietary exposures were estimated using recipe data available, the levels of ochratoxin A in spices found in the survey and contributions to ochratoxin A exposure from the rest of the diet. Two samples could have caused consumers to exceed an exposure of 5 ng/kg bw/day. Both these products were withdrawn from the food chain.

### **Agency Action**

Following receipt of the analytical results, the Agency took action on samples that were found to exceed statutory limits for aflatoxins. All the companies concerned were contacted, informed of the result and the relevant limit, and were requested to take action.

The traceability of all the affected samples was also investigated. The brand owners of these samples were asked to provide information on their suppliers (importers/wholesalers). The importers/wholesalers of the original consignments were then contacted and were requested to inform other companies who were also supplied with spices from the same consignments. Manufacturers were also invited to send in results of their own analyses to demonstrate that testing had taken place.

A summary of the companies involved as well as their actions appears as Table 5. In accordance with the Agency's survey guidelines, these companies were given the opportunity to comment on their results. These comments appear in the Annex.

The European Commission was also notified of those samples that exceeded the regulatory limits via the Commission's Rapid Alert System for Food and Feed (RASFF).

A risk assessment was carried out for all the samples that contained ochratoxin A. Two samples, an organic paprika and a ground chilli product, were found to contain levels of ochratoxin A which could result in consumers exceeding the TDI. Both these samples were collected from warehouses and have now been voluntarily withdrawn from the food chain and destroyed.

## **Conclusion**

This survey reported some products with concentrations above the legal limit for aflatoxins. However, occasional consumption of food products with aflatoxin, although not desirable, is not considered to present any increased risk to human health.

The survey also indicated that further work may be needed by food operators to ensure that consignments of spices are able to meet existing limits for aflatoxins and future EC limits for ochratoxin A.

Fungal contamination of various food commodities, including spices, with consequent exposure of the population to mycotoxins is a hazard that has always existed. The Agency is of the opinion that provided that the levels of mycotoxins are kept to the lowest levels that are reasonably achievable, the consumption of spices as a part of a healthy and balanced diet does not pose a significant risk to consumer health.

## **References**

1. European Commission. Commission Regulation (EC) No 466/2001 of 8 March 2001. Official Journal of the European Communities No. **L77**, 1-13.
2. European Commission. Commission Regulation (EC) No 472/2002 of 12 March 2002. Official Journal of the European Communities No. **L75**, 18-20.
3. European Commission. Commission Directive No 2002/27/EC of 13 March 2002. Official Journal of the European Communities No. **L75**, 44-45.

4. European Commission. Commission Directive No 98/53/EC of 16 July 1998. Official Journal of the European Communities No. **L201**, 93-101.
5. European Commission. Commission Directive No 2002/26/EC of 16 March 2002. Official Journal of the European Communities No. **L75**, 38-43.
6. Patel, S., Hazel, C.M., Winterton, A.G.M. and Mortby, E., 1996. Survey of Ethnic Foods for Mycotoxins. *Food Additives & Contaminants* **13** (7), 833-841.
7. European Commission. Council Regulation (EC) No 178/2002 of 28 January 2002. Official Journal of the European Communities No. **L31**, 1-24.

#### **Further Information**

Further information on this survey can be obtained from:

Dr Wendy Matthews

Food Standards Agency  
Chemical Safety Division  
Room 707c, Aviation House  
125 Kingsway  
WC2B 6NH  
Tel: +44 (0) 20 7276 8707  
Fax: +44 (0) 20 7276 8717  
E-mail: [wendy.matthews@foodstandards.gsi.gov.uk](mailto:wendy.matthews@foodstandards.gsi.gov.uk)

A copy of the final report of this survey has been placed in the FSA Library – address details below. If you wish to consult a copy, please contact the library for an appointment giving at least 24 hours notice or, alternatively, copies can be obtained from the Library: a charge will be made to cover photocopying and postage.

The Food Standards Agency Library  
Aviation House  
125 Kingsway  
London  
WC2B 6NH  
Tel: +44 (0) 20 7276 8281/8182  
Fax: +44 (0) 20 7276 8193  
E-mail: [library&info@foodstandards.gsi.gov.uk](mailto:library&info@foodstandards.gsi.gov.uk)



**Table 1: Sample details**

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
04B-04284	BTS 09814	Paprika	unknown	unknown	unknown	Bart Spices	York Road Bedminster Bristol BS3 4AD
04B-04285	BTS 09821	Organic Paprika	unknown	unknown	unknown	Bart Spices	York Road Bedminster Bristol BS3 4AD
04B-04286	BTS 09823	Paprika	unknown	unknown	unknown	Bart Spices	York Road Bedminster Bristol BS3 4AD
04B-04287	BTS 09813	Organic Paprika	unknown	unknown	unknown	Bart Spices	York Road Bedminster Bristol BS3 4AD
04B-04288	BTS 09812	Cayenne Pepper	unknown	unknown	unknown	Bart Spices	York Road Bedminster Bristol BS3 4AD
04B-04289	LTS 03747	Raazi Chilly Powder - Kashmiri	July 2006	12004	India	Ghelanis Superstore	180 Catherine Street Leicester
04B-04290	LTS 03748	Red Hot Stemless Chilli Powder	unknown	unknown	India	Jalpur Millers	133A Harrison Road Leicester LE4 6NP
04B-04291	LTS 03749	Extra Hot Chilli Powder	unknown	unknown	India	Jalpur Millers	133A Harrison Road Leicester LE4 6NP
04B-04292	LBB 001	Chilli Powder	June 2006	12005 E/662	India	Natco Foods Ltd	Choithram House Lancelot Road Wembley

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
							Middx HA0 2 BG
04B-04293	LTS 03750	Chilli Powder - Dandi cut	2006	unknown	India	Ashapura Millers Ltd	43A St. Bernard Street Leicester LE4 5JR
04B-04294	78017	Chilly powder - extra hot	June 2006	TWI/0406 02	India	Lubna Foods Ltd	Garnett Street Bradford BD3 9HA
04B-04295	78018	Sweet Paprika	Feb 2007	P:00047	Spain	Lubna Foods Ltd	Garnett Street Bradford BD3 9HA
04B-04296	HBC 001	Paprika CCSI M/Safe (M3074)	July 2006	A- 6643/AA0 400013	Spain	Lions Foods Ltd	Faraday Road Astmoor Runcorn WA2 1PE
04B-04297	HBC 002	Chilli Powder 35 HU M/Safe (M3200)	May 2006	BH04000 93	Spain	Lions Foods Ltd	Faraday Road Astmoor Runcorn WA2 1PE
04B-04298	LBE 001	TRS Chilli Powder	31-10-06	L4285	unknown	TRS Cash & Carry	TRS 2 Southbridge Way Southall UB2 4AX
04B-04299	LBE 002	TRS Paprika	30-11-06	L4323	unknown	TRS Cash & Carry	TRS 2 Southbridge Way Southall UB2 4AX
04B-04300	LBE 003	Rajah Extra Hot Chilli Powder	June 2006	IA621	unknown	TRS Cash & Carry	TRS 2 Southbridge Way Southall UB2 4AX
04B-04301	LTS 03990	Paprika Powder 100 Asta	Nov 2005	unknown	South Africa	FGS Mills	24 Burfield Street Leicester LE4 6AL
04B-04302	LTS 03991	Paprika Powder Steam Sterilised	July 2006	unknown	unknown	Jalpur Millers	133A Harrison Road Leicester LE4 6NP
04B-04303	LTS 03992	Triple Lion Red Chilly Powder	June 2006	unknown	India	FGS Mills	24 Burfield Street Leicester LE4 6AL
04B-04304 <sup>4</sup>	LTS 03993	Triple Lion Red Chilly Powder	June 2006	unknown	India	FGS Mills	24 Burfield Street Leicester LE4 6AL

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
04B-04305	BTS 1	Rajah Paprika	13/09/2006	unknown	unknown	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04306	BTS 2	Creende Natural Dried Chilli Powder	8/01/2007	unknown	China	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04307	BTS 3	Rajah Chilli Powder	11/06/2006	unknown	unknown	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04308	BTS 4	Rajah Extra Hot Chilli Powder	20/05/2006	unknown	unknown	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04309	BTS 5	TRS Chilli Powder Extra Hot	Oct 2004	L4293	Several	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04310	BTS 6	TRS Paprika	30/09/2006	L4246	Several	Wing Yip	Nechells Park Road Nechells Birmingham B7 5NA
04B-04311	BTS 7	Indus Chilli Powder extra hot	Feb 2005	3925	unknown	Indus Foods	Stratford Street North Birmingham B11 1BH
04B-04312	BTS 8	Indus Paprika Powder	Feb 2005	3921N	unknown	Indus Foods	Stratford Street North Birmingham B11 1BH
04B-04313	BTS 9	Rajah Chilli Powder	31/05/2006	unknown	unknown	Giro Foods	Welcome House Glover Street Bordesley Birmingham B9 4EP
04B-04314	BTS 10	Rajah Paprika	22/08/2005	unknown	unknown	Giro Foods	Welcome House Glover Street Bordesley Birmingham B9 4EP
04B-04315	no number given	Paprika	unknown	WH139 29-11-04	Spain	Green Cuisine	3 Threxton Way Threxton Road Industrial Estate

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
							Watton Norfolk IP25 6NG
04B-04316	no number given	Ground Chilli	unknown	PI 7-10-04	India	Green Cuisine	3 Thrextton Way Thrextton Road Industrial Estate Watton Norfolk IP25 6NG
04B-04342	GBC001	Natco Natural Foods Paprika Powder	J211004C	Sept 2006	unknown	Sita Spices	6 Kingside Ruston Rd London SE18 5BX
04B-04317	Asda	Paprika Refill (40 g)	APR2006	4307MAA	UK	Asda	Killingbeck Drive Halton LS14 6UT
04B-04318	Morrisons	Chilli Powder (50 g)	DEC2006	4348	None declared	Morrisons	Kirkstall Valley Retail Park Kirkstall LS5 3RP
04B-04319	Sainsbury's	Paprika (44 g)	DEC 2006	4357A	UK	Sainsbury's	Moor Allerton Centre King Lane Leeds LS17 5NY
04B-04320	Chef William	Ground Cayenne Pepper (500 g)	SEP 05	L252/3547	None declared	Fair Deal Cash & Carry	3-7 Westgreen Road Tottenham London N15 5BX
04B-04321	Fudco	Gondal Hot Chilli Powder (1 kg)	NOV 2006	B/no H41181K	India	Tesco	361 Roundhay Road Leeds LS8 4BU
04B-04322	East End	Paprika (300 g)	07/06/07	4342 L1A	Foreign Produce Packed in the UK	Eastern Foods	329 – 331 Roundhay Road Leeds LS8 4HT
04B-04323	East End	Chilli Powder (100 g)	2/10/05	3275 L6	Produce of Pakistan Packed in UK	Rashid Bros	259 Roundhay Road Leeds LS8 4HS
04B-04324	Sara	Paprika (75 g)	31/03/2006	None declared	Product of more than	Abu Bakar	37 Queens Road Leeds LS6 1NY

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
					one country		
04B-04325	Narmah	Red Chilli Powder (200 g)	MAY 2006	None declared	Pakistan	T.F.C.	678-682 High Road Tottenham London N17 0AE
04B-04326	EDA	Chillie Powder (Aci Toz Biber) (100 g)	DEC 2005	None declared	Produce of more than one country	T.F.C.	678-682 High Road Tottenham London N17 0AE
04B-04327	EDA	Paprika Powder (Tatli Toz Biber) (100 g)	JAN 2006	None declared	Produce of more than one country	T.F.C.	678-682 High Road Tottenham London N17 0AE
04B-04328	Kohinoor	Red Chilli Powder (300 g)	08/2005	None declared	None declared	Tesco	230 High Road Tottenham London N15 4AJ
04B-04329	Tesco	Ground Cayenne (48 g)	NOV2005	4322BV	Produce of more than one country. Packed in the UK.	Tesco	230 High Road Tottenham London N15 4AJ
04B-04329	Tesco	Ground Cayenne (48 g)	NOV2005	4322BV	Produce of more than one country. Packed in the UK.	Tesco	21-35 Stratford Road Shirley Solihull B90 3LU
04B-04330	Natco	Paprika Powder (400 g)	10/2006	U141204 04JJ38	Spain	Tesco	230 High Road Tottenham London N15 4AJ
04B-04331	Schwartz	Paprika (80 g)	11.2006	L4328D	Packed in EU	Tesco	230 High Road Tottenham London N15 4AJ
04B-04332	Schwartz	Hot Paprika (34 g refill)	05.2006	L4124 A	Packed in EU	Tesco	230 High Road Tottenham London N15 4AJ

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
04B-04332	Schwartz	Hot Paprika (34 g refill)	05.2006	L4124 A	Packed in EU	Sainsbury's	Poplar Way Solihull West Midlands B91 3DX
04B-04333	Morrisons	Ground Paprika (100 g)	NOV2007	4307	None declared	Morrisons	George Road Solihull West Midlands B91 3BQ
04B-04334	East End	Extra Hot Chilli Powder (1 kg)	03/08/06	4216 L2B	Foreign produce	Cost Less Supermarket	1088 Stratford Road Hall Green Birmingham B28 8AD
04B-04335	Tesco	Paprika (52 g)	DEC2005	4356BV	Produce of more than one country. Packed in the UK.	Tesco	21-35 Stratford Road Shirley Solihull B90 3LU
04B-04336	Tesco	Smoked Paprika (48 g)	DEC2006	4345BV	Packed in the UK	Tesco	21-35 Stratford Road Shirley Solihull B90 3LU
04B-04337	Natco	Chilli Powder (1 kg)	4/2006	U030904 011778B/ 530	India	Azad Supermarket	154-158 Stoney Lane Sparkbrook Birmingham B12 8AJ
04B-04338	Schwartz	Hot Chili Powder (85 g)	08.2005	L32380	EU	Somerfield	1 Stainbeck Lane Leeds LS7 3PJ
04B-04339	The Spice Shop	Cayenne Pepper Organic (50 g)	MAY.2007	None declared	None declared	The Spice Shop	1 Blenheim Crescent London W11 2EE
04B-04340	White Pearl	Extra Hot Chilli Powder (100 g)	JAN 2006	N601040 P	Product of several countries. Packed in the UK.	Costcutter	15-23 Porchester Road Bayswater London W2 5DP
04B-04341	Nisa	Hot Chilli Powder (50 g)	OCT 2005	L3302	Packed in the UK.	Costcutter	15-23 Porchester Road Bayswater London W2 5DP

Laboratory Sample code	Local Authority sample code/Brand <sup>1</sup>	Product as described <sup>2</sup>	Best before date <sup>3</sup>	Batch code <sup>3</sup>	Country of origin <sup>3</sup>	Name of retail outlet/warehouse	Address of outlet
05B-00435	Sainsbury's	Mild Chili Powder (39 g)	JUN 2006	4343A	Packed in the UK	Sainsbury's	Brooks Road Cambridge CB1 3HP
05B-00435	Sainsbury's	Mild Chili Powder (39 g)	JUN 2006	4343A	Packed in the UK	Sainsbury's	The Poplars Magpie Crescent Stevenage SG2 7DU
05B-00436	Asda	Hot Chilli Powder (100 g)	JAN2006	4197MAA	Packed in the UK	Asda	Beehive Centre Coldham's Lane Cambridge CB1 3ER

Notes:

<sup>1</sup> Details as described on packaging;

<sup>2</sup> as described on product packaging, with package weight in grams in following brackets

<sup>3</sup> "Unknown" denotes that the sample was taken from bulk storage before the product was packed, meaning that this information was not available.

<sup>4</sup> This sample code was an incremental sample that was not aggregated with the rest of the samples in accordance with EC Directive 98/53, as amended and produced an analytical result that was atypical of the batch as a whole in respect of the higher aflatoxin B1 level. However, sample code 04B-04303 was representative of the portion of the batch sampled.

**Table 2: Limits of quantification (LOQ)**

Analyte	Limit of Quantification (ug/kg)	Spike Level (ug/kg)
Ochratoxin A	0.2	10
Aflatoxin B1	0.2	10
Aflatoxin B2	0.2	3.3
Aflatoxin G1	0.2	10
Aflatoxin G2	0.2	3.3

**Table 3: Summary of recovery data**

Mycotoxin	Total number of Samples	Mean Recovery	RSD (%)
Ochratoxin A	61	86	10.3
Aflatoxin B1	61	83	5.7
Aflatoxin B2	61	83	6.0
Aflatoxin G1	61	82	4.9
Aflatoxin G2	61	85	8.2

**Table 4: Analytical results**

Laboratory code	Sample source/Brand	Product <sup>1</sup>	Mycotoxins (ug/kg) <sup>2,3</sup>				
			Aflatoxins				Ochratoxin A
			AFB1	AFB2	AFG1	AFG2	
04B-04284	Sampled from warehouse	Paprika	3.3	0.2	0.9	<0.2	1.8
04B-04285	Sampled from warehouse	Organic Paprika	1.0	<0.2	0.7	<0.2	47.7 ± 9.5
04B-04286	Sampled from warehouse	Paprika	1.2	<0.2	0.6	<0.2	3.6
04B-04287	Sampled from warehouse	Organic Paprika	2.0	0.2	2.2	<0.2	7.0 ± 1.4
04B-04288	Sampled from warehouse	Cayenne Pepper	0.2	<0.2	<0.2	<0.2	4.5
04B-04289	Sampled from warehouse	Raazi Chilly Powder - Kashmiri	5.4 ± 1.1	0.3	<0.2	<0.2	5.3 ± 1.1
04B-04290	Sampled from warehouse	Red Hot Stemless Chilli Powder	0.8	<0.2	<0.2	<0.2	2.8
04B-04291	Sampled from warehouse	Extra Hot Chilli Powder	1.1	<0.2	<0.2	<0.2	0.7
04B-04292	Sampled from warehouse	Chilli Powder	1.1	<0.2	<0.2	<0.2	1.7
04B-04293	Sampled from warehouse	Chilli Powder - Dandi cut	6.0 ± 1.2	0.2	<0.2	<0.2	6.9 ± 1.4
04B-04294	Sampled from warehouse	Chilly powder - extra hot	2.5	<0.2	<0.2	<0.2	2.1
04B-04295	Sampled from warehouse	Sweet Paprika	1.3	<0.2	1.0	0.3	1.4
04B-04296	Sampled from warehouse	Paprika CCSI M/Safe (M3074)	0.7	<0.2	0.4	<0.2	4.6
04B-04297	Sampled from warehouse	Chilli Powder 35 HU M/Safe (M3200)	2.0	0.2	0.2	<0.2	21.2 ± 4.2
04B-04298	Sampled from warehouse	TRS Chilli Powder	1.8	<0.2	<0.2	<0.2	4.2
04B-04299	Sampled from warehouse	TRS Paprika	1.0	<0.2	0.6	0.4	0.7
04B-04300	Sampled from warehouse	Rajah Extra Hot Chilli Powder	5.4 ± 1.1	0.3	<0.2	<0.2	6.2 ± 1.2
04B-04301	Sampled from warehouse	Paprika Powder 100 Asta	1.8	<0.2	1.7	0.2	1.9

Laboratory code	Sample source/Brand	Product <sup>1</sup>	Mycotoxins (ug/kg) <sup>2,3</sup>				
			Aflatoxins				Ochratoxin A
			AFB1	AFB2	AFG1	AFG2	
04B-04302	Sampled from warehouse	Paprika Powder Steam Sterilised	2.1	<0.2	0.4	<0.2	4.7
04B-04303	Sampled from warehouse	Triple Lion Red Chilly Powder	1.3	<0.2	<0.2	<0.2	1.9
04B-04304 <sup>4</sup>	Sampled from warehouse	Triple Lion Red Chilly Powder	13.9 ±2.8	0.7	<0.2	<0.2	1.7
04B-04305	Sampled from warehouse	Rajah Paprika	0.6	<0.2	0.5	<0.2	5.2 ± 1.0
04B-04306	Sampled from warehouse	Creende Natural Dried Chilli Powder	<0.2	<0.2	<0.2	<0.2	1.5
04B-04307	Sampled from warehouse	Rajah Chilli Powder	2.8	<0.2	<0.2	<0.2	2.4
04B-04308	Sampled from warehouse	Rajah Extra Hot Chilli Powder	1.6	<0.2	<0.2	<0.2	3.4
04B-04309	Sampled from warehouse	TRS Chilli Powder Extra Hot	9.0 ± 1.8	0.5	<0.2	<0.2	5.9 ± 1.2
04B-04310	Sampled from warehouse	TRS Paprika	1.0	<0.2	<0.2	<0.2	0.5
04B-04311	Sampled from warehouse	Indus Chilli Powder extra hot	10.4 ± 2.1	0.7	<0.2	<0.2	4.4
04B-04312	Sampled from warehouse	Indus Paprika Powder	3.4	0.3	1.0	0.7	16.5 ± 3.3
04B-04313	Sampled from warehouse	Rajah Chilli Powder	0.9	<0.2	<0.2	<0.2	1.2
04B-04314	Sampled from warehouse	Rajah Paprika	2.6	<0.2	1.3	0.5	3.3
04B-04315	Sampled from warehouse	Paprika	2.3	<0.2	2.2	0.2	3.6
04B-04316	Sampled from warehouse	Ground Chilli	12.8 ± 2.6	0.6	<0.2	<0.2	152.2 ± 0.4
04B-04342	Sampled from warehouse	Natco Natural Foods Paprika Powder	2.8	<0.2	2.7	0.2	3.9
04B-04317	Asda	Paprika Refill	1.4	<0.2	0.5	0.3	19.5 ± 3.9
04B-04318	Morrisons	Chilli Powder	1.4	<0.2	1.1	0.3	4.8
04B-04319	Sainsbury's	Paprika	0.8	<0.2	0.2	<0.2	18.6 ±3.7

Laboratory code	Sample source/Brand	Product <sup>1</sup>	Mycotoxins (ug/kg) <sup>2,3</sup>				
			Aflatoxins				Ochratoxin A
			AFB1	AFB2	AFG1	AFG2	
04B-04320	Chef William	Ground Cayenne Pepper	0.7	<0.2	<0.2	<0.2	2.4
04B-04321	Fudco	Gondal Hot Chilli Powder	1.7	<0.2	<0.2	<0.2	6.1 ± 7.2
04B-04322	East End	Paprika	0.2	<0.2	0.2	<0.2	0.3
04B-04323	East End	Chilli Powder	2.0	<0.2	<0.2	<0.2	7.1 ± 1.4
04B-04324	Sara	Paprika	1.2	<0.2	0.8	<0.2	4.6
04B-04325	Narmah	Red Chilli Powder	4.9	0.2	<0.2	<0.2	4.7
04B-04326	EDA	Chillie Powder (Aci Toz Biber)	0.9	<0.2	<0.2	<0.2	3.7
04B-04327	EDA	Paprika Powder (Tatli Toz Biber)	0.5	<0.2	<0.2	0.4	5.7 ± 1.1
04B-04328	Kohinoor	Red Chilli Powder	1.4	<0.2	<0.2	0.4	0.6
04B-04329	Tesco	Ground Cayenne	1.2	<0.2	0.8	<0.2	16.5 ± 3.3
04B-04330	Natco	Paprika Powder	1.3	<0.2	1.0	0.3	0.6
04B-04331	Schwartz	Paprika	0.7	<0.2	0.4	0.7	3.1
04B-04332	Schwartz	Hot Paprika (Refill)	1.2	<0.2	0.3	<0.2	9.0 ± 1.8
04B-04333	Morrisons	Ground Paprika	1.7	<0.2	0.8	0.4	32.5 ± 6.5
04B-04334	East End	Extra Hot Chilli Powder	6.2 ± 1.2	0.4	<0.2	<0.2	5.7 ± 1.1
04B-04335	Tesco	Paprika	1.2	<0.2	0.6	<0.2	24.2 ± 4.8
04B-04336	Tesco	Smoked Paprika	1.0	<0.2	0.3	<0.2	25.3 ± 5.1
04B-04337	Natco	Chilli Powder	0.7	<0.2	<0.2	<0.2	1.9

Laboratory code	Sample source/Brand	Product <sup>1</sup>	Mycotoxins (ug/kg) <sup>2,3</sup>				
			Aflatoxins				Ochratoxin A
			AFB1	AFB2	AFG1	AFG2	
04B-04338	Schwartz	Hot Chili Powder	0.6	<0.2	<0.2	<0.2	5.7 ± 1.1
04B-04339	The Spice Shop	Cayenne Pepper Organic	6.8 ± 1.4	0.2	<0.2	<0.2	4.5
04B-04340	White Pearl	Extra Hot Chilli Powder	2.7	<0.2	<0.2	<0.2	2.5
04B-04341	Nisa	Hot Chilli Powder	0.6	<0.2	<0.2	<0.2	15.6 ± 3.1
05B-00435	Sainsbury's	Mild Chili Powder	<0.2	<0.2	<0.2	<0.2	0.2
05B-00436	Asda	Hot Chilli Powder	0.6	<0.2	0.2	<0.2	4.3

Notes:

<sup>1</sup> Details as described on packaging;

<sup>2</sup> Measurement in micrograms/kg (µg/kg)

<sup>3</sup> Aflatoxin results over 5 µg/kg and ochratoxin A results over 10 µg/kg show associated measurement uncertainty

<sup>4</sup> This sample was an incremental sample that was not aggregated with the rest of the samples in accordance with EC Directive 98/53, as amended and produced an analytical result that was atypical of the batch as a whole in respect of the higher aflatoxin B1 level. However, sample code 04B-04303 was representative of the portion of the batch sampled.

**Table 5: summary of Agency actions**

<b>Sample number</b>	<b>Nature of contamination</b>	<b>Product as described</b>	<b>Name of retail outlet/warehouse</b>	<b>Supplier action taken to date</b>
04B-04316	Aflatoxin and Ochratoxin A	Ground Chilli	Green Cuisine	Both the brandowner and their supplier have withdrawn the affected batch from the food chain.
04B-04309	Aflatoxin	TRS Chilli Powder Extra Hot	Wing Yip	Both the brandowner and their supplier have withdrawn the affected batch from the food chain.
04B-04311	Aflatoxin	Indus Chilli Powder extra hot	Indus foods	Indus has withdrawn product from the food chain.
04B-04339	Aflatoxin	Cayenne Pepper Organic	The Spice Shop	This product was part of a very small consignment and no product was left at the supplier.
04B-04285	Ochratoxin A	Organic Paprika	Bart Spices	Company has withdrawn the product.

## **Annex – Comments from companies**

### **TRS WHOLESALE**

*“We believe that the results of a sample taken from an individual packet from a Supermarket shelf should be treated with caution. It does not allow for isolated “Hot Spots” that occur in Ground Chillies and it is not representative of the full consignment of 18MT.*

*This occurrence of “Hot Spots” has been recognised and incorporated into the European Union sampling regime and protocol.*

*Our Shipper gets the goods analysed by the Spice Board of India, a Government recognised authority who follow the method laid down by European Union and supplies with a certificate at the time shipment.*

*On arrival of the goods they are further sampled by us using European Union Sampling Protocol. Samples are then sent for testing to a UKAS accredited Analytical Laboratory. Only after we receive a satisfactory microbiological certificate showing that goods are within permitted levels of Aflatoxin that we pack the goods for Retail distribution.”*

### **GREEN CUISINE FOOD PRODUCTS LIMITED**

*“Products manufactured from this batch of Chilli powder have been recalled. However as chilli powder is consumed in such small quantities (typically ½ g per serving) the company considers that they present no significant risk to public health.”*

*Products affected are:*

<i>GC Chilli Powder x 50g</i>	<i>BBE 19/01/07, 21/01/07, 23/01/07, 17/05/07</i>
<i>GC Cayenne Pepper x 50g</i>	<i>BBE 19/01/07, 21/01/07, 17/05/07</i>
<i>GC Chilli Powder x 25g</i>	<i>BBE 28/01/07</i>

### **Lion Foods**

*'All the products manufactured and supplied by Lion Foods are tested to ensure that they conform to all current EU & UK legislation. Lion Foods holds BRC 'higher level' accreditation which ensures that the manufacture of all products are to the very highest standards. At this moment in time no legislation exists for Ochratoxin A, however should the EU and/or UK regulatory bodies determine it necessary to introduce legislation, then Lion Foods would as a matter of course ensure conformance with immediate effect.'*

## **Waitrose**

*"At Waitrose we were most concerned hear the level of ochratoxin A (OA) found in our organic paprika. In the absence of any legal limit we promptly followed the FSA's advice to withdraw and destroy the stock whilst noting the subsequent assurance to us that the 'balance of risk did not justify a full product recall'.*

*Both Waitrose and our supplier have in place a long established comprehensive screening programme. Amongst other things we very regularly look for mycotoxin levels in our spices. Historically our main focus has, of course, been aflatoxins as these are perceived as being of high concern and regulated by law; however, work has also been done on OA in Waitrose spices with no adverse results being found.*

*As a result of this we have reviewed our quality assurance procedures with our supplier; taken expert advice on our testing schedule in 2005 and plan to closely monitor this issue. It would be most helpful and we would particularly welcome from the FSA a statutory limit for OA in spices, once agreement is found on what level actually constitutes a hazard".*

## **SPL Ltd**

*"Whilst we welcome the survey we would like to make the following observations: -*

- The sample taken is far from representative; in fact the sampling official drew two samples. One sample was made up, entirely, from the moulded portion of an obviously water damaged sub-lot, not suprisingly this sample returned the high aflatoxin result.*
- The second sample from the undamaged stock was found to be **acceptable**. No attempt was made by the sampling official to homogenise the samples, as recommended, in acknowledgement of the nature of aflatoxin contamination.*
- Both FGS Mills and SPL Ltd. had samples analysed independently (by Leatherhead and Campden & Chorleywood, receptively). In both instances the product was found to be **acceptable** (B1 at 4.7, 3.8, & 1.5mg/Kg in three separate instances).*
- None the less SPL conducted a 100% recall of the product and were able to consolidate the entire consignment at our premises. Our local TSO then conducted a formal sampling in accordance with EC directive. Oldham Trading Standards found the product to be **acceptable** (B1 - 4.4 mg/Kg, Total – 4.7mg/Kg).*

*At SPL we are acutely aware of our responsibilities for Food Safety and take matters of this nature very seriously. However, we are concerned and disappointed that, despite the efforts of all parties (including Trading Standard Officers), such an unrepresentative and prejudiced sample has been presented as part of the survey."*

## **Seasoning & Spice Association**

*"The SSA welcome the recent ochratoxin A survey in paprika and chilli products. Members will continue to work with both the Food Standards Agency, and their suppliers at origin, to ensure that levels are as low as reasonably practicable, in line with FSA guidance. Regulation EC 123/2005 of 26 January 2005 on ochratoxin A refers to the EC-wide review which is currently underway to examine whether a limit for presence of ochratoxin A in spices should be set, and if so at what level. In this process, the SSA will continue to work with the FSA and the European Commission."*

## **BART SPICES**

*"There are no legal limits for Ochratoxin A in Paprika or other spices  
The European Commission does not yet have the toxicity data on  
Ochratoxin A required to decide if, and at what level, a limit should be  
set for spices  
One batch of Organic Paprika supplied by Bart marginally exceeded the  
tolerable daily intake as calculated by FSA  
Another batch of Bart Organic Paprika was sampled as part of this survey  
and the Ochratoxin A found fell way within the tolerable daily intake  
Bart have not, yet, had the opportunity of reviewing the calculation of  
tolerable daily intake done by FSA  
Bart has destroyed all packed stock of affected Organic Paprika and  
remaining affected raw material was rejected back to the supplier, where  
it is now held by the local authority  
Bart Spices continues to work closely with its suppliers to reduce  
levels of Ochratoxin A in spices and, as a long-standing member of the  
UK Seasoning & Spice Association, continues to work closely with other  
members and the FSA"*