MYCOTOXINS IN FOOD
Legislation and Sampling

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Foods Standards Agency
Chemical Safety Division
York 20th April 2007
Overview

- Chemical Safety Division – Chemical Contaminants
- Contaminants Legislation
- Mycotoxins
- Sampling
- Analysis
- Incidents
The Food Safety Policy

Analytical Services, Surveys and Research Policy Division

Chemical Safety Division

Primary Production Division

Microbiological Safety Division

Emergency Planning, Radiation and Incident Division

Toxicology of Food Chemicals

Mycotoxins, Process Contaminants and Nitrates

Inorganic and Organic Environmental Contaminants

Chemical Safety of Food Packaging
FSA Strategic Plan
Chemical Contaminants

• Reduce the risks to consumers from contamination

• Work with industry to reduce food contamination (identify and encourage best practice)

• Increased collaboration with enforcement authorities

• Prioritise contaminants for EC control
What do we do?

- Research
- Surveillance
- Risk Communication
- Consumer Advice
- Legislation
- Guidance to Industry and Enforcement
- Withdrawal from Food Chain
- RASFF*
- Stakeholder Consultation

* Rapid Alert System on Food and Feed
Research

Triggers for work include:

- expert and consumer concern
- need for updates
- availability of new or improved analytical techniques
- identification of new contaminants or new toxicological information
- EC proposals
- assessing effects of legislation, codes, new manufacturing methods
Surveillance

We conduct surveys to protect consumers:

• not intended to be official controls
• consumer exposure assessments and monitor trends
• consumer advice
• assess the effectiveness of legislation
• inform EU negotiations
Surveillance

We conduct **surveys** to protect consumers:

Sample purchase → Analysis

Exposure Assessment + Risk Assessment

Consumer advice → Website report
Legislation
General Food Law
EC Regulation 178/2002

Lays down the general principles and requirements of food law

“Food and feed business operators at all stages of production, processing and distribution within the businesses under their control shall ensure that food or feeds satisfy the requirements of food law”

Responsibilities of food business operators are described in a guidance document from the European commission


- Codes of Practice
- Report incidents
- Ensuring food is compliant with the legislation e.g sampling and analysis
Official Controls

• Regulation (EC) No 882/2004 of the European Parliament and of the Council on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules

• Controls at all stages of production, processing and distribution

• Controls on EU products and 3rd country imports and exports
European Food Safety Policy

- Most food regulation comes from Europe
- Farm to fork approach - a general principle
- Consumers buy in a global market
- Food law establishes the right of consumers to safe food at national and EU level
Regulation setting maximum levels
Contaminants Legislation
Philosophy

• Presence of contaminants cannot be avoided (e.g. additives can be avoided)

• Limits set for those foods which contribute the most to consumers diets

• Foods known to occur with high levels of contamination

• Foods for vulnerable groups
HOW is Legislation Formulated?

- Scientific literature
- R&D
- Monitoring data
- Food alerts (RASFFs)

RISK to consumers
Exposure Assessment

Advice on Toxicology

Risk Management
Discussion at Working Group

VOTE at Standing Committee
EU-wide limits on contaminants in food - before April 2002

- **Aflatoxins**
  - cereals
  - nuts & dried fruit
  - milk (M1)

- **Nitrate**
  - fresh lettuce
  - spinach

- **Mercury**
  - fish
EU-wide limits on contaminants in food today...

**Fusarium toxins**
- Cereals and cereal products

**Aflatoxins**
- Cereals
- Nuts & dried fruit
- Milk (M1)

**Tin**
- Canned food

**Nitrate**
- Fresh lettuce
- Spinach

**3-MCPD**
- Soy sauce
- HVP

**Dioxins**
- Meat, offal
- Fish, milk, eggs
- Oils and fats

**Lead**
- Milk, formula
- Meat, offal
- Cereals, fruit, veg.
- Fats, oils, wine
- Fish, seafood

**Mercury**
- Fish

**Cadmium**
- Meat, offal
- Cereals, fruit, veg.
- Fish, seafood

**Ochratoxin A**
- Coffee, wine
- Dried fruit, grape juice
- Baby foods
- Cereals

**Patulin**
- Apple products
- Baby foods

**BaP**
- Oils, fats, fish, shellfish, meat, babyfood

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EC Regulation 1881/2006

• Set the maximum levels for certain contaminants, including mycotoxins, in foodstuffs

  Coming soon…

• Fusarium toxins in maize and maize products

• Ochratoxin A in spices and liquorice
Special Import Conditions
Mycotoxins
Mycotoxins

- Toxic secondary metabolites of moulds, approximately 70,000 recognised mould species and 500 known mycotoxins

- Toxic at very low levels, among the most toxic compounds found in food

- Formed under certain conditions of temperature and humidity, very stable

- Occur in a variety of commodities

- Absence of mould does not mean it is safe! Can’t see, can’t smell, can’t taste
Regulations:
Main mycotoxins of interest

- Aflatoxins (B1, M1, total)
- Ochratoxin A
- Patulin
- *Fusarium* toxins
  - Tricothecenes (Deoxynivalenol, HT2 & T2)
  - Zearalenone
  - Fumonisins

CAN occur in the field AND/OR in storage THROUGHOUT food chain
Health Implications

*CAN cause range of health effects:*

- Carcinogenic, genotoxic (aflatoxin B1, ochratoxin A)
- Hepatotoxic (aflatoxins, fumonisins)
- Nephrotoxic (ochratoxin A, patulin, fumonisins)
- Reproductive and developmental toxicity (zearalenone)
## Commodities affected

<table>
<thead>
<tr>
<th>Commodities</th>
<th>Aflatoxin</th>
<th>OTA</th>
<th>Patulin</th>
<th>Fusarium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundnuts</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dried Fruit</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals (wheat, barley, oats, rye, rice)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Maize</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Spices</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby foods</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Coffee</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cocoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Grape juice</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>(apple)</td>
</tr>
<tr>
<td>Milk, egg</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Wine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beer</td>
<td></td>
<td></td>
<td>*</td>
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</tr>
</tbody>
</table>
Sampling
MYCOTOXINS Sampling

• Mould grows in patches
• Heterogeneous contamination
  ➢ Hot spots
• Must take representative sample!!
  – a large number of small samples
  – throughout the batch
  – at random
Take representative sample...

EC Regulation 401/2006 lays down the official procedure for sampling foodstuffs for mycotoxins:
- Small incremental samples at various places distributed throughout the lot/batch
- Incremental samples are combined to give an aggregate sample for analysis

Additional information for aflatoxin sampling in certain foods can be found in the Commission Guidance Document:
# Sampling dried fruit: Worked Examples

<table>
<thead>
<tr>
<th>Total Weight of Batch at Warehouse</th>
<th>Number of Incremental Samples to take</th>
<th>Packaging size</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 70kg</td>
<td>10</td>
<td>100gram retail packs</td>
<td>Take 10 retail packs taken at random from the entire batch</td>
</tr>
<tr>
<td>130kg</td>
<td>15</td>
<td>400gram retail packs</td>
<td>Take the minimum number of packets required to make up the aggregate weight. In this case this is 1.5kg; so take 4 packs*</td>
</tr>
<tr>
<td>160kg</td>
<td>15</td>
<td>10kg sacks</td>
<td>Take 1 scoop of ~100grams from 15 different sacks to give 15 incremental samples.</td>
</tr>
<tr>
<td>8 tonnes</td>
<td>80</td>
<td>25kg sacks</td>
<td>Take 1 scoop of ~100grams from 80 different sacks to give 80 incremental samples.</td>
</tr>
</tbody>
</table>

*In this case a special dispensation is applied to ensure that not more than 10% of the lot is taken for sampling purposes.
Analysis
Mycotoxins Analysis

- Method of analysis used must comply with the performance parameters specified in EC Regulation 401/2006
  
- Full analytical procedure including sample preparation must be accredited
  
- To check compliance, the analytical result must be corrected for recovery and take into account the measurement of uncertainty
All analytical results have a variability known as the measurement uncertainty. The Eurachem/CITAC interpretation of the definition of measurement uncertainty is “the range of values that the analyst believes could be reasonably attributed to the measurand.”

**Measurement Uncertainty**

(i) Result plus uncertainty above limit
(ii) Result above limit but limit within uncertainty
(iii) Result below limit but limit within uncertainty
(iv) Result minus uncertainty below limit

<table>
<thead>
<tr>
<th>Action:</th>
<th>Reject</th>
<th>Accept</th>
<th>Accept</th>
<th>Accept</th>
<th>Accept</th>
</tr>
</thead>
</table>

Action: Reject  Accept  Accept  Accept
Official samples must be analysed at an Official Control Laboratory (OCL).

A sample which is taken and analysed according to all the relevant legislation is a formal sample.

Official samples are split at laboratory into three samples:

1) Enforcement sample (OCL)
2) Defence sample (Food business operator)
3) Reference sample (LGC)
Enforcement Authorities

Surveys

Industry

INCIDENTS
Rapid Alert System on Food and Feed (RASFFs)

• Legal basis is Regulation EC 178/2002

• Provides control authorities with an effective tool for exchange of information on measures taken to ensure food safety
Considerations

Withdrawal vs. recall

- Is analysis ok?
- Distribution to Consumers and/or Member States?
- Quantity affected
- How was the sample collected?
Communication goes wrong.

NATURAL PRAWN ‘KILLERS’
Shellfish cancer alert

Toxic levels of cancer agent found in crisps

SUDAN 1: THE BUNGLES THAT PUT POISON ON OUR PLATES

COKE TAP WATER IN CANCER WARNING
Web Links

**Contaminants Legislation** – Main page:  
http://europa.eu.int/comm/food/food/chemicalsafety/contaminants/index_en.htm

**Sampling** - Commission Guidance Document for enforcement authorities for the control of compliance with EU legislation on aflatoxins:  

**Commission guidance on the Official Food and Feed Regulations (OFFC) – 882/2004**  

**Food Law - 178/2002**  
THANKS!!!

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