Sampling for GMOs and mycotoxin analysis along the food and feed production and supply chains

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Two basic questions on sampling:

- Why sampling is relevant?
- Which is the overall meaning of the word “sampling”

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Sampling is relevant?

because

Only by the means of a good sampling we can obtain

RELIABLE concentration data

The availability of **RELIABLE** concentration data is

crucial

The implementation of the Risk Analysis process

(Risk Assessment, Risk Management and Risk Communication)

requires reliable concentration data for any health, legal and socio-economic assessment..

concentration data → Risk Analysis implementation

bottom-up process

relying on the quality of the data that will be managed by all stakeholders involved in Risk Analysis

Two basic questions on sampling:

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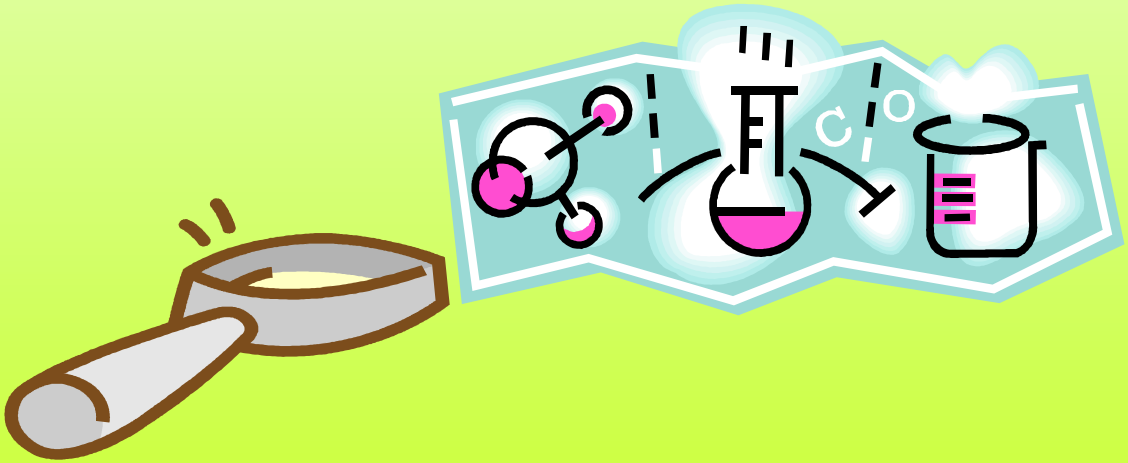
“THE ANALYTICAL CHAIN”

- **SAMPLING**

- **SUBSAMPLING**
- **ANALYSIS**



“Primary” sampling programs

- SAMPLING

“Secondary” sampling plans

“Primary” sampling programs

- SAMPLING

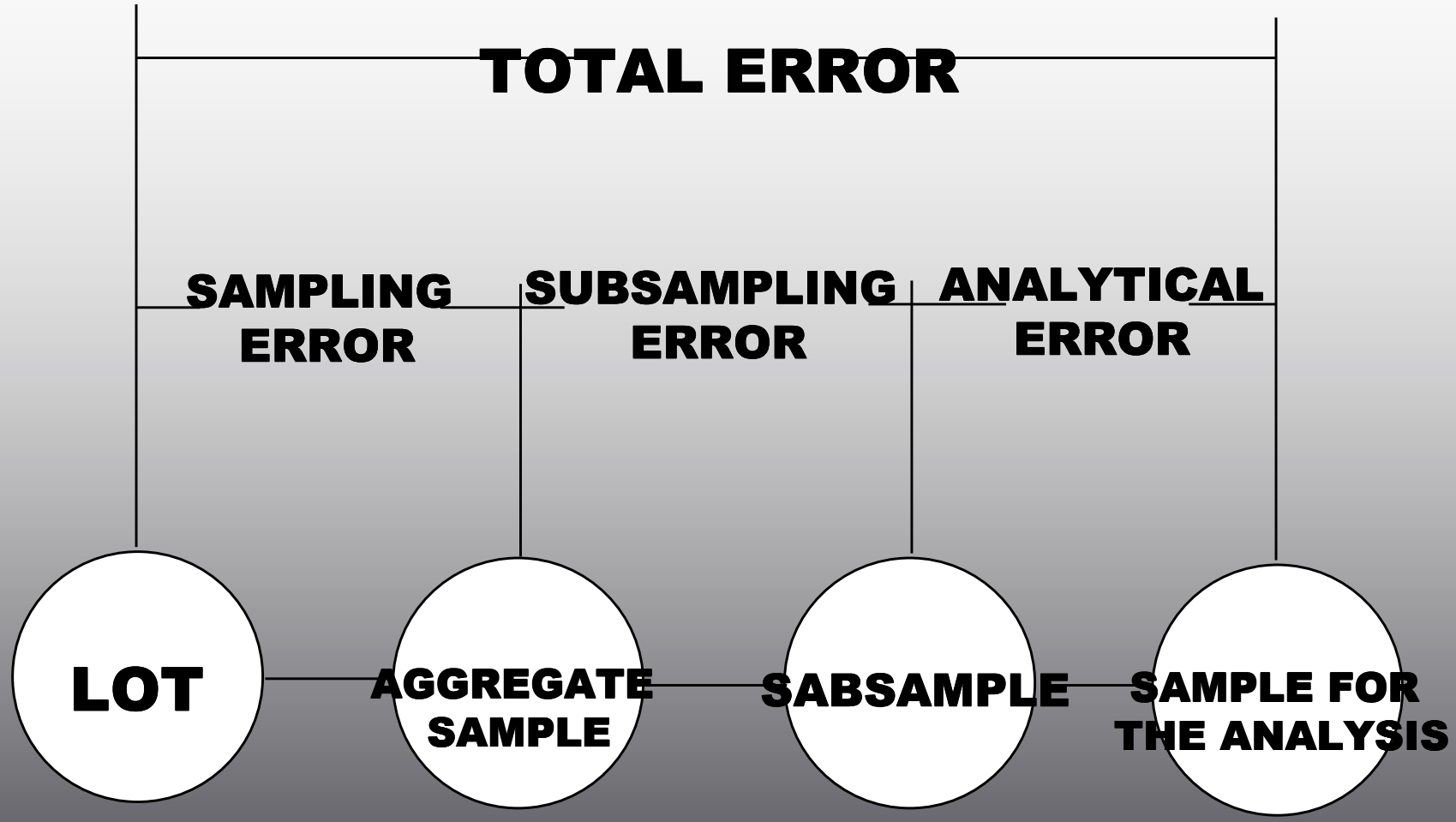
“Secondary” sampling plans

"*Secondary*" Sampling (Plan)

Consists in the actual drawing of incremental samples, gathering them and take the sample for the analysis

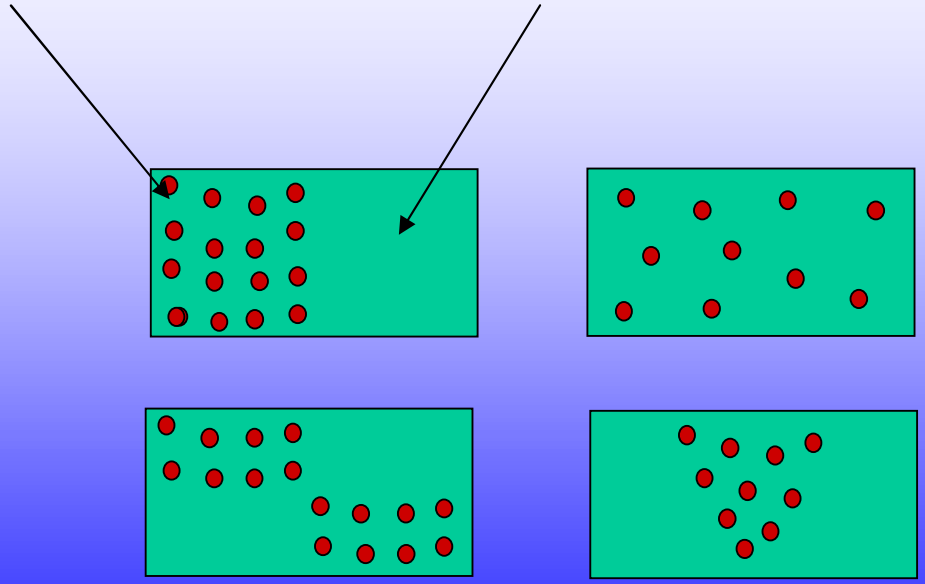
This sampling is crucial for contaminants not homogeneously distributed in the bulk such as mycotoxins and GMOs

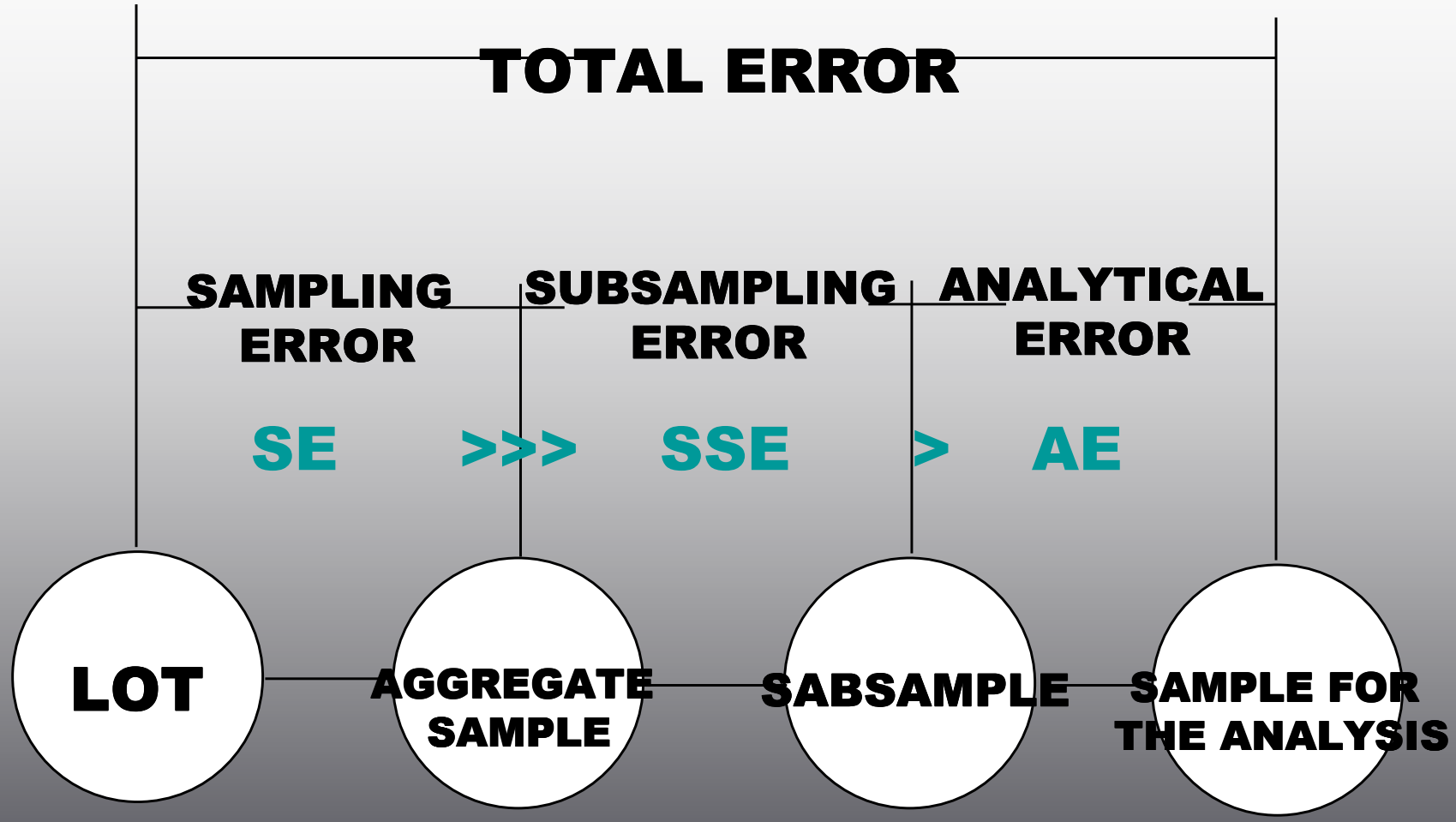
It has to be performed in agreement with the inference principle according to which the sample for analysis should be representative of the whole consignment or lot



ERRORS IN EACH STEP OF THE ANALITYCAL CHAIN

Distribuzione eterogenea





ERRORS IN EACH STEP OF THE ANALITYCAL CHAIN

“Primary” sampling programs

- **SAMPLING**

“Secondary” Sampling plans

"*Primary*" Sampling Programs

in this step the appropriate choice of samples is performed

- **Sites (Where?)**
- **Types (Which?)**
- **Times (When)**
- **How Many ?**

(control plans,monitoring, surveillance,HACCP, exposure assessment)

Statistically-based "*Primary*" Sampling Programmes

should be in agreement with

i) the "fit for purpose" principle for any Risk Analysis target (such as occurrence for the exposure Assessment, survey and monitoring in Risk Management and Risk Communication, HACCP systems)

ii) a number of parameters that should be preselected and ranked depending on the purpose

(indicators)

The need for focused Sampling Programmes is required by the EC and EFSA for the various stakeholders of Risk Analysis. A few examples are:

- Regulations on Official Control always calls for focused sampling programmes: provisions of the Regulation (EC) 882/2004 (EC, 2004) refers to the need of "establish and implement multi-annual national control plans in accordance with broad guidelines drawn up at Community level. These guidelines should promote coherent national strategies, and identify risk-based priorities and the most effective control procedures".

- The problem of uncertainty in exposure assessment has been recently dealt with by EFSA that underlined the link between the overall uncertainty associated with dietary exposure assessment and an unfocused sampling programme; the problem of uncertainty could be linked to many factors including a limited number of samples analysed and the bias when sampling for contaminants is targeted or non-random (EFSA, 2006);

Reliability of concentration data

The generation of reliable data

is a global process which requires

- **reliable analytical data,**
- **appropriate and coherent related *metadata*,**

"metadata" : "data about data" or the structured information that describes and explains what are the procedures……

Behind

the analytical data

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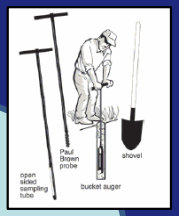
RELIABLE ANALYTICAL DATA

ANALYSTS

SAMPLING OPERATORS



"SECONDARY" SAMPLING PLANS

Risk Assessors

Risk Managers

Risk Communicators

Producers

Fit for purpose
"PRIMARY"
SAMPLING PROGRAMMES

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Decision Support System

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Mycotoxins

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BASIC STATEMENT FOR MYCOTOXIN and GMOs SAMPLING

"*CONTAMINATED*" GRAINS (UNITS) ARE NOT HOMOGENEOUSLY DISTRIBUTED IN A LOT

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SAMPLING PROCEDURES

HOW TO TAKE A REPRESENTATIVE SAMPLE FROM THE LOT UNDER INVESTIGATION.

It depends on:

Statistical background, resources, facilities,skilled people,

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Static sampling

Dynamic sampling

Mycotoxins

STATISTICAL BASIS FOR SAMPLING

approx 0.1% of units are likely to be highly contaminated

Information on the distribution of contaminated units are available for:

Aflatoxin B_1, DON and fumonisins

Lack of information for OTA

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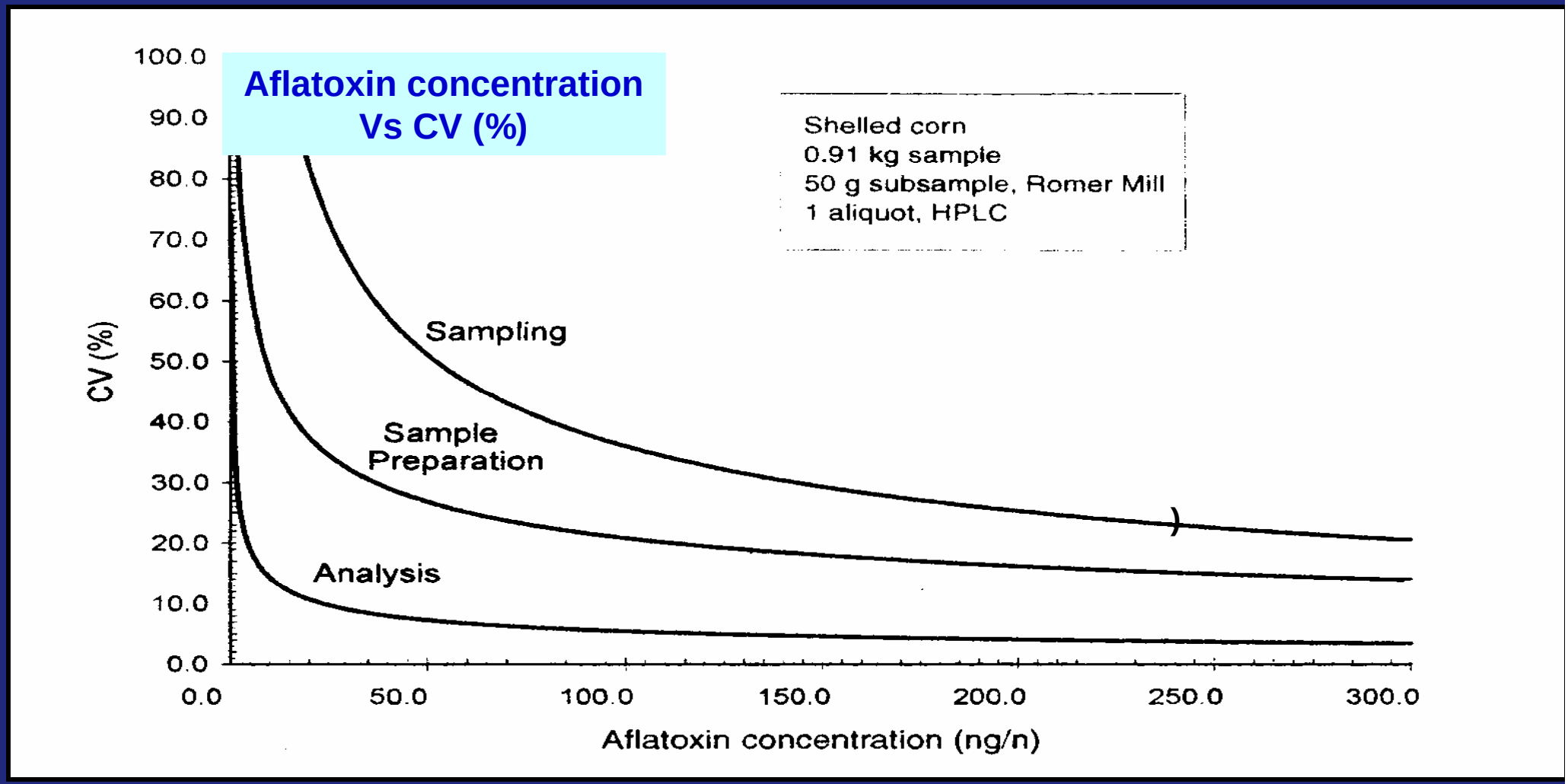
Coefficient of variation *versus* toxin concentration



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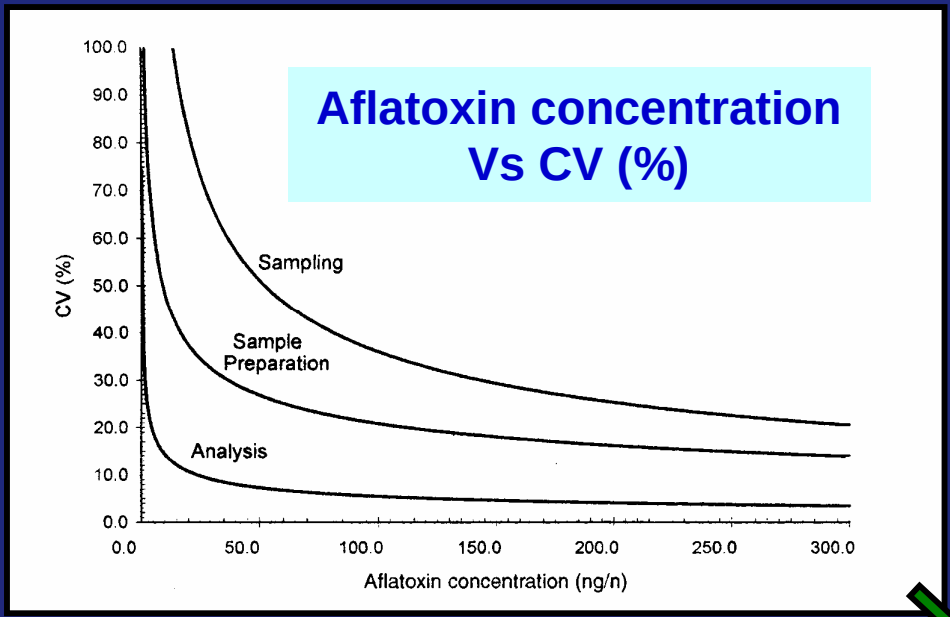
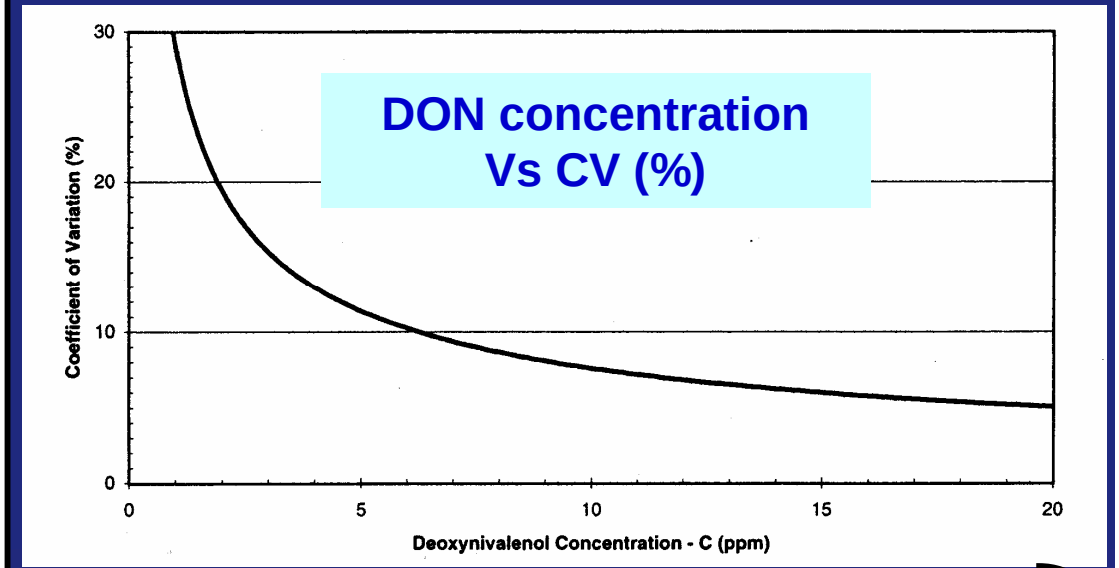
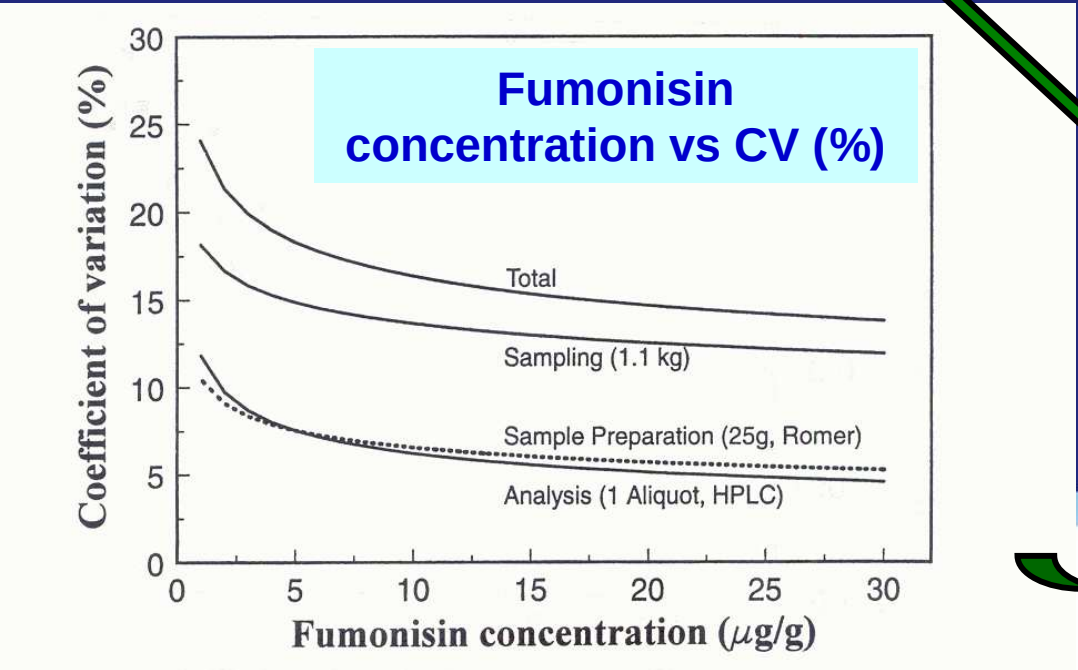
Coefficient of variation *versus* toxin concentration





Whitaker *et al*., 2000, J AOAC Int., Vol. 83 (5)



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Classification of errors

- If the mycotoxin concentration, M, in a lot exceeds a defined lot guideline, M_c, then the lot should be rejected. If the lot concentration, M, is less than or equal to the guideline, M_c, then the lot should be accepted.
- Because of the total variance among sample test results, two types of mistakes are associated with mycotoxin sampling plan:
  - Seller's risk: some good lots (lots with $M \leq M_c$) will be rejected ($X_{avg} > M_c$)by the sampling – FALSE POSITIVE
  - Consumer's risk: some bad lots (lots with $M > M_c$) will be accepted ($X_{avg} \leq M_c$) by the sampling plan – FALSE NEGATIVE

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KELDA PROJECT

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Typical mycotoxin/GMOs sampling scheme

- Identification of the lot or sublot including their size
- Calculation of the incremental samples to be collected
- Evaluation of the type of sampling procedure to be performed (static vs dynamic)
- Collection of the incremental samples
- Formation of the aggregate sample by combining all the incremental sample
- Grinding of the aggregate sample
- Formation of the test aliquots (dry or slurried)

- **Feasible**
- **Cost/effective**
- **Fit for purpose**
- **Reliable**

Mycotoxin Sampling – Worldwide legislation

- **Europe – Regulation (EC) 401/2006 of 23/2/2006 published on the Official Journal of the European Union L70/12 on 9/3/2006**
- **Codex Standard - Maximum level and sampling plan for aflatoxin in peanuts CODEX STAN 209-1999, Rev. 1-2001**
- **Codex General Guidelines on Sampling GL 50 - CAC/GL 50-2004**
- **ISO 11648-2:2001 - Statistical aspects of sampling from bulk materials**
- **ISO 13690:1999 - Cereals, pulses and milled products -- Sampling of static batches**
- **ISO 6644:2002 - Flowing cereals and milled cereal products -- Automatic sampling by mechanical means**

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Training video

FAO - ISS

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GMO SAMPLING Raccomandation (2004/787/CE)

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SAMPLING

AT RETAILS

?????????

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Thanks for your attention

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