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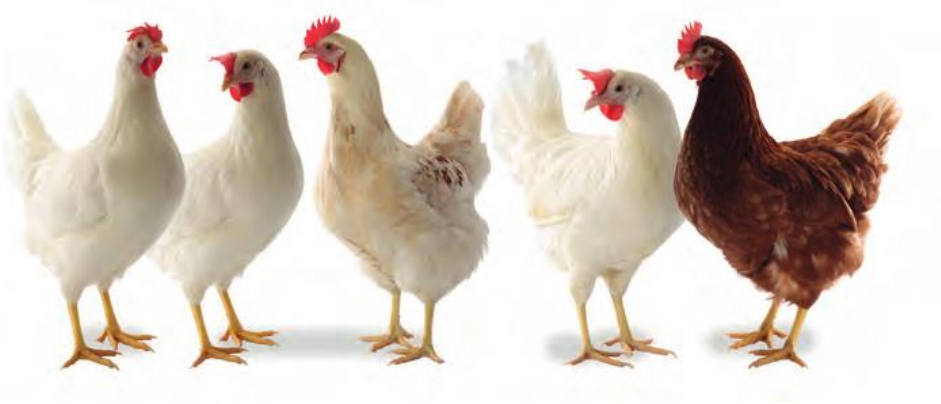
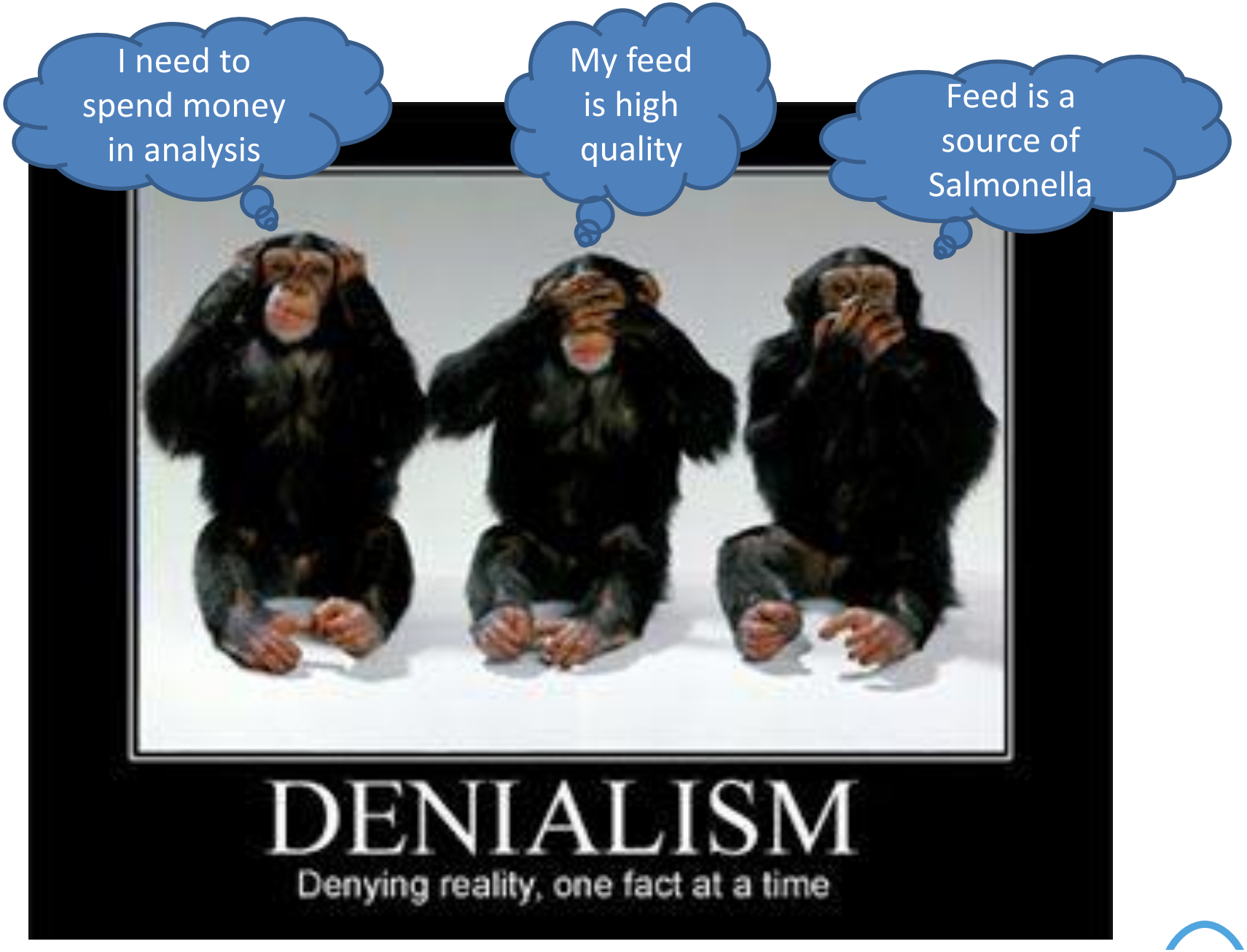
INTERNATIONAL
The key to your profit!



Quality control of feed


I need to spend money in analysis
My feed is high quality
Feed is a source of Salmonella
DENIALISM
Denying reality, one fact at a time

Parameters

- Composition
  - Nutrients
  - Structure

- Free of hazards
  - Biological hazards: pathogenic micro-organisms, parasites
  - Chemical hazards: natural toxins, chemicals, pesticides, etc.
  - Physical hazards: glass, metal, etc.

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How much lysine does the soyameal of 46% CP?

1. 2.6

2. 2.7

3. 2.8

4. Without data I’m just a guy with an opinion

What is a value in it?

1. 3000 euro
2. 5000 euro
3. 7000 euro
4. 10000 euro

Every day you are spending…

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How much energy does a brown hen need daily?

1. 280 kcal / day

2. 290 kcal / day

3. 300 kcal / day

4. 310 kcal / day

Practical example

In March

	Week	% Lay	Egg size	Egg mass	BW	Feed intake	Energy intake
CH FR 3	36	95	59.5	56.5	1915	98	?

- Feed had 2850 kcal / kg
- Energy intake: 280 kcal / day / bird

Practical case

- Pullet under weight 8 weeks
- Corn and soya
- Mortality at start of the production

Feed	Energy
Pre starter	2950
Grower	2900
Developer	2800

What do you think it was the nutritional reason?

1. Lack of energy
2. Lack of amino acids
3. Lack of phosphorus
4. Lack of vitamins

What do they have in common?

1. They are bad farmers
2. They have a bad nutritionist
3. They have the wrong breed
4. None of the above

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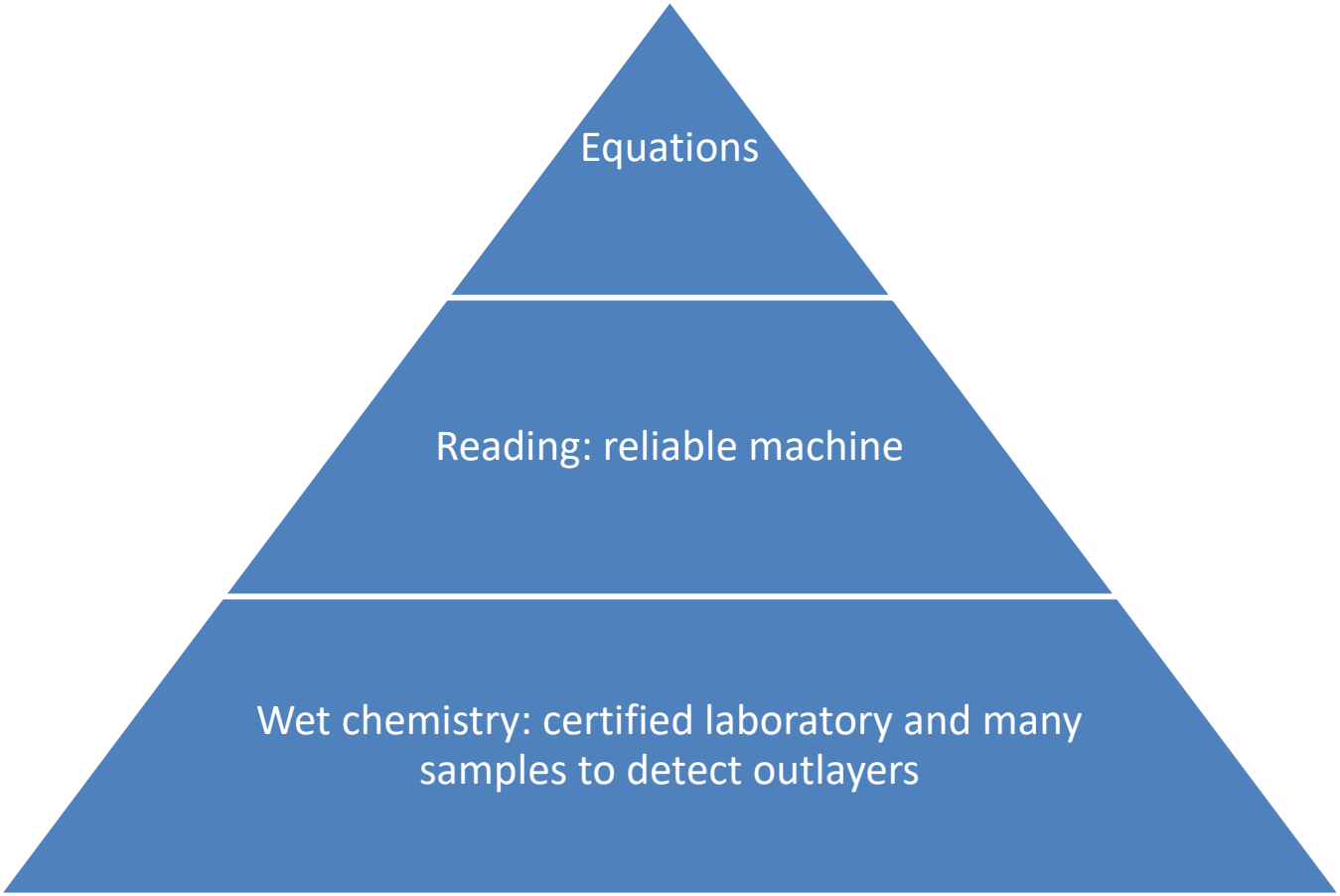
Raw materials control

- Visual:
  - Indication
  - Not a value for the nutritionist
- Analysis
  - Wet chemistry
  - NIR technology

When I use NIR how much I can reduce wet chemistry

1. 60%
2. 70%
3. 80%
4. I don’t need it

How the NIR works



What to analyze

	Raw materials	Feed
Moisture	x	x
Starch	x	
Protein	x	x
Amino acids	x	x
Fat	x	x
Sugars	x	
Crude fiber	x	x
Ash	x	
Calcium		x
Phosphorus		x
Sodium		x
Chloride		x
Potassium	x	

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I need to analyze sugars in soya

1. True

2. False

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I need to analyze potassium in corn

1. True

2. False

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How many analysis

- Volume of the feed
- Origins: how many suppliers
- Variability of the raw materials
  - Process raw materials more variable
  - Farming standards

What about the nutrient absorption?

- The variation of the amino acid digestibility is another factor affecting the accuracy of the formulation
- This variation becomes more and more important as we are formulating with digestible amino acid
- There are factors of each raw material physical and chemical influencing the digestibility

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Formulations

RM	Diet	% M+C in RM	% M+C in diet	Total M+C in diet	% Dig M+C in RM	% Dig M+C in diet	Dig M+C in diet	Diff
SBM	20%	1.32	0.264	0.264	1.12	0.224	0.224	
SBM	17%	1.32	0.2204	0.264	1.12	0.187	0.216	-4%
MBM	4%	1.09	0.0436		0.72	0.0288		
SBM	15%	1.32	0.1929	0.264	1.12	0.1636	0.210	-6%
MBM	4%	1.09	0.0436		0.72	0.0288		
RB	5%	0.55	0.0275		0.36	0.018		

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Digestibility

Vs

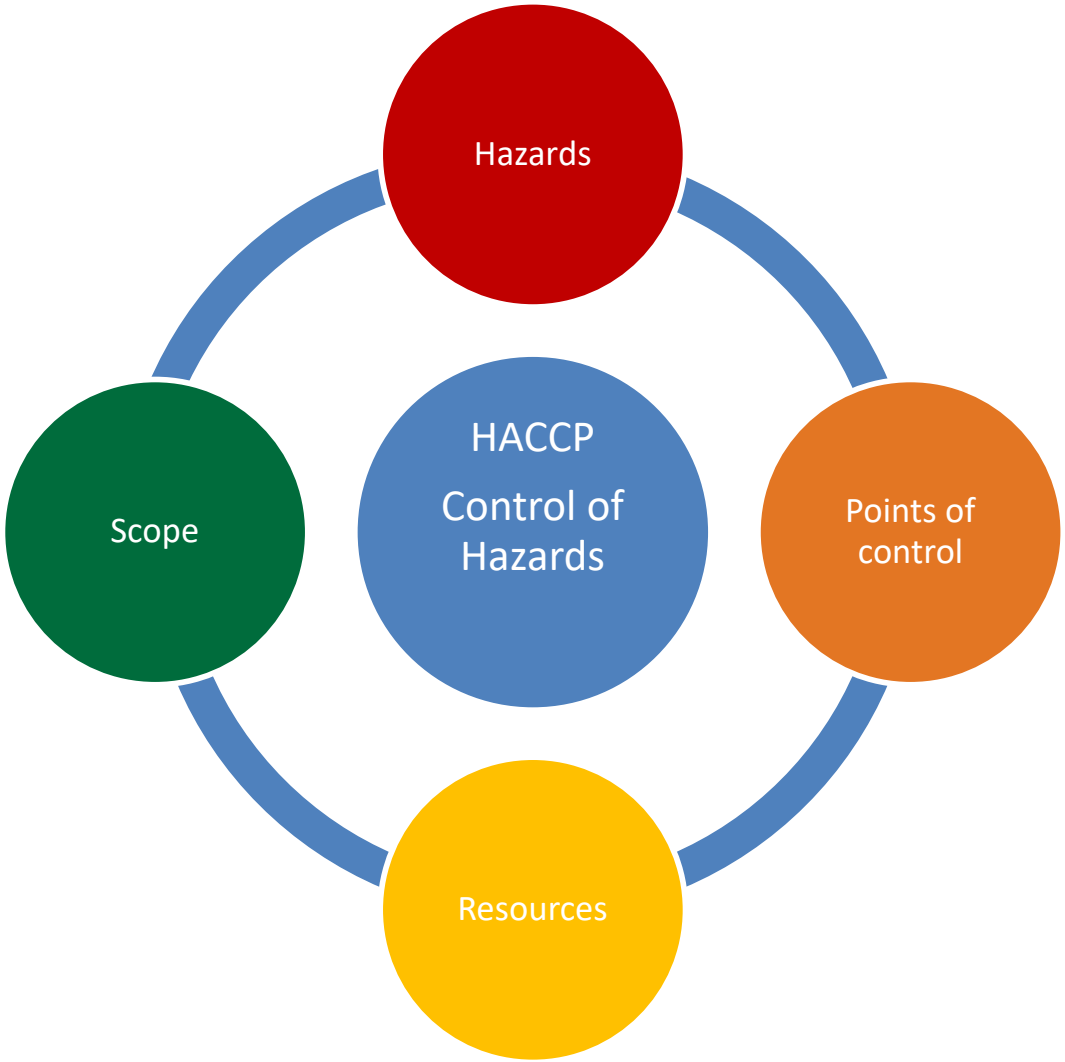
Equations

Mycotoxines are a microbiological hazard

1. True

2. False

How to keep the feed safe



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Scope

- Produce safe feed that it will reduce the gut health challenges originated by the feed
  - At the feed mill: control of the raw materials and the process
  - At the delivery: control of the transport and limited preservation
  - At the feeder: preservation of the feed

I’m buying commercial feed, when I can complain about a Salmonella problem in feed?

1. When I found it in the feed at feeder
2. When I found it in the feed at the silo
3. When I found it in the feed sample at delivery
4. When I found it in the bird

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Identify and evaluate the hazards

Hazard	Interest of screening	Cost (USD)	Level of interest
Total flora	Global assessment of the microbiological quality	7	+
Enterobacteriaceae	Facilitates the microbiological assessment of raw materials used Allows to assess the health risks for the animals Allows to assess the growth conditions	10	+++
E.Coli	Specific risk for the animals	8	++
Salmonella Sp.	Health risk assessment for the final consumer	13	?
ASR	Allows microbiological assessment of raw materials used Specific rick for the animals	13	++
Moulds and Yeast	Allows to assess the risk of mycotoxins presence in/production Allows to assess the growth conditions	8	+++
Mycotoxins	Allows to assess the health risk for animals	30 / ELISA	

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Limits for the hazards

Log CFU/gr	Enterobacteria	*E.Coli*	*Salmonella Sp.*	Mould	Yeast
Cereal	3.5	< 1	Neg	<3.5	< 3.5
Processed raw material	< 1	< 1	Neg	< 1	< 1
Mash feed	3.5	< 1	Neg	<3.5	< 3.5
Pellet feed	< 1	< 1	Neg	< 1	< 1

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Limits of the hazards

- Aflatoxine B1

Product	ppm (12% M)
Corn, corn by products, copra, palm kernel, cotton seed	0.02
Other cereals and feed materials	0.05
Feed pigs and poultry (except young animals)	0.02
Other feed	0.01
Feed dairy cattle	0.005

EU legislation

- Zearalenone

Product	ppm (12% M)
Cereals and cereal by products (except corn by product)	2
Corn by products	3
Feed for piglets and gilts	0.1
Feed for sow and fattening pigs	0.25
Feed for calves, dairy, sheep and goats	0.5

EU recommendation
Poultry is resistant up to 800 ppm

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Limits for the hazards

- Ocratoxin A

Product	ppm (12% M)
Cereals and cereal by products	0.25
Feed for pigs	0.05
Feed for poultry	0.1

EU recommendation

- Fumonisin B1 + B2

Product	ppm (12% M)
Cereals and cereal by products	60
Feed for pigs, horses, rabbits and pet	5
Fish	10
Poultry, calves (< 4 months), lambs, baby goat	20
Adult ruminants	50

EU recommendation

This is my soya should I worry about it?

Log CFU/gr	Enterobacteria	*E.Coli*	*Salmonella Sp.*	Mould	Yeast
Soya meal	2.0	< 1	Neg	1	2.5

1. Yes

2. No

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Points of control

- Sampling
- Technology
  - Dust collection
  - Cleaning practices
  - Heat treatment
- Additives
  - Feed preservatives

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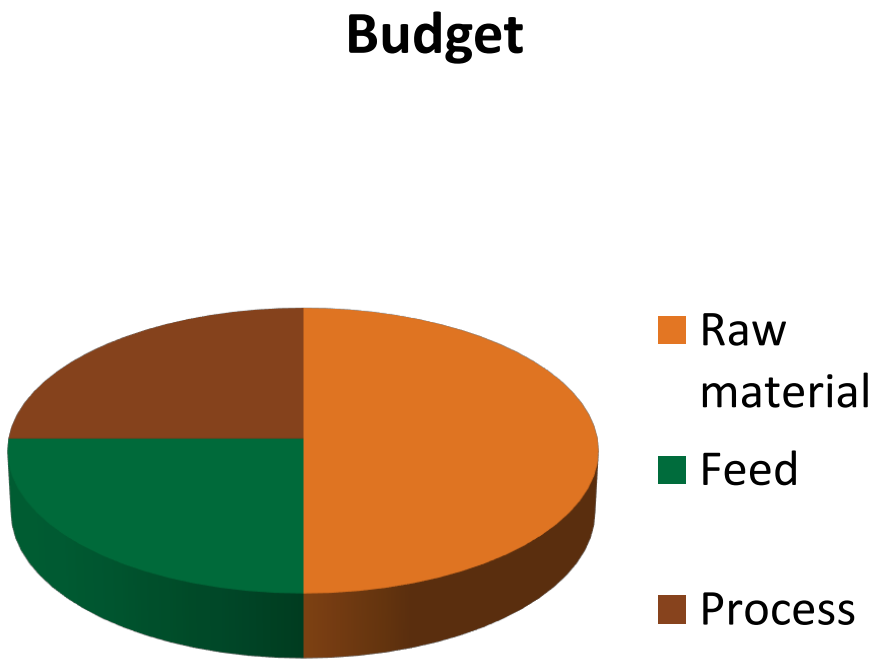
Sampling budget

- Raw materials
- Feed
- Process



Philosophy of the sampling

- Purpose:
  - Obtain information upon which to base decision to reject or accept the product
- Acceptability:
  - Whether or not some particular organism or group of organism occur in number above a specified level

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Weakness of the sampling

- **Nature of sampling**:

  Microorganism is unevenly distributed within the batches of feed

- **Analytical process**

  Related to the error inherent in the method used to detect or enumerate microorganisms

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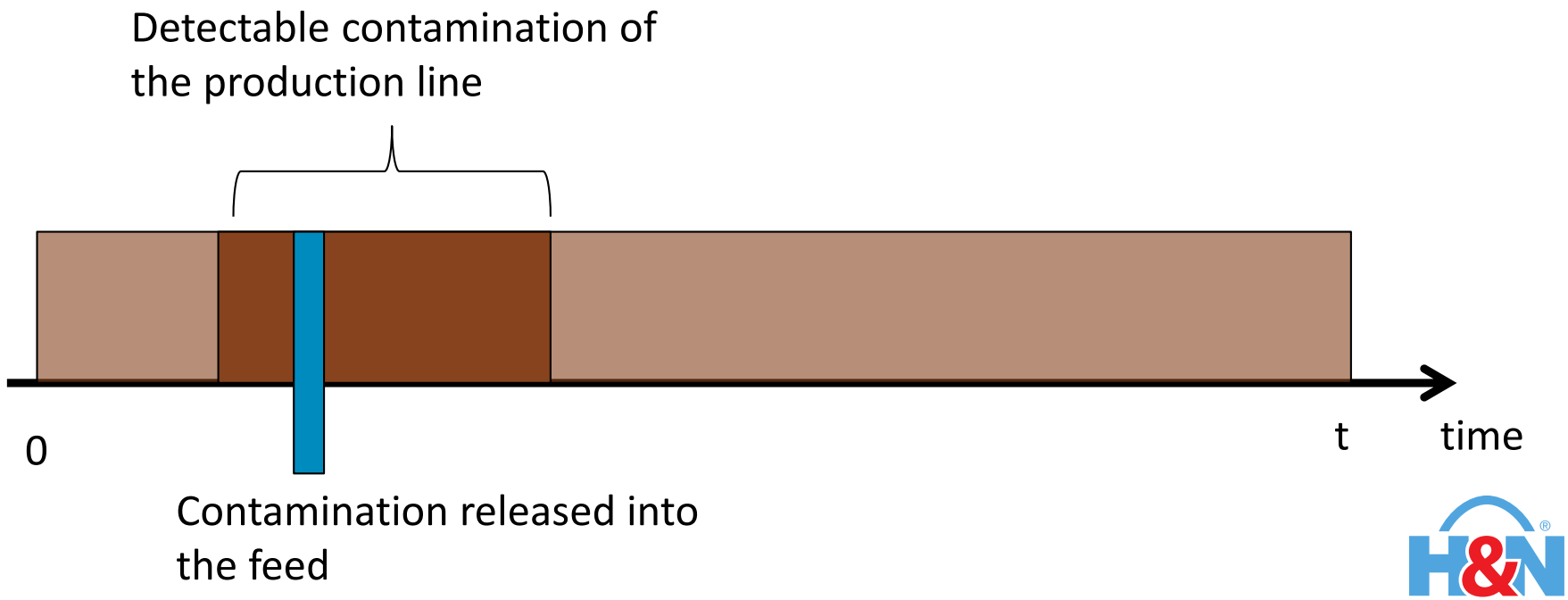
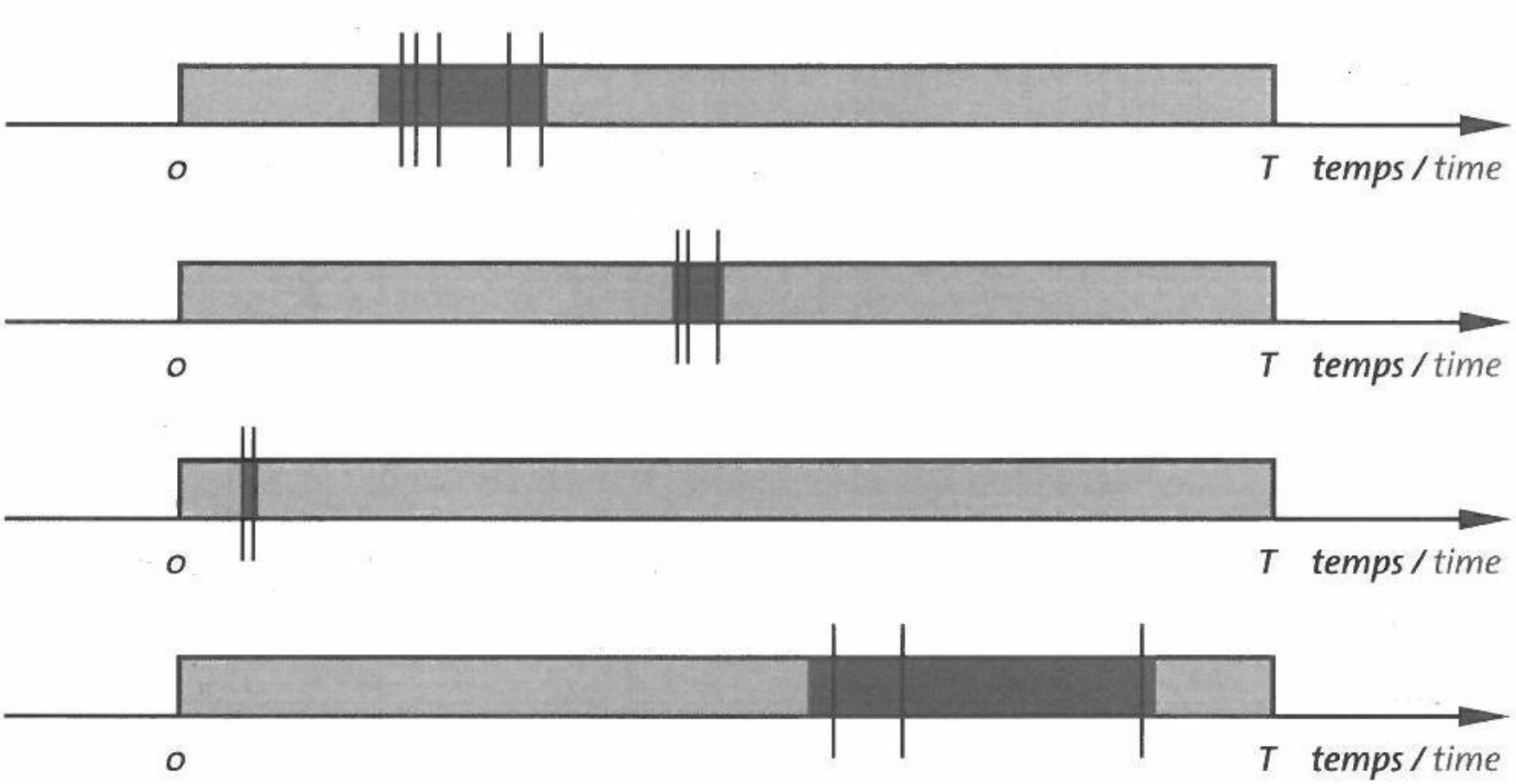
Unevenly distributed contamination

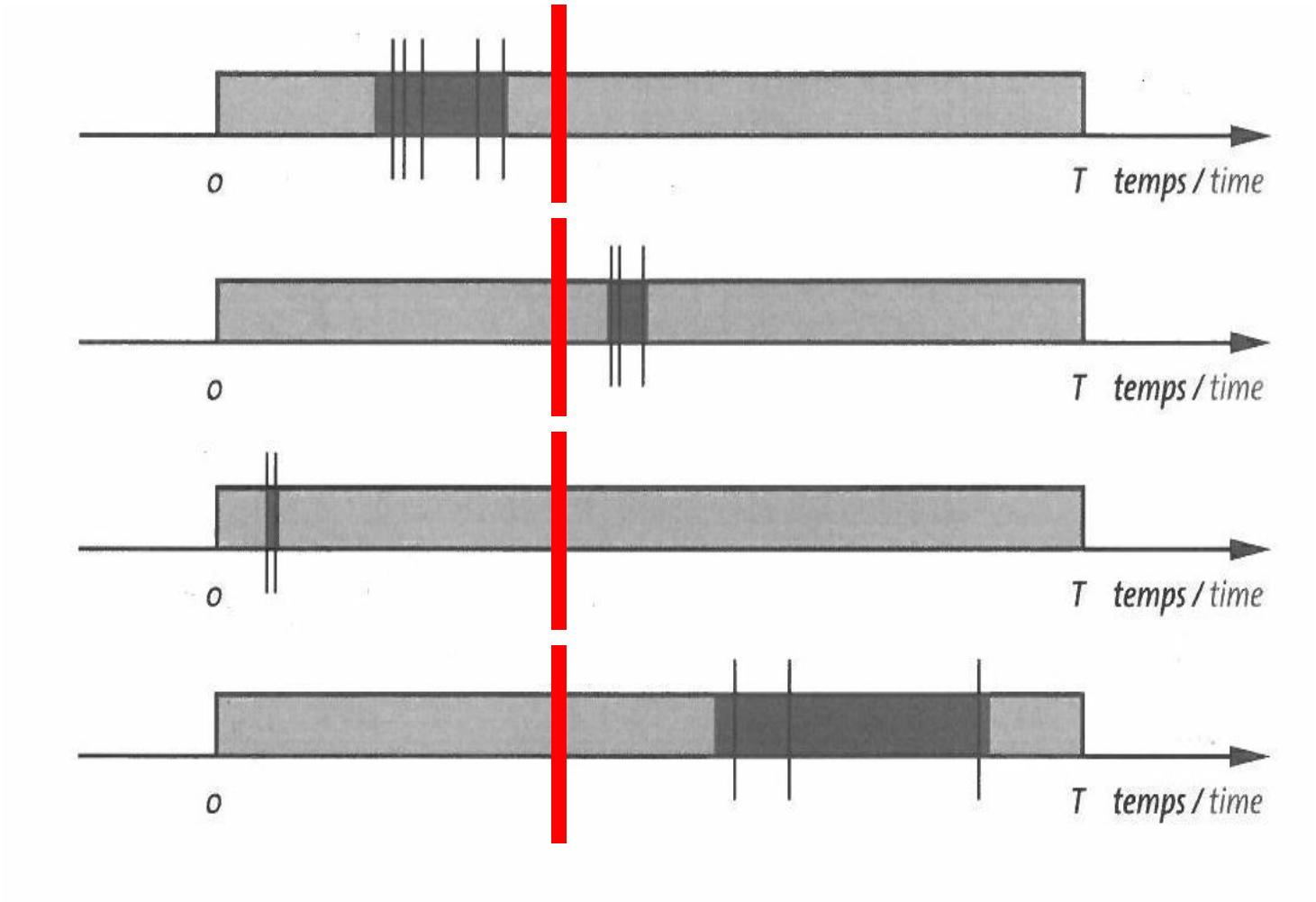
- A contamination of a batch can be summarized as follows:



Contamination examples



If I take a sample?



Result
Absence
Absence
Absence
Absence

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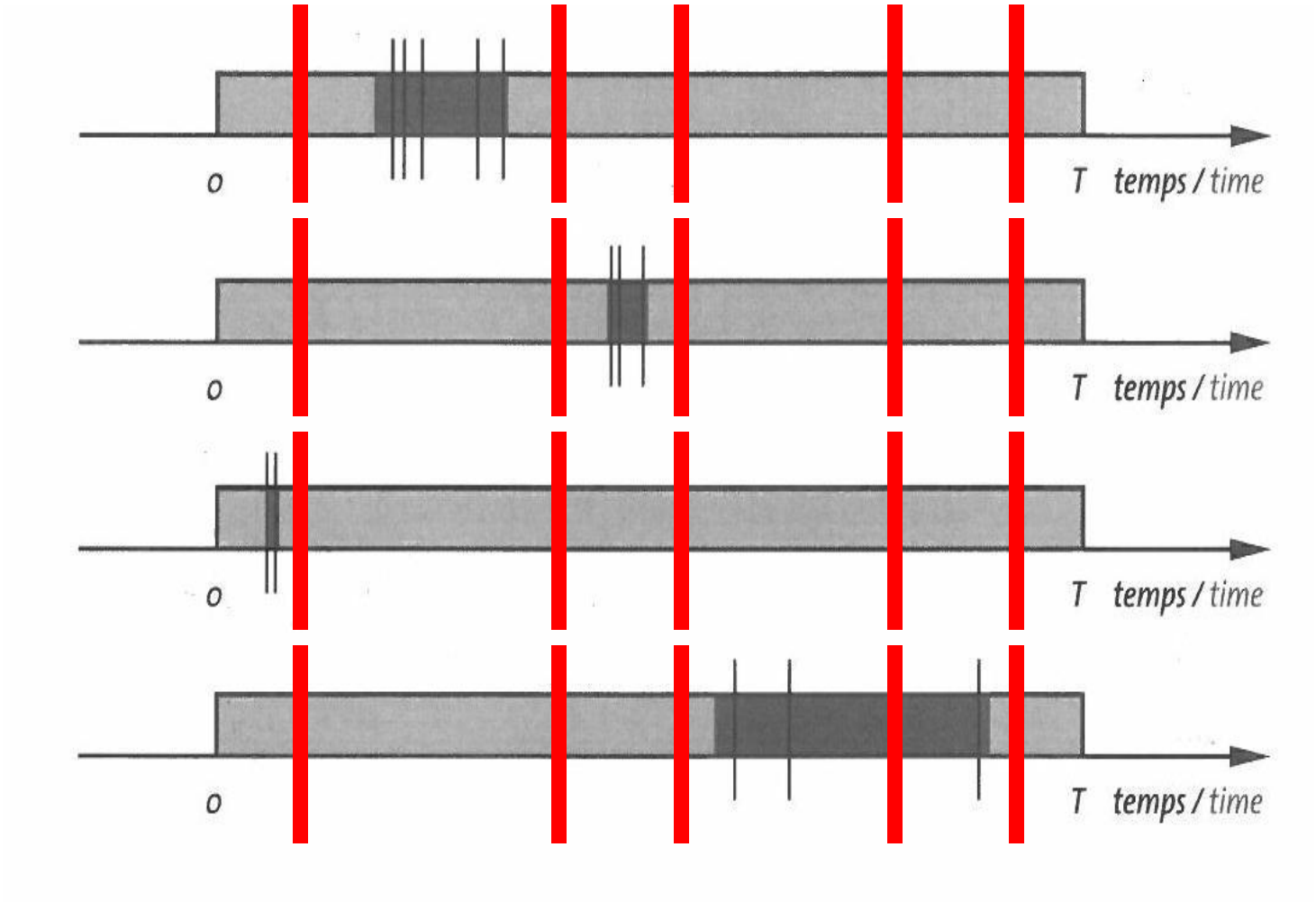
If I take 5 samples?



Result
Absence
Absence
Absence
Presence

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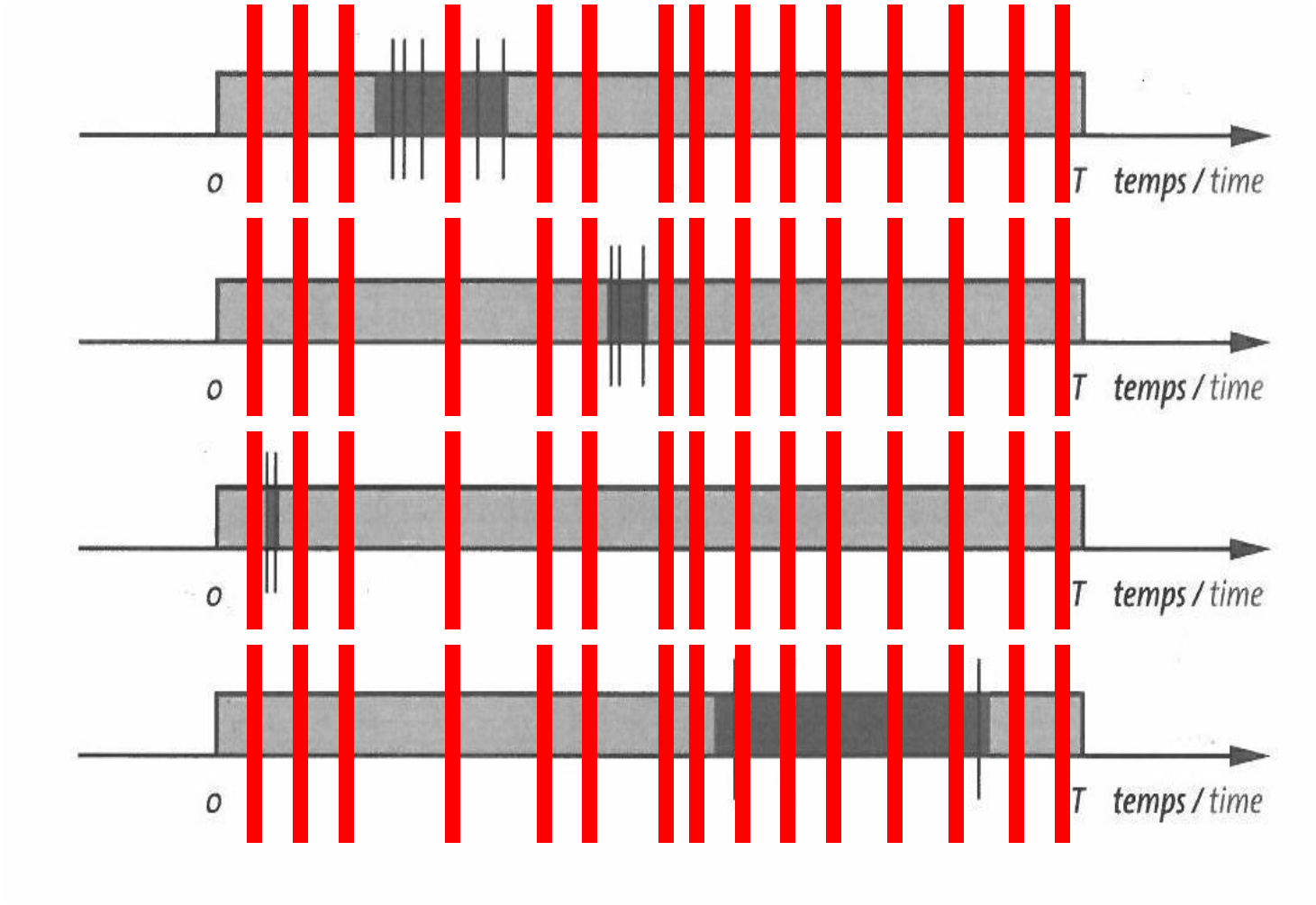
If I take 15 samples?



Result
Presence
Absence
Absence
Presence

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How many samples do I need to take?

- n : number of samples
- $P_{(x>0)}$: probability of detecting contamination, the assurance that the batch comply with the established criteria
- d: true prevalence of the contamination in the batch

$$n = \log_{10}(1 - P_{(x>0)}) / \log_{10}(1 - d)$$

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Are we sure?

True prevalence (d)	Number of samples Assurenace 95%
10 %	28
5 %	58
2 %	148
1 %	298
0.5 %	598
0.1 %	2,994
0.05 %	5,990
0.01%	29,956

- D / prevalence = 5%
- Plan: 58 samples in a year in one feed
- If I found 1 positive of the 58 samples
- D new = 8%

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The corn has a Salmonella prevalence of…

1. 1%

2. 5 %

3. 10%

4. 15%

The soya has a Salmonella prevalence of…

1. 1%

2. 5 %

3. 9%

4. 13%

The brans (rice or wheat) have a Salmonella prevalence of

1. 4%

2. 8%

3. 12%

4. 16%

The MBM (rice or wheat) have a Salmonella prevalence of

1. 10%

2. 15%

3. 20%

4. 25%

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What is the most risky raw material in feed for Salmonella?

1. Corn

2. Soya

3. Brans

4. MBM

How to read the results?

- The log counts of a contamination follows a normal distribution when the batch is coming from a common source and is processed under uniform conditions

- A population (log counts) will have a mean log and a standard deviation

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How to read the results?

	Enterobacteria	Mould	Yeast
Wheat	30	170	<10
Arg Soya	65	57	13
MBM	<10	13	<10
Local fish meal	<10	10	<10
US Soya	35	30	<10
Ceres Copra	<10	43	<10
Corn	5200	400	310
Rice bran	3400	510	120

	Enterobacteria	Mould	Yeast
Wheat	1.48	2.23	0.00
Arg Soya	1.81	1.76	1.11
MBM	0.00	1.11	0.00
Local fish meal	0.00	1.00	0.00
US Soya	1.54	1.48	0.00
Ceres Copra	0.00	1.63	0.00
Corn	3.72	2.60	2.49
Rice bran	3.53	2.71	2.08

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How the sampling helps

- Raw materials
  - Purchasing strategy
  - Formulation
- Feed
  - Reject products
  - Trend of contamination
- Process
  - Quick alert of the contamination

Summary

- If the feed is the 60-70% of the production expenses we need to know what we are giving to the birds
- Stablish a system and follow up the efficiency
- The investment in quality is paid by itself

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