



FEDERAL AGENCY FOR THE SAFETY OF THE FOOD CHAIN (FASFC)

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CONTROL OF THE FOOD CHAIN

The Belgian approach



Dioxin incident 1999: the facts

- Contamination of animal products with PCBs/dioxins following the use of recycled contaminated oils in animal fat for feed production.
- PCB rather than dioxin incident:
 - first produced in 1929
 - peak production in 1975 (2 million tons)
 - dielectric properties, chemical stability, fire resistant
 - accumulation in fat
 - toxic effects: chloracne, pigmentation, swelling of eyelids

Dioxin incident 1999: the facts

- About 55000 analyses carried out

ALL RESULTS PCB (results in the central database until 31/12/1999)						
Type of sample	% Negative	% Positive	number of results	negative	positive	limit (µg/kg)
unknown	97,4	2,6	156	152	4	200
waste	96,1	3,9	486	467	19	1000
butter	100,0	0,0	77	77	0	200
eggs	92,1	7,9	1355	1248	107	200
foodstuff	97,7	2,3	7151	6987	164	200
milk	96,3	3,7	993	956	37	100
fat/other	96,6	3,4	145	140	5	200
fat-pigs	91,7	8,3	24588	22543	2045	200
fat-poultry	97,4	2,6	7125	6939	186	200
fat-cattle	97,9	2,1	5088	4979	109	200
fat-animal not known	99,6	0,4	3968	3954	14	200
feedstuff	98,3	1,7	1896	1863	33	1000
ingredients feedstuff	99,9	0,1	770	769	1	1000
fat for feedstuff	94,5	5,5	1165	1101	64	1000
Total			54963	52175	2788	

Type of sample	> 200 µg/kg	200 - 500 µg/kg	500 - 1000 µg/kg	1000 - 5000 µg/kg	> 5000 µg/kg
unknown	4	2	0	2	0
butter	0	0	0	0	0
eggs	107	41	33	21	12
foodstuff	164	86	38	35	5
fat/other	5	1	1	3	0
fat-pigs	2045	860	485	636	64
fat-poultry	186	82	53	33	18
fat-cattle	109	64	30	15	0
fat-animal not known	14	6	2	5	1

Type of sample	> 100 µg/kg	100 - 200 µg/kg	> 200 µg/kg
milk	37	15	22

Type of sample	> 1000 µg/kg	1000 - 5000 µg/kg	> 5000 µg/kg
waste	19	8	11
feedstuff	33	22	11
ingredients feedstuff	1	1	0
fat for feedstuff	64	64	0

From incident to crisis

- Lack of communication and coordination between different services from different ministries
- Limited lab capacity
- Lack of international standards
- Context: political situation in Belgium

Impact of the dioxin crisis in 1999

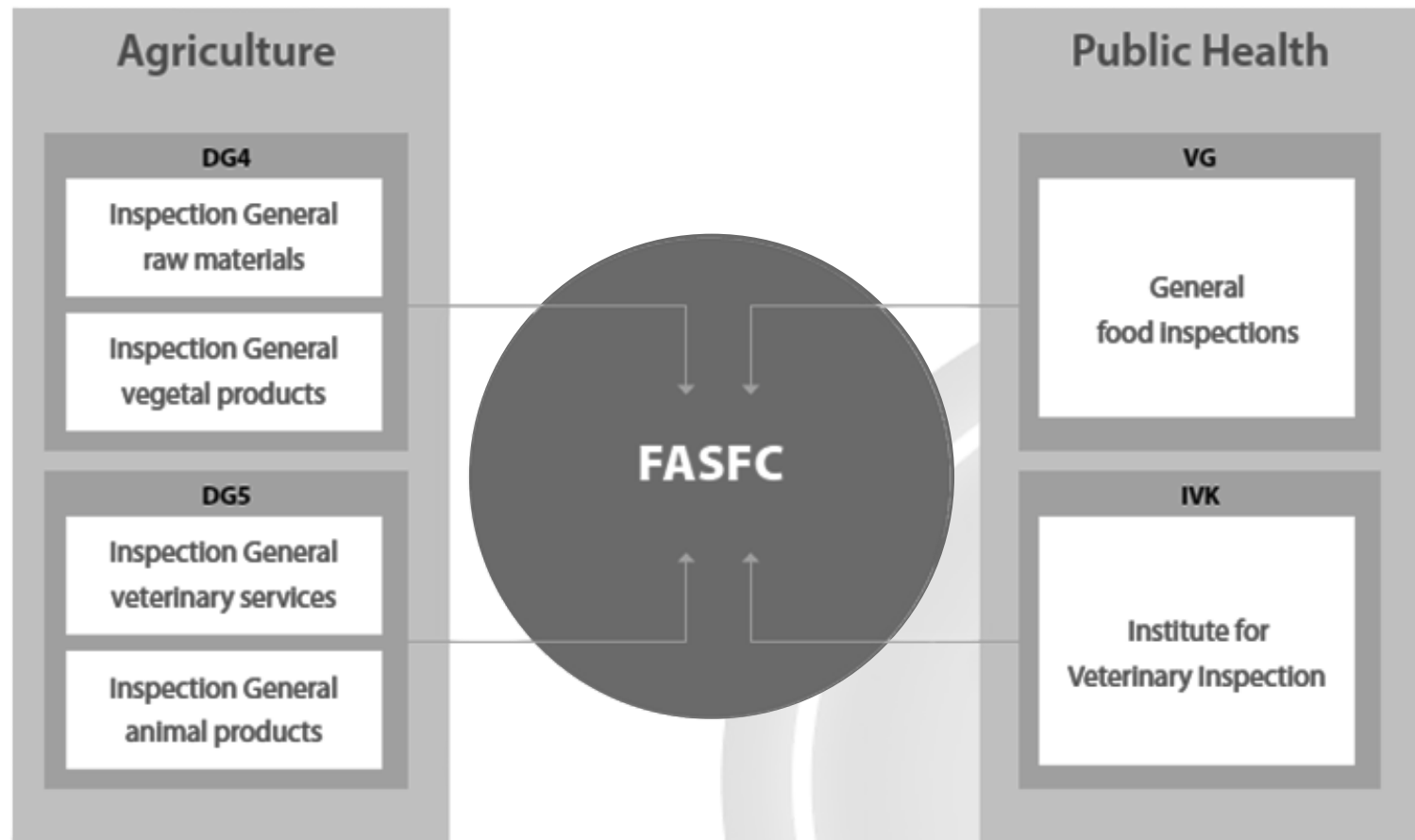
- Hundreds of farms were affected (major feed mills had received contaminated fat)
- Destruction of primary products ($\pm$ 250 million euro)
- Massive destruction of meat : 96.348 tons
 - pork : $\pm$ 45.000 tons
 - poultry : $\pm$ 12.500 tons
 - beef, eggs, food stuffs : $\pm$ 38.848 tons
- Financial impact : 437,5 million euro ?
- Resignation of 2 ministers
- Image of Belgian products ↘↘
- Loss of export markets (image and EU export prohibition)

Lessons learned: new legislative framework

- General Food Law and establishment of EFSA
- Emphasis on the Safety of the whole food chain
- First responsibility = food business operator
- Consumer: central place
- Specific legislation and maximum limits for dioxins/PCBs

	action limits		limits	
	dioxins pg TEQ/g	dioxin-like PCB pg TEQ/g	dioxins pg TEQ/g vet	dioxins + dioxin-like PCB pgTEQ/g
ruminants (meat or fat)	1,5	1	3	4,5
poultry and game (meat or fat)	1,5	1,5	2	4
pigs (meat or fat)	0,6	0,5	1	1,5
milk and milk products	2	2	3	6
eggs and egg products	2	2	3	6
fish and derived products	3	3	4	8

Lessons learned: creation of FASFC

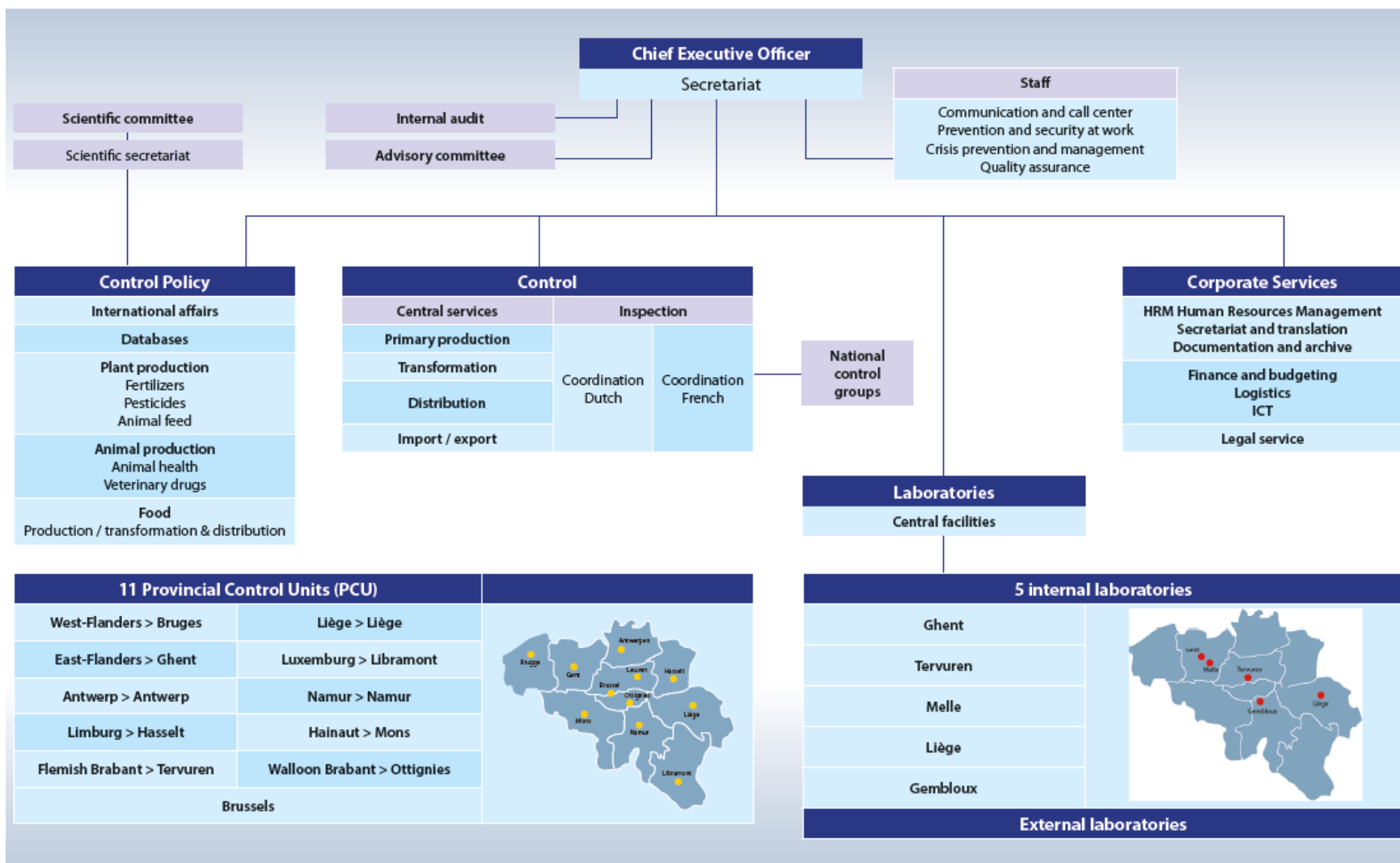


Lessons learned: FASFC organisation



The Belgian Food Agency

Federal Agency for the Safety of the Food Chain



Lessons learned: FASFC organisation

The Scientific Committee (+- 21 members)

- independent Risk evaluation
- advice on standards for the risk management, on regulations
- **quick reactions in case of incidents!**

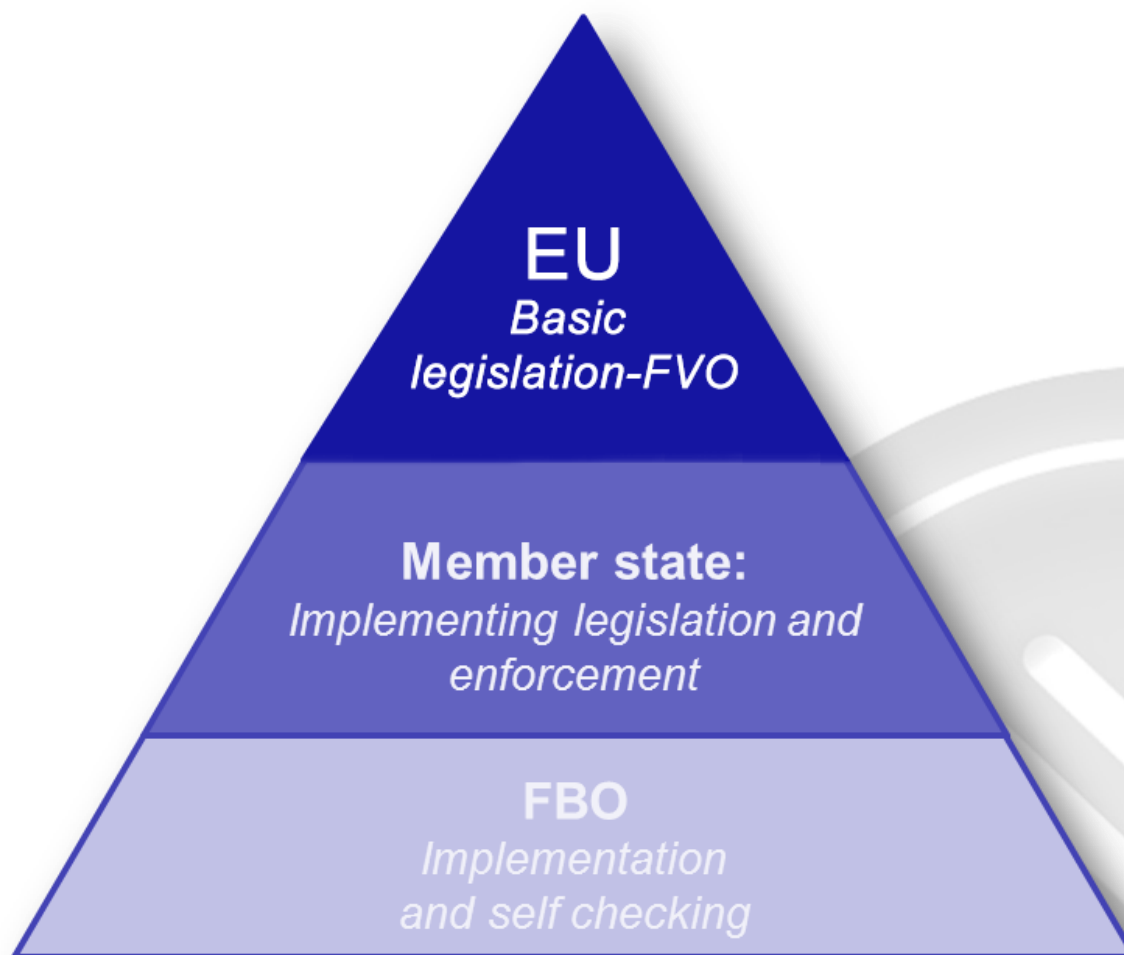
Crisis prevention and management unit

- under CEO
- advice on standards for the risk management, on regulations
- training and exercises to be prepared for crisis situations
- crisis manual(s)
- Short chain of commands in case of crisis: central – local level

Communication service

- Open and transparant communication

Food safety responsibilities

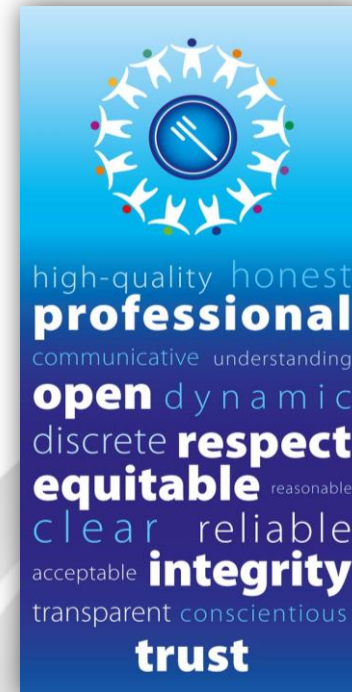


Food Safety in Belgium

- Country profile on website European Commission:
 - Control system in Belgium for food&feed safety, animal health and plant health
 - Five most recent audit reports
 - Link to MANCP (multi-annual national control plan) and annual report
- Business plan of the FASFC CEO, with active contribution of stakeholders
- Consultative bodies: advisory committee, scientific committee, audit committee

Mission and values

OUR TASK IS TO
PRESERVE THE SAFETY OF
THE FOOD CHAIN AND THE
QUALITY OF FOOD, IN
ORDER TO PROTECT THE
HEALTH OF HUMANS,
ANIMALS AND PLANTS.



Competencies

- Operational regulations
- Registration, authorisation, approval of operators
- Export certification
- Prevention, awareness and information
- Laboratories
- Surveillance of the different links within the chain (products and production processes)

the FASFC in numbers

5 own labs
(ISO 17025)

a network of
external labs **50**

93.000
export certificates

1.250
staff members

157.000
operators

130.000 missions
at **74.000** operators

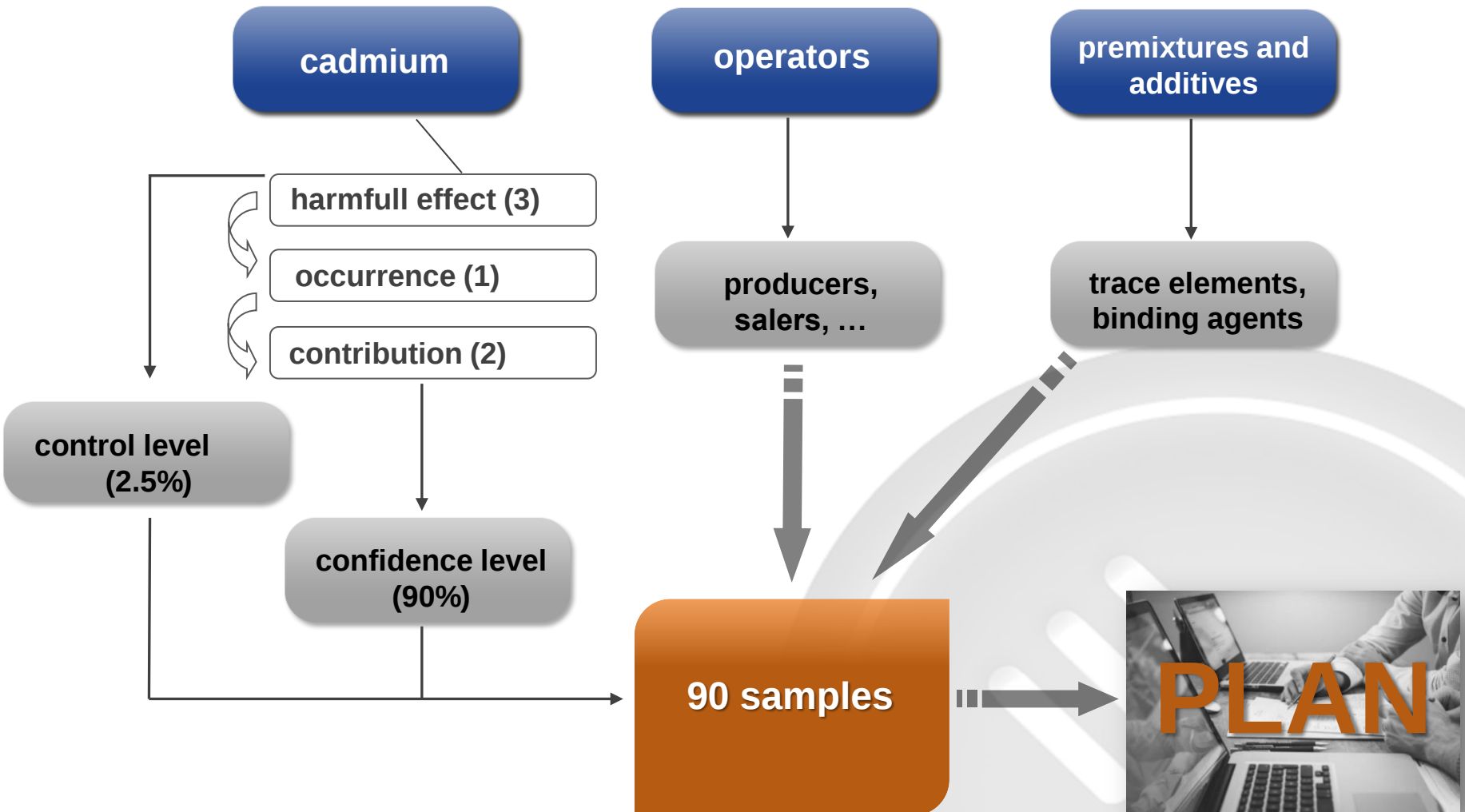
30.000
samplings

a **€167** million budget
(where 57% comes from
Public funding)

Core process



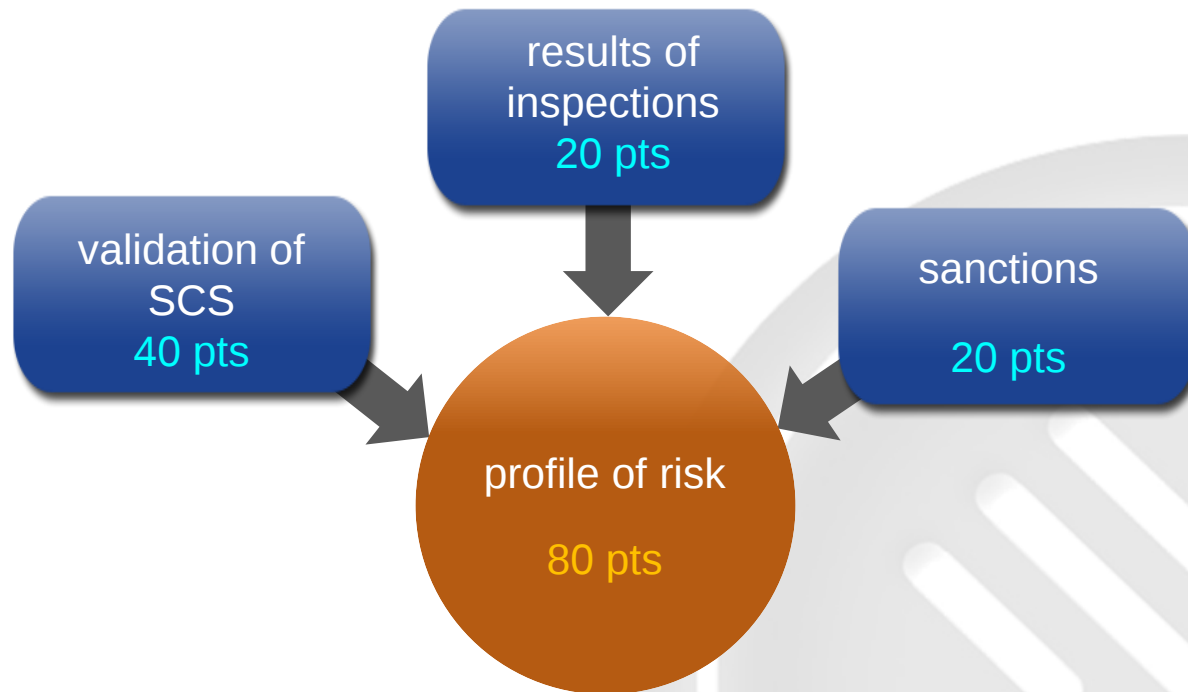
Program of analyses



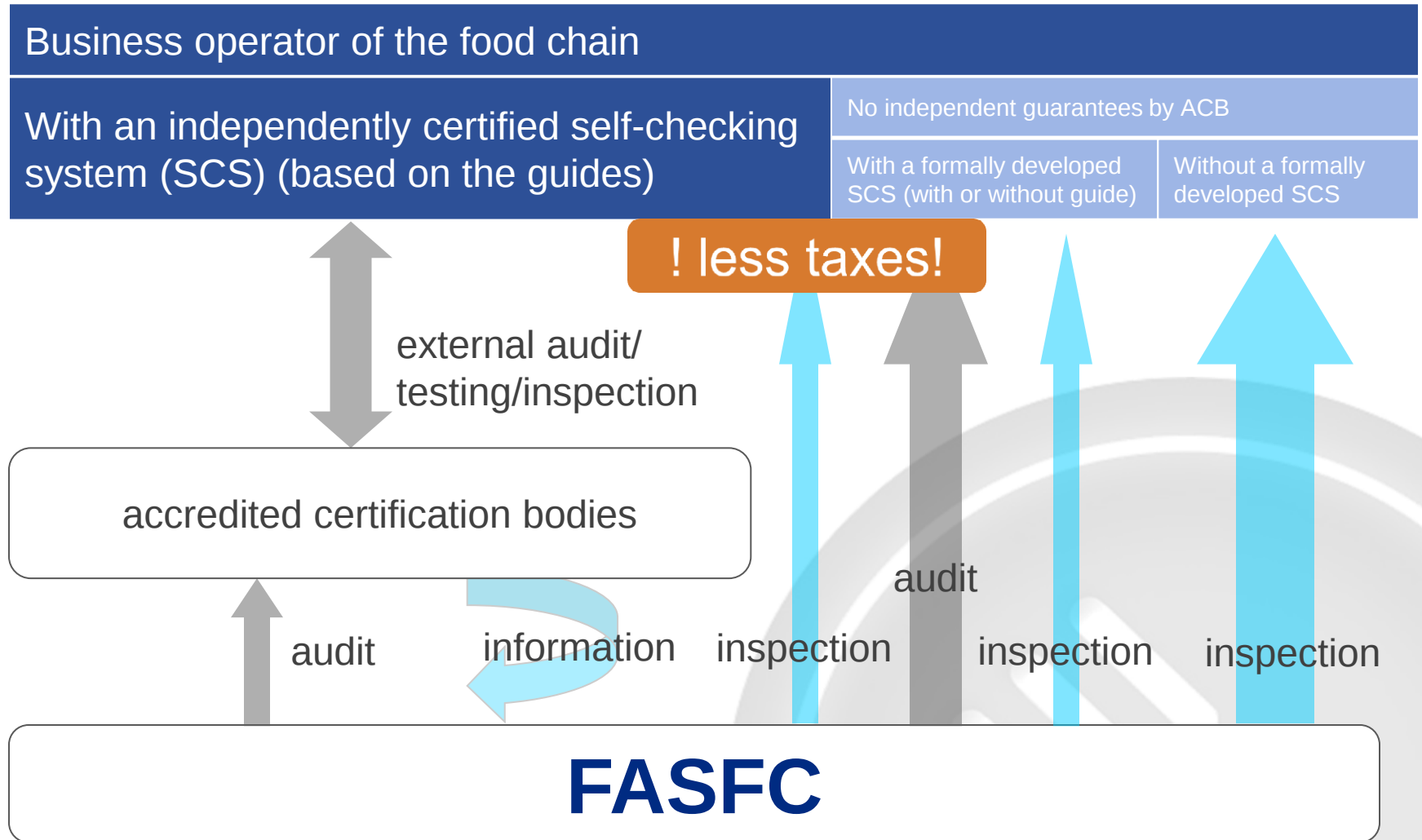
Program of inspections

Basis = risk based approach

Risk profile for each food business operator,
taking its activities into account.



Implementation of the self-checking systems



Effects of a validated self-checking systems



International activities

- Participation in international summits (OIE, IPPC, Codex, WTO-SPS)
- Partnerships: exchange of experience/knowledge and closer/more efficient collaboration
- Bilateral export agreements

A food agency under quality control

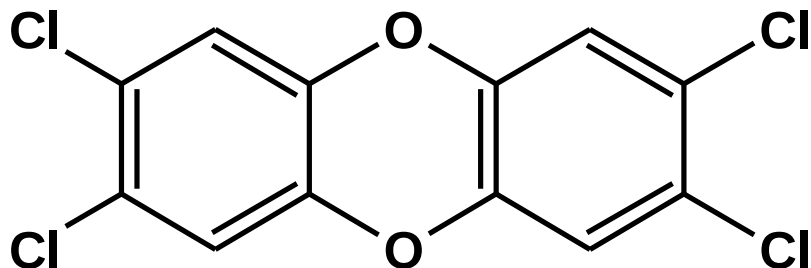




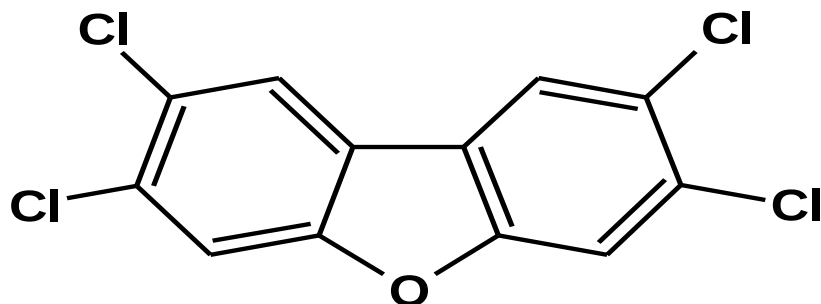
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Control of dioxins in poultry

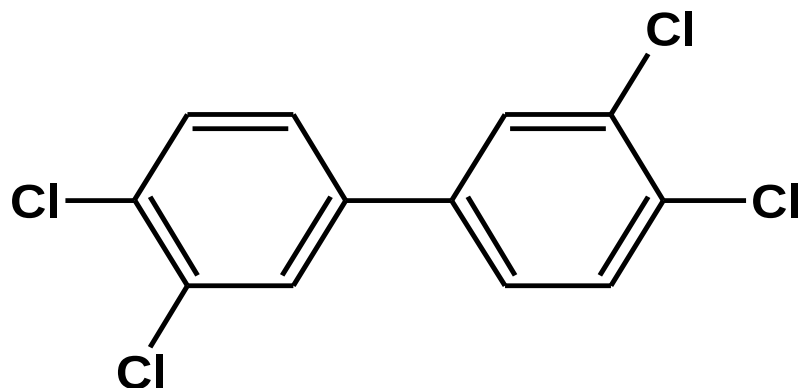
Hazard identification : Dioxins



Polychlorinated dibenzodioxins
PCDD



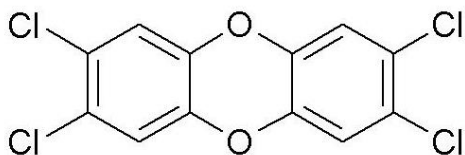
Polychlorinated dibenzofurans
PCDF



Dioxin- like polychlorinated
biphenyls DL-PCB

Properties of dioxins

- Lipophilicity
 - Persistence
- Bioaccumulation
- Pertinent toxic congeners :
10 PCDD and 7 PCDF, 12 DL-PCB
 - Concentration expressed in TEQ
Total TEQ = Σ C congener X TEF congener



2,3,7,8-tetrachloro dibenzo-p-dioxine (TCDD)



TEF = 1

Hazard characterization

- Human studies (strong evidence):
 - Chloracne
 - Cancer : occupational exposure
 - Reproductive effects : change in sex ratio (Seveso)
- NOAEL derivated from animal studies
- Tolerable Weekly Intake (TWI) (SCF, 2001)
= 14 pg/kg/week for 17 PCDD/F + 12 DL-PCB

Exposure

- Mainly through diet (90%)
- Food with the main contribution :

Animal fat

- Meat
- Milk
- Eggs
- Fish

Legislation: Food safety and contaminant

- General Food Law [Reg. (EC) No 178/2002] and Royal decree of 14/11/03
 - Responsibility of the operators
 - Autocontrol (HACCP)
 - Obligatory notification
 - Tracability
- Official Food Control Regulation [Reg. (EC) No 882/2004] + Official Controls on products of animal origin [Reg. (EC) No 854/2004]
 - Responsibility of the BFSA
 - Official control program
 - based on the risks
 - based on autocontrol
 - based on anterior results (analytical, inspections, sanctions)

Dioxins legislation in food and feed

- [Commission Regulation \(EC\) 1881/2006](#) setting maximum levels for certain contaminants in foodstuffs
- Directive 2002/32/EC on undesirable substance in animal feed
- [Commission Regulation \(EU\) 2017/644](#) laying down methods of sampling and analysis for the control of levels of dioxins, dioxin-like PCBs and non-dioxin-like PCBs in certain foodstuffs
- [Commission Regulation \(EC\) 152/2009](#) laying down the methods of sampling and analysis for the official control of feed
- [Commission Recommendation 2013/711/EU](#) on the reduction of the presence of dioxins, furans and PCBs in feed and food

Maximum levels for dioxins and PCB in poultry

	Sum of dioxins (WHO-PCDD/F- TEQ)	Sum of dioxins and dioxin-like PCBS (WHO-PCDD/F- PCB-TEQ)	Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180
Meat and meat products (excluding edible offal) of poultry	1.75 pg/g fat	3.0 pg/g fat	40 ng/g fat
Liver of terrestrial animals	0.30 pg/g wet weight	0.50 pg/g wet weight	3.0 ng/g wet weight
Fat of poultry	1.75 pg/g fat	3.0 pg/g fat	40 ng/g fat

Action level for PCCD/F and DL-PCB in poultry

	Action level for dioxins + furans (WHO-TEQ)	Action level for dioxin-like PCBs (WHO-TEQ)
Meat and meat products (excluding edible offal) of poultry	1.25 pg/g fat	0.75 pg/g fat
Mixed fats	1.00 pg/g fat	0,75 pg/g fat

When the action level is exceeded :

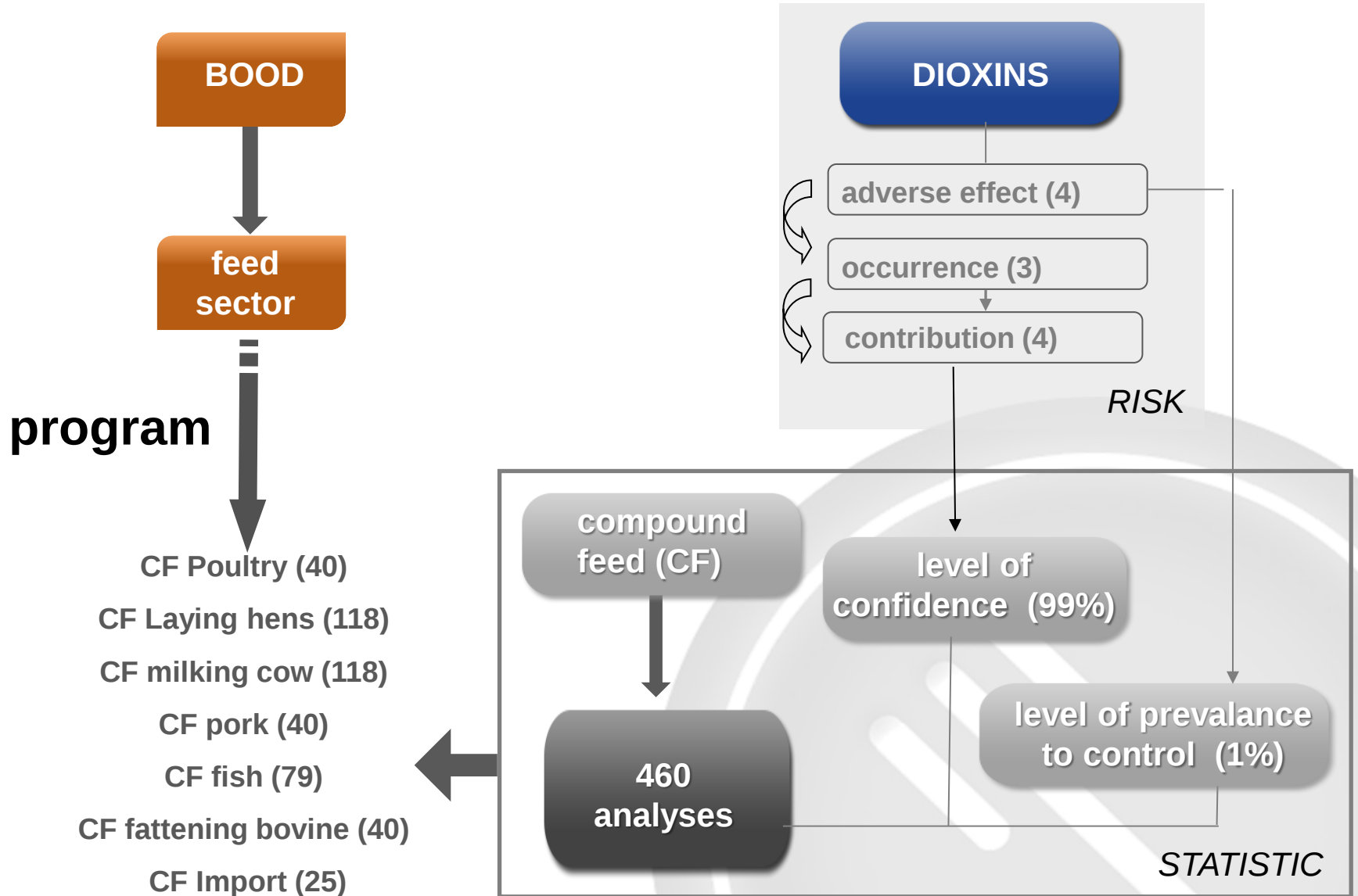
- Investigation are initiated to identify the source of contamination
- Measures are taken to reduce or eliminate the source of contamination

Actions on the product when the maximal level is exceeded

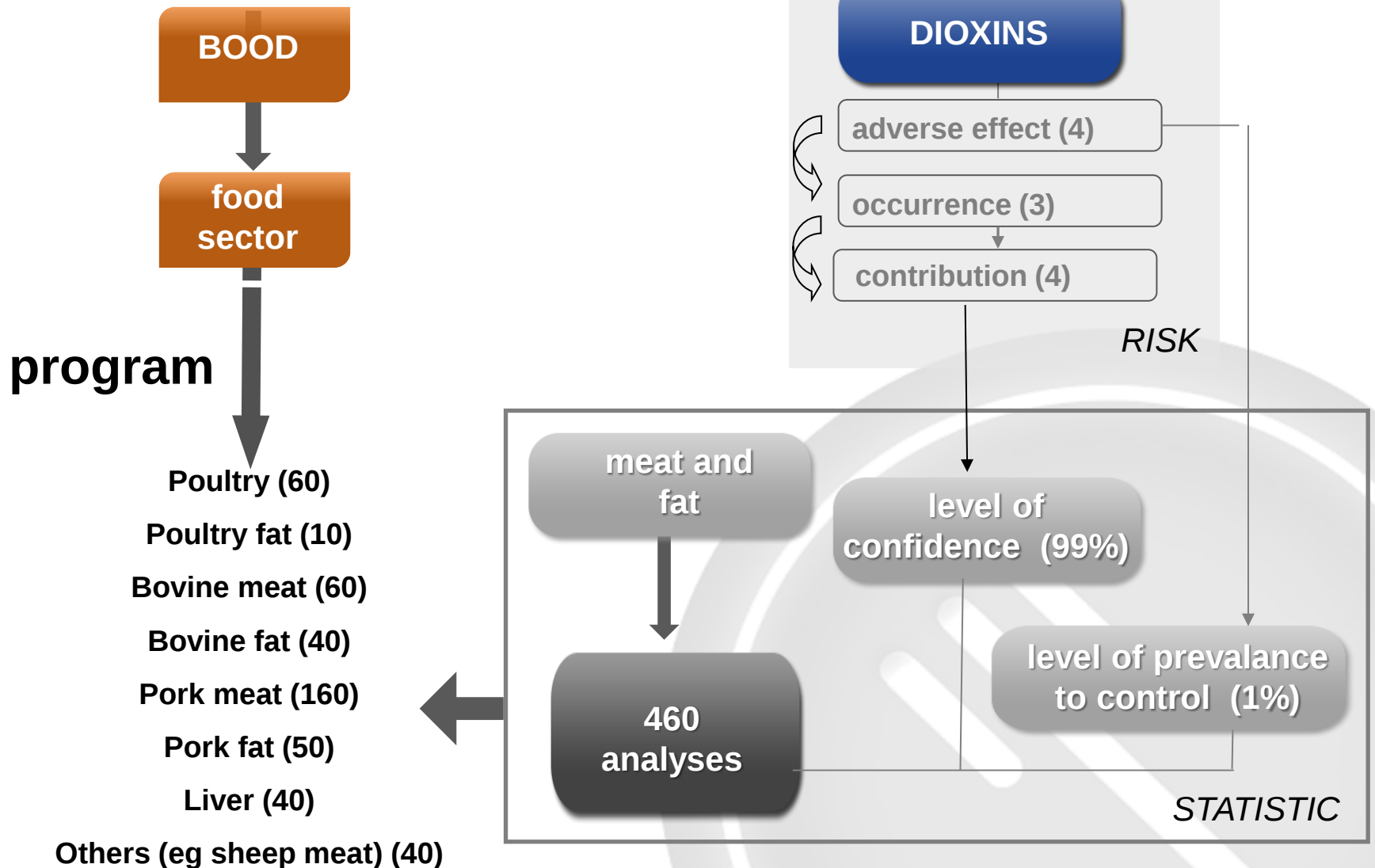
Official analysis program of dioxins

- Number of analyses fixed by a statistical approach
 - Objective: detection of dioxins and dioxin-like PCB
 - Risk-based approach
 - **Hazard:** severity of the adverse effect (score 1 to 4)
 - **Exposure**
 - Cotation of « **occurrence** » (1 to 4)
 - Cotation of « **contribution** » (1 to 4)
 - Statistic approach
 - Description of **population** and identification of matrix to sample
 - Determination of **prevalence to control**
 - Determination of **level of confidence**

Analysis program of dioxins in feed



Analysis program of dioxins in meat and fat (slaughterhouse, transformation and distribution)



Analytical Methods

- Screening method

- CALUX (Dioxin Responsive Chemical Activated Luciferase gene eXpression assay)
 - Bioanalytical method
 - Give an indication of the TEQ level expressed in bioanalytical equivalent (BEQ)

If result is higher than 70% of the maximum level, the result as to be confirmed by

- A confirmatory method

- GC-HRMS
 - Quantitative analysis method
 - Give a quantitatif result for each PCCD/F + DL PCB congener

Results of the official control for dioxins and PCB on the poultry meat in 2016

- Matrix analysed
 - Whole poultry
 - Cut meat of poultry without skin
- Samples taken in the following sector
 - Slaughterhouse
 - Transformation
 - Distribution
- 100% conform





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Situation on zoonotic Salmonella in Belgium

Main legislation

- Regulation (EC) No 2160/2003 of the European Parliament and of the Council of 17 November 2003 on the control of salmonella and other specified food-borne zoonotic agents
- Commission Regulation (EC) No 1003/2005 of 30 June 2005 implementing Regulation (EC) No 2160/2003 as regards a Community target for the reduction of the prevalence of certain salmonella serotypes in breeding flocks of Gallus gallus and amending Regulation (EC) No 2160/2003
- Commission Regulation (EC) No 1168/2006 of 31 July 2006 implementing Regulation (EC) No 2160/2003 as regards a Community target for the reduction of the prevalence of certain salmonella serotypes in laying hens of Gallus gallus and amending Regulation (EC) No 1003/2005

Main legislation

- Commission Regulation (EC) No 1177/2006 of 1 August 2006 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards requirements for the use of specific control methods in the framework of the national programs for the control of salmonella in poultry
- Commission Regulation (EU) No 200/2010 of 10 March 2010 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of Salmonella serotypes in adult breeding flocks of Gallus gallus
- Commission Regulation (EU) No 517/2011 of 25 May 2011 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of certain Salmonella serotypes in laying hens of Gallus gallus and amending Regulation (EC) No 2160/2003 and Commission Regulation (EU) No 200/2010

Main legislation

- Commission Regulation (EU) No 200/2012 of 8 March 2012 concerning a Union target for the reduction of *Salmonella enteritidis* and *Salmonella Typhimurium* in flocks of broilers, as provided for in Regulation (EC) No 2160/2003 of the European Parliament and of the Council
- Commission Regulation (EU) No 1190/2012 of 12 December 2012 concerning a Union target for the reduction of *Salmonella Enteritidis* and *Salmonella Typhimurium* in flocks of turkeys, as provided for in Regulation (EC) No 2160/2003
- Royal and Ministerial Decree of 27 April 2007 governing the control of Salmonellosis in Poultry

Control program

- Targeted serotypes

- Breeders:

- *S. Enteritidis*, *S. Typhimurium*, *S. Infantis*, *S. Hadar*, *S. Virchow*, *S. Paratyphi B* var. *Java*

- Laying hens:

- *S. Enteritidis*, *S. Typhimurium*

- Broilers and meat turkeys

- All serotypes

- Vaccination policy

- Compulsory against *S. Enteritidis* (breeders and layers)
 - Strongly recommended against *S. Typhimurium* (breeders and layers)

Control program: breeders

■ Monitoring/testing

- Rearing:
 - day old chicks, 4 weeks (routine sampling)
 - 16 weeks (official sampling)
- Production:
 - 24 weeks, 46 weeks and 56 (62) weeks (official)
 - every 2 weeks (routine)
- Cocks:
 - at time of placement (routine)
- Moulting:
 - 3 times during second production (official)

■ Slaughter :

- Positive for 1 of the 5 serotypes : within 30 days
- Positive for other *Salmonella* spp: logistic at the end of the day

■ Co-financing from European Commission

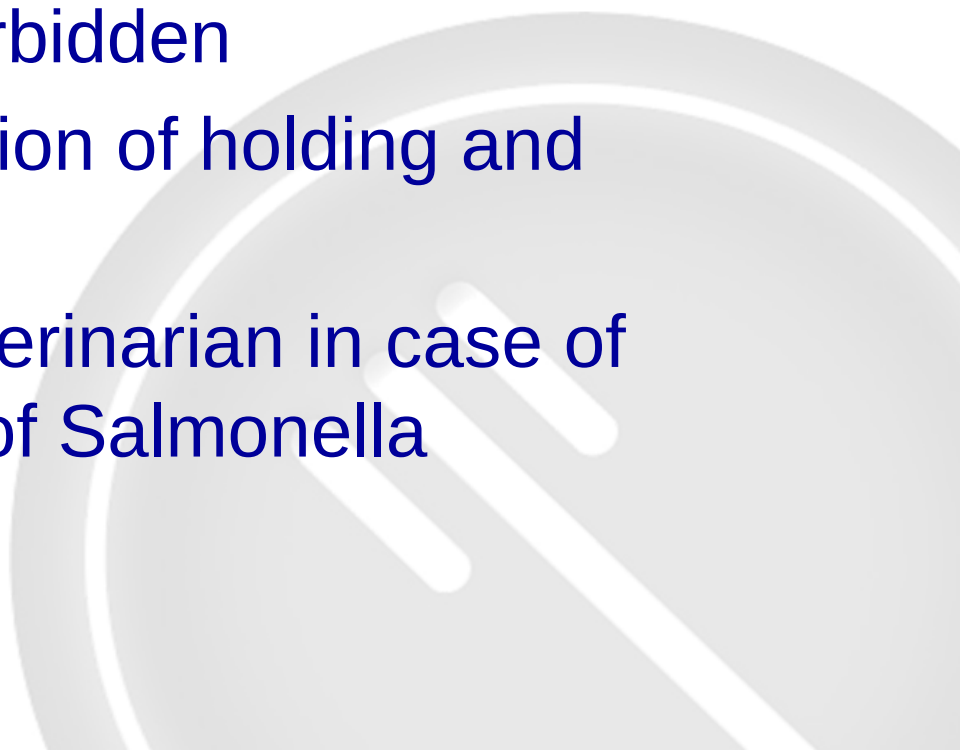
Control program: layers

- **Monitoring/testing**
 - Rearing:
 - day old chicks
 - 16 weeks
 - Production:
 - 24, 39 and 54 weeks (routine sampling)
 - in the last 3 weeks of production (exit control)
 - one flock of every holding per year at random time (official sampling)
 - Moulting flocks:
 - 3 times during second production (routine)
- **Slaughter :**
 - Logistic slaughter at the end of production
- **Co-financing from European Commission**

Control program: broilers

- **Monitoring/testing**
 - In the last 3 weeks before slaughtering: routine control made by operator
 - 10 % of the holdings per year; one flock by holding: official control checked
- **No financing from European Commission**

Measures in case of detection

- Notification of results to the holder
 - Destruction of incubated hatching eggs/pasteurization of non-incubated eggs
 - Logistic slaughter
 - Antibiotic treatment forbidden
 - Cleaning and disinfection of holding and verification of efficacy
 - Assistance of farm veterinarian in case of successive presence of Salmonella
- 

Results 2011 - 2016

- Rearing breeders: 3 cases in the last 6 years
- Breeders: 2-3 cases per year (average)
- Laying hens: 0,3 – 2,1%
- Broilers: 0,15 – 0,57 %





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Microbiological controls poultry meat

Microbiological analysis

Poultry meat

- Legislation
 - Official analysis program
 - Microbiological analysis in poultry meat
 - Results
 - Measures in case of non compliance
 - Self-checking
- 

Legislation: food safety

- General Food Law [Reg. (EC) No 178/2002] and Royal decree of 14/11/03
 - Responsibility of the operators
 - Self-checking (HACCP)
 - Obligatory notification
 - Traceability
- Official Food Control Regulation [Reg. (EC) No 882/2004] + Official Controls on products of animal origin [Reg. (EC) No 854/2004]
 - Responsibility of the BFSA
 - Official control program
 - based on the risks
 - based on Self-checking
 - based on anterior results (analytical, inspections, sanctions)

Legislation: microbiological control

- Microbiological criteria Regulation [Reg. (EC) No 2073/2005] and Royal decree of 26/04/2009 and Royal decree of 30/11/2015
 - Definition of food safety criteria
 - Definition of process hygiene criteria
 - No action on products but Improvements in production hygiene and improvements in selection and/or origin of raw materials
 - Bacteriological sampling and analytical methods
 - FBO have to do microbiological analysis (Self-checking)

Legislation: microbiological control

- Microbiological criteria Regulation [Reg. (EC) No 2073/2005]

Food safety	Minced meat, preparation meat, MSM, meat products	Salmonella
Process hygiene	Carcasses	Salmonella
	Minced meat, MSM	E. coli and total colony count
	Preparation meat	E. coli

- Royal decree of 26/04/2009 and Royal decree of 30/11/2015

Food safety	Minced meat, preparation meat	Campylobacter

Legislation: microbiological control

- Microbiological criteria Regulation [Reg. (EC) No 2073/2005]

Process hygiene	Carcasses	campylobacter

New criterion under preparation by the European Commission



Official analysis program



BFSA

1. Legislation

- Number of analyses fixed by legislation

2. Detection of contamination

- Vigilance
- Number of analyses fixed by a statistical approach
- Aim : detect a contamination with a certain level of confidence

3. Determination of prevalence

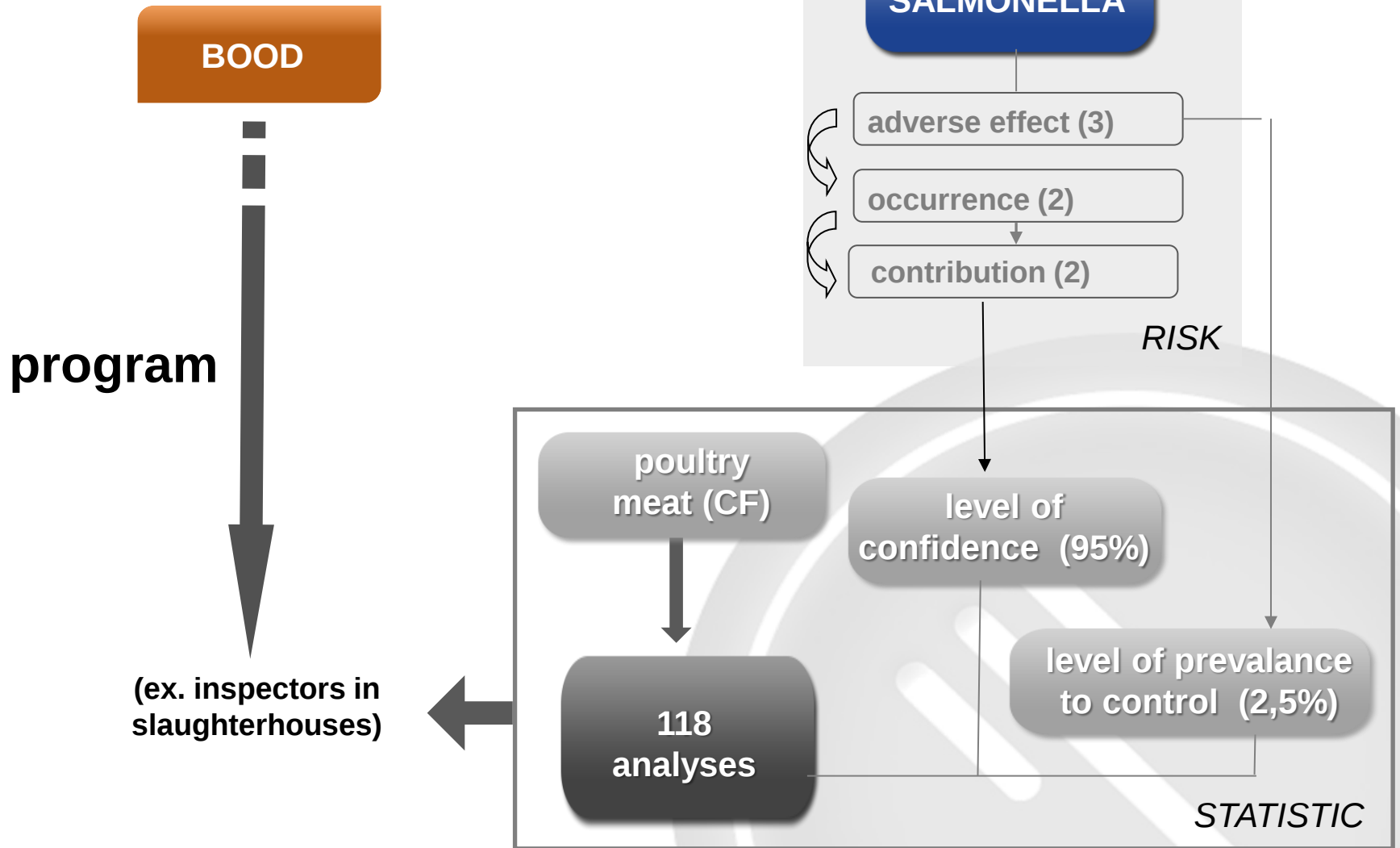
- Surveillance
- Number of analyses fixed by a statistical approach
- Aim : estimate the prevalence with a certain level of precision

Official analysis program

Detection of contamination

- Number of analyses fixed by a statistical approach
 - Risk-based approach
 - **Hazard:** severity of the adverse effect (score 1 to 4)
 - **Exposure**
 - Cotation of « *occurrence* » (1 to 4)
 - Cotation of « *contribution* » (1 to 4)
 - Statistic approach
 - Description of **population** and identification of matrix to sample
 - Determination of **prevalence to control**
 - Determination of **level of confidence**

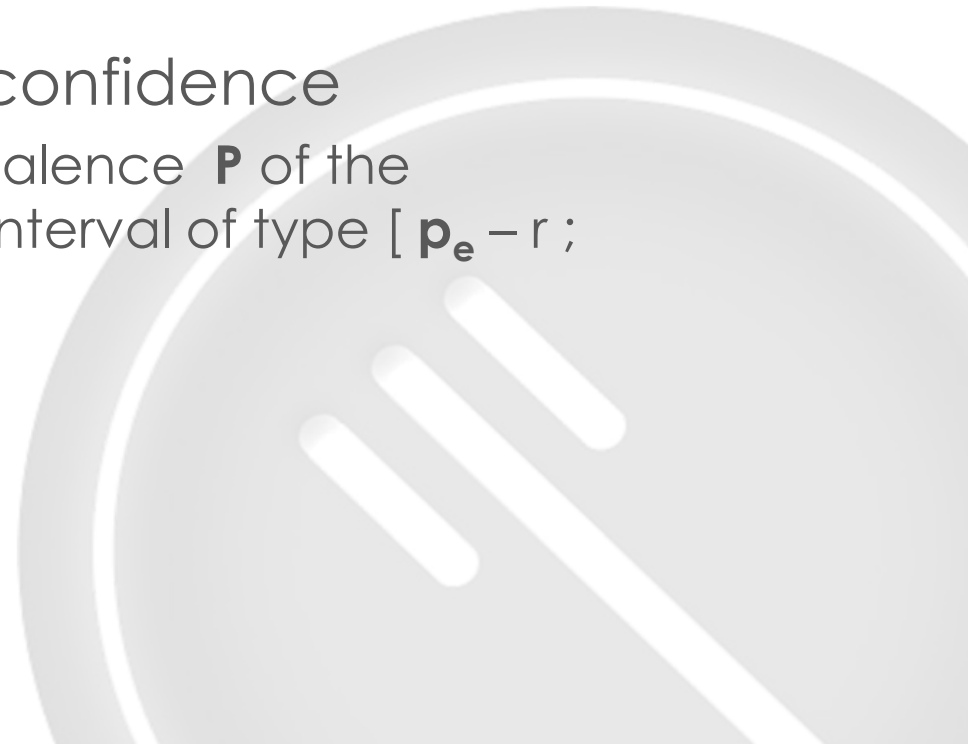
Official analysis program



Official analysis program

Estimation of prevalence

- Punctual estimation
 - Unique value
 - Precision of unknown estimate
- Estimation per level of confidence
 - Probability that the prevalence **P** of the population falls into an interval of type [**p_e** - r ; **p_e** + r]



Official analysis program

Estimation of prevalence

Sample Size: Estimate Percentage #2

Sample Size | Absolute Error

Input of DATA:

Population Size: 200000

Expected prevalence (%): 10

Accepted error (%): 5

Level of Confidence (%): 95 %

RESULTS:

Sampling fraction (%): 0,069

Sample size: n 138,30

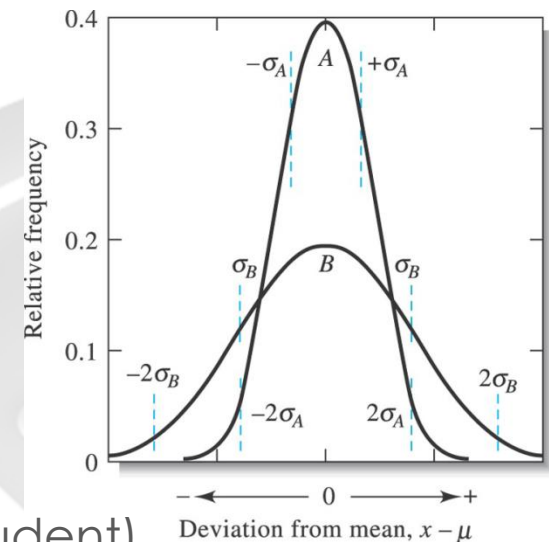
Adjusted sample size: n(a) 138,20

Use value of n = 139



% Expected Prevalence	% Level of Confidence				
	90	95	97.5	99	99.5
0	1	1	1	1	1
10	98	139	181	239	284
20	174	246	322	425	505
30	228	323	423	558	662
40	260	369	483	637	757
50	271	385	503	664	788
60	260	369	483	637	757
70	228	323	423	558	662
80	174	246	322	425	505
90	98	139	181	239	284
100	1	1	1	1	1

$$n = \left(\frac{z \sqrt{(p_{ex} (1 - p_{ex}))}}{L} \right)^2$$



n = number of samples to analyse

z = value associated with level of confidence (student)

p_{ex} = expected prevalence

L = wished precision of estimation (in %)

Microbiological analysis

– Food safety criteria - Pathogenic bacteria

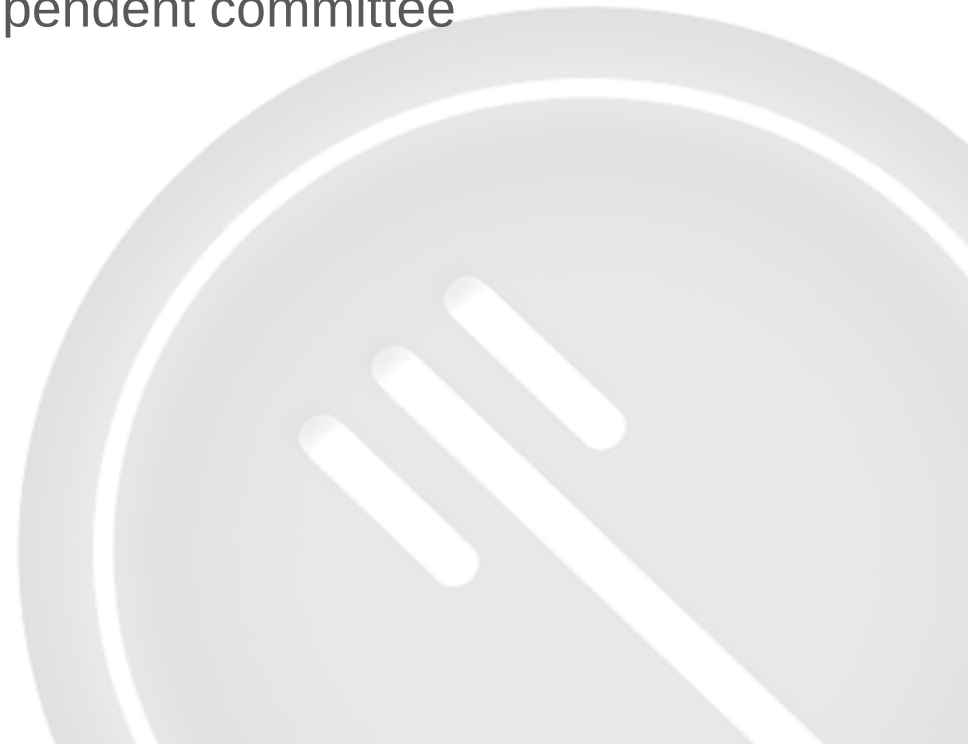
- Meat processing plant and cutting plant
- “Vigilance’ approach”: sampling that aims to detect a certain level of contamination ('prevalence level to be controlled')
- Ex. *Salmonella enteritidis* and *Salmonella typhimurium* in raw meat because they are the most dangerous salmonella
- Ex. *Salmonella* and *campylobacter* in meat preparations, minced meat, MSM because they are products that could be eaten raw or insufficiently cooked

– Process hygiene criteria

- Slaughterhouses and cutting plant
- Monitoring approach: sampling that aims to estimate a prevalence with a given level of precision.
- No action on products but Improvements in production hygiene and improvements in selection and/or origin of raw materials
- Ex. *Salmonelle* spp (except *S. e.* and *S. t.*) and *campylobacter* in raw meat and carcass because these products are always consumed very cooked

Microbiological analysis

- Origin of microbiological criteria
 - European and Belgian Legislations
 - Opinions of the Scientific Committee of the BFSA (for example: *Salmonella enteritidis* and *Salmonella typhimurium* = Food safety criteria)
 - Control program are evaluated by the Scientific Committee of the BFSA which is an independent committee



Microbiological analysis

Slaughterhouses

Sampling place	Matrix	Parameter
Slaughterhouse	Neck skin	Salmonella spp.
	Carcasses	Salmonella spp., Campylobacter spp., E. coli and total colony count

Neck skin: verification of correct implementation by operator of process hygiene criterium *Salmonella* spp. n=50, c=5 (Regulations 854/2004 on official controls and 2073/2005 on microbiological criteria).

Carcasses: detection of *Salmonella* spp. on carcasses (food safety criteria S.e./S.t. If salmonella detection then typing) and estimation of contamination carcasses with *Campylobacter* spp., *E. coli* and total colony count.

Microbiological analysis

Sector transformation

(cutting plant, meat processing plant)

Sampling place	Matrix	Parameter
Transformation	Cutting meat with and without skin	Salmonella spp., Listeria monocytogenes, Campylobacter spp. and E. coli
	Meat products	Salmonella spp., Listeria monocytogenes, Campylobacter spp., E. coli and Enterobacteriaceae

Cutting meat: verification of correct implementation by operator of good practices and self-checking.

Meat products: verification of correct implementation by operator of good practices, self-checking and legal microbiological criteria.

Microbiological analysis

Sector transformation

(cutting plant, meat processing plant)

Sampling place	Matrix	Parameter
Transformation	Meat preparations	Salmonella spp., Campylobacter spp., E. coli and total colony count
	Mechanical separated meat	Salmonella spp., E. coli and total colony count

Meat preparations and mechanical separated meat: verification of correct implementation by operator of good practices, self-checking and legal microbiological criteria.

Microbiological analysis

Examples of programming - 2016

Matrix	Parameters	Samples
Chicken carcasses	Salmonella	462
	Campylobacter	879
	E. coli	204
Hen carcasses	Salmonella	563
	Total colony count	210
Turkey carcasses	Salmonella	20
Raw meat	Salmonella	402
	Campylobacter	587
Meat products	Enterobacteriaceae	45

Poultry meat

Microbiological analysis: Results

- 2014 : 3.142 analysis - 87,1% of compliance
- 2015 : 3.376 analysis - 86,0% of compliance
- 2016 : 4.019 analysis - 86,6% of compliance

Poultry meat

Microbiological analysis: Results

Focus on Salmonella and Campylobacter

Parameter	Year	Number of sampling	Compliance
<i>Salmonella spp.</i>	2014	2.082	95,4%
	2015	2.038	94,7%
	2016	1.880	95,3%
<i>Campylobacter spp.</i>	2014	1.609	89,2%
	2015	2.042	90,5%
	2016	2.281	90,3%

Measures in case of non compliance

- Process hygiene criteria (R 2073/2005) /indicative values (monitoring) ➡ corrective measures
 - operator responsibility
 - describe in HACCP plan
 - improving of slaughter hygiene/process control
 - Search of non compliance origin
 - No measure of market withdraw
- Safety criteria (R 2073/2005)/indicative values (monitoring) ➡ mandatory notification, market withdraw

Measures in case of non compliance

- **Mandatory notification**

- By operators and laboratories
- In the context of self-checking analyzes
- For example, for the safety criteria « salmonella » for poultry products (meat, meat preparations, minced meat,...)
 - 87 mandatory notifications in 2016 for the safety criteria « salmonella »
 - 4 recall
 - 83 market withdraw
 - 1 mandatory notifications in 2016 for the criteria « campylobacter »



Thank you for your attention!

Together towards a safer food chain!

