



Dioxins in poultry

Virtual Training school Risk-based Meat Safety Assurance Systems focusing on risk categorisation of farms and abattoirs June 13th – 16th, 2023



Risk-based meat inspection and integrated meat safety assurance

What are dioxins?

- Dioxins are **unwanted toxic chemicals** that persist in the environment and **accumulate in the food chain**.
- «Dioxins» include:
 - Two groups of compounds
 - PCDDs and PCDFs (polychlorinated dibenzop-dioxins and polychlorinated dibenzofurans)
 - PCBs (dioxin like (DL)-polychlorinated biphenyls

What are dioxins?

 PCDD/Fs have never been produced on an industrial scale and have no technological use. They are formed unintentionally in a number of industrial and thermal processes.

 PCBs had widespread use in numerous industrial applications until 1970s, when their production was abandoned due to their high persistence in the environment.

Toxicity of dioxins





- Skin lesions (chloracne)
- Darkening of the skin
- Dermatitis
- Impairment of the liver function
- Gastrointestinal problems

- Endocrine system toxicity
- Immune system toxicity
- Reproductive system toxicity
- Nervous system toxicity
- Cardiovascular system toxicity
- Carcinogenicity

Exposure to dioxins

 The diet accounts for over 95% of the total human exposure to dioxins.

Fish, milk, dairy products, meat, and eggs are the primary sources



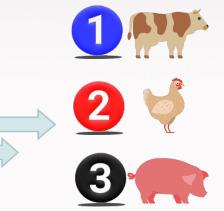
The **lipophilic** nature and the **low degradability** of these compounds are the main reasons underlying their tendency to:

- be absorbed and stored in the fat and in the liver of animals
 (BIOACCUMULATION) and excreted through milk and eggs.
- undergo **BIOMAGNIFICATION** along the food chain.

Dioxins in the food chain

Sum of PCDD/Fs and DL-PCB levels (expressed in pg TEQ $_{\rm WHO2005}/g$ across different food/feed group

	Upper bound estimate							
Food / Feed group	Mean ^(c)	P50 ^(d)	P95 ^(d)	P99 ^(d)				
Fat of pig	0.20	0.16	0.42	0.88				
Fat of poultry	0.49	0.26	1.59	2.64				
Fat ruminants	0.91	0.66	2.37	3.51				
Fish liver and derived products	28.28	16.99	81.36	118.83				
Fruits, vegetables and cereals	0.05	0.02	0.22	0.64				
Hen eggs and egg products	1.62	0.61	5.16	11.96				
Infant and baby foods	0.03	0.02	0.08	0.13				
Liver terrestrial animals	10.98	3.41	57.41	113.04				
Marine oil	1.40	0.78	4.91	7.88				
Meat bovine animals and sheep	2.01	1.36	5.54	11.43				
Meat pigs	0.31	0.11	0.79	5.58				
Meat poultry	0.99	0.56	2.79	11.75				
Muscle meat eel	9.76	5.76	33.94	44.04				
Muscle meat fish	2.50	0.95	10.68	19.41				
Other food products	2.57	0.75	8.30	31.13				
Raw milk and dairy products	1.91	0.77	4.36	10.11				
Vegetable oils and fats	0.18	0.13	0.50	0.61				
Additives binders and anti-caking agents	0.38	0.33	0.82	0.82				
Additives compounds of trace elements	0.09	0.05	0.20	0.37				
Animal fat	0.65	0.51	1.89	2.03				
Compound feed, excl. Fur animals, pets and fish	0.17	0.05	0.62	2.57				
Feed for fur animals, pets and fish	1.24	1.02	3.03	4.43				
Feed materials of mineral origin	0.09	0.06	0.30	0.71				
Feed materials of plant origin, oils excluded	0.30	0.10	0.52	2.96				
Feed not specified	0.97	0.83	2.15	3.75				
Fish oil	8.61	7.28	23.17	32.73				
Fish, other aquatic animals, their product	1.00	0.85	2.24	4.33				
Other feed additives	0.73	0.12	1.12	18.58				
Other land animal products	0.12	0.11	0.26	0.46				
Premixtures	0.15	0.08	0.27	2.39				
Vegetable oils and their by-products	0.74	0.37	6.41	7.73				



In Europe, 4.3 % meat and product of poultry exceed on average the maximum limits of dioxins established at European level

	PCDD/Fs	PCDD/Fs + DL-PCBs	NDL- PCBs
	pg WHO- TEQ/g fat	pg WHO- TEQ/g fat	ng/g fat
Meat and meat products of poultry	1.75	3.0	40

Dioxins in the food chain

...Despite that:

PCDD/Fs and DL-PCBs were ranked as being of high potential concern in food-producing animals due to their rapid accumulation potential, the risk of exceedance of maximum levels, and their toxicological profile.



High risk of exceeding the currently established

tolerable weekly intake (TWI) set by EFSA of

2 pg TEQ/kg bw/ week



Your company name

through the whole diet...

...where consumption of poultry meat has its contribution.

EFSA.Scientific Opinion on the public health hazards to be covered by inspection of meat (poultry). *EFSA Journal* 10.6 (2012): 2741. EFSA. Results of the monitoring of dioxin levels in food and feed. *EFSA Journal* 8.3 (2010): 1385.

Dioxins in poultry Risk Factors



Contaminants occurring in poultry mainly derive from farm practices

Poultry species, age, weight at slaughter

Farm location

Housing system (indoor vs outdoor)

Feeding

Farm management practices

SOURCES:

- Point source (controlled e.g. industry)
- Non-point source (uncontrolled e.g. volcanoes, fires)

Sources of dioxins





COMBUSTION	ENERGY PRODUCTION	PRODUCTION OF CHEMICALS	METAL INDUSTRY
Urban waste	Oil combustion	Paper manufacturing (Cl bleaching)	Steel and iron production
Medical waste	Coal combustion	Pharmaceautical	Metal foundries
Biogas	Wood combustion	Dyes, pigments, paints	Ferrous and non- ferrous metal processing
Industrial		Pesticides	
furnaces			



NON-POINT SOURCES

COMBUSTION	ENERGY PRODUCTION	PRODUCTION OF CHEMICALS
Open fires	Automotive fuel burning	Leaking/spilling of PCBs
Forest waste	Waste wood	Sodium hypochlorite
Volcanism		
Cigarette		
smoking		

Farm categorisation

	Farm A			Farm B						Farm C		Farm D				
	Yes	No	not known	not applicable	Yes	No	not known	not applicable	Yes	No	not known	not applicable	Yes	No	not known	not applicable
Broiler farm (slaughter - 30 days)			1			1	1			1		The second second		1		
Turkey farm (slaughter - 2-5 months)		1									1				1	
Extensive - free-range farming system			1		1						1			1		
Intensive - cage farming system		1				1	1			1					1	
Commercial feed		1				:	1			1				1		
Home-produced feed			1								1				1	
Animal-based feed components		1					1		1 conside	the perce	ntage! On 5%,	low			1	
Mineral-based feed supplements			1	L			1				1				1	
Feed suppliers rotation		1					1				1				1	
Contact/Access to manure		1	1		1						1			1		
Old building materials		1					1				1				1	
Rural area		1			1	1					1				1	
Proximity to a volcano area			1	L			1				1				1	
Proximity to pesticide manufacturing plants			1				1				1				1	
Proximity to steel plants			1				1				1				1	
Proximity to thermal power stations			1				1				1				1	
Proximity to paper-producing factories			1				1				1			1		
History of open fires			1	L	1						1				1	
Use of pesticides			1	L			1				1				1	
Pest control				1				1				1				1
Compliant dioxin + PCB results from self-control procedures			1				1				1 neighbour	ing farms are good			1	
Compliant dioxin + PCB results from official controls			1				1				1				1	
Microbiological/chemical safe water				1				1				1				1
Comments	National	Residue M	onitoring plan	s -> neighbouring far	ms failed to	meet esta	blished maxi	mum levela (surro	our Likely in	ural locatio	or Nearby farm	s are compliant with	o Unclear v	whether they	rotate through	a large or small
																were certified, v
				RESULT												
				Best (lowest risk C												
				Medium -low A												
	1			Medium-high D												
				Worst (highest ri B												

Your company name

Abattoir categorisation

Contaminants occurring in poultry mainly derive from farm practices

- Abattoir 1: 15.25
 HIGH
 - Improved FCI, risk-based flock categorisation,
 logistic slaughter, multiple interventions, frequent testing.
- Abattoir 2: 5.96



MEDIUM

- Poor HACCP implementation (box-ticking only), no training, poor hygiene practices, disorganised and inadequate control and audit.
- Abattoir 3: 9.58
 - Occasional risk-based categorisation, FCI is legislation compliant only, farm follow-up on request only, occasional, non-compliances.

Legislationcompliant

Non compliant

Best practice

Summary

- Contaminants occurring in poultry mainly derive from farm practices (not abattoir practices).
- Improved FCI is necessary to provide appropriate risk management of Dioxins in poultry:
 - Farm location
 - History of natural disasters (e.g. open fires)
- Recommendations:
 - Include risk-based monitoring of Dioxins on a primary production level.
 - Include monitoring results in FCI.