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Assessment of bioavailability and bioaccessibility of persistent organic pollutants in the chain «soil-animal-food»

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CONTEXT

- Environmental contaminants (metals, POPs) can be stored during centuries in soil, therefore soil is a major exposure matrix
- All free ranged (food producing) animals ingest soil[1;2] at different levels
- Soil is one of the main vector for contaminants in animals and then in food

OBJECTIVE

Reducing the bioavailability of POPs in the food chain "soil – farm animals – food products of animal origin“ using different sequestration materials.

AIM № 1 — Evaluation of POP transfer to food of animal origin

AIM № 2 — Characterization of POP mobility in soil

AIM № 3 — Reducing the POP transfer from soil to animals by application of sequestration materials

Task 1 — Literature review (meta-analysis)

Task 2 — *In vitro* assessment of POPs availability in soils

Task 3 — *In vitro* assessment of the efficiency of POP sequestration

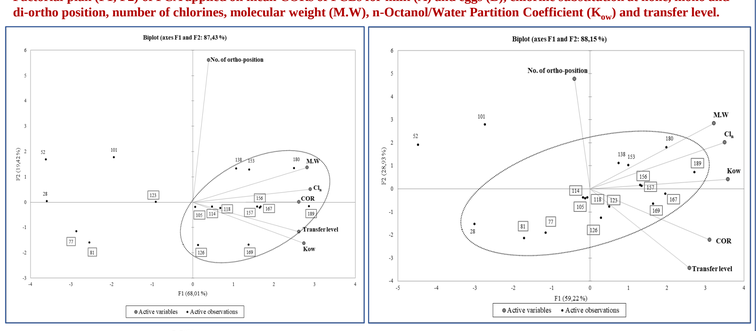
Task 4 — *In vivo* validation of Sequestration strategies

Preliminary results.

Mean and SDs of carry-over rates (COR) of PCDD/Fs in milk and eggs derived from the literature

Cl_n	Compound	Transfer to milk		Transfer to eggs	
		COR, %	Transfer level	COR, %	Transfer level
4	2,3,7,8-TCDD	**34.5** ±14.3	**high**	**40.5** ± 0.7	**high**
5	1,2,3,7,8 -PeCDD	**36.0** ± 12.4	**high**	**44.5**± 4.9	**high**
6	1,2,3,4,7,8-HxCDD	**26.8** ± 8.9	**high**	**43.0** ± 1.4	**high**
6	1,2,3,6,7,8-HxCDD	**28.1** ± 13.7	**high**	**44.0** ±0	**high**
6	1,2,3,7,8,9-HxCDD	17.8 ± 6.5	medium	**33.0** ± 1.4	**high**
7	1,2,3,4,6,7,8-HpCDD	5.06 ± 3.3	low	21.5 ± 0.7	medium
8	OCDD	0.72 ± 0.6	low	10.5 ± 3.5	low
4	2,3,7,8-TCDF	2.41 ± 2.70	low	**40.0**±0	**high**
5	1,2,3,7,8-PeCDF	4.45 ± 4.00	low	**43.5** ± 6.4	**high**
5	2,3,4,7,8-PeCDF	**40.6** ± 18.2	**high**	**41.0** ± 4.2	**high**
6	1,2,3,4,7,8-HxCDF	**26.2** ± 11.3	**high**	**43.5** ± 0.7	**high**
6	1,2,3,6,7,8-HxCDF	**25.6** ± 11.6	**high**	**41.0** ± 1.4	**high**
6	1,2,3,7,8,9-HxCDF	14.3 ± 6.10	medium	**33.0** ± 2.8	**high**
6	2,3,4,6,7,8-HxCDF	19.0 ± 16.9	medium	**40.0** ± 1.4	**high**
7	1,2,3,4,6,7,8-HpCDF	4.63 ± 3.20	low	18.0 ± 0	medium
7	1,2,3,4,7,8,9-HpCDF	5.87 ± 4.10	low	20.5 ± 0.7	medium
8	OCDF	0.54 ± 0.60	low	6.00 ± 1.4	low

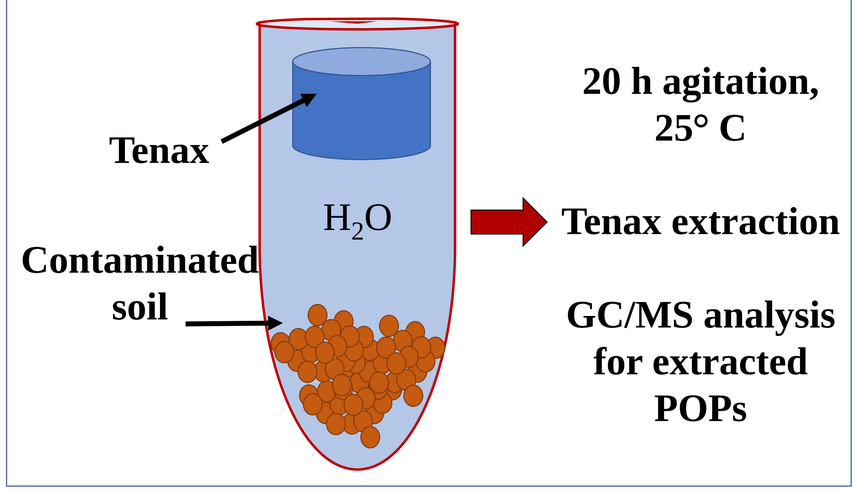
Factorial plan (F1, F2) of PCA applied on mean CORs of PCBs for milk (A) and eggs (B), chlorine substitution at none, mono and di-ortho position, number of chlorines, molecular weight (M.W), n-Octanol/Water Partition Coefficient (K_{ow}) and transfer level.

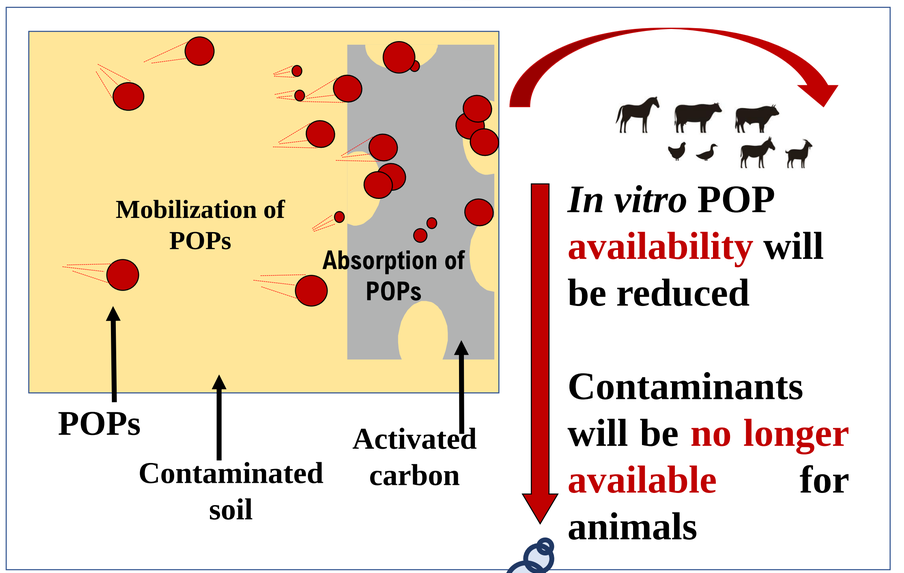


Milk

Chicken eggs

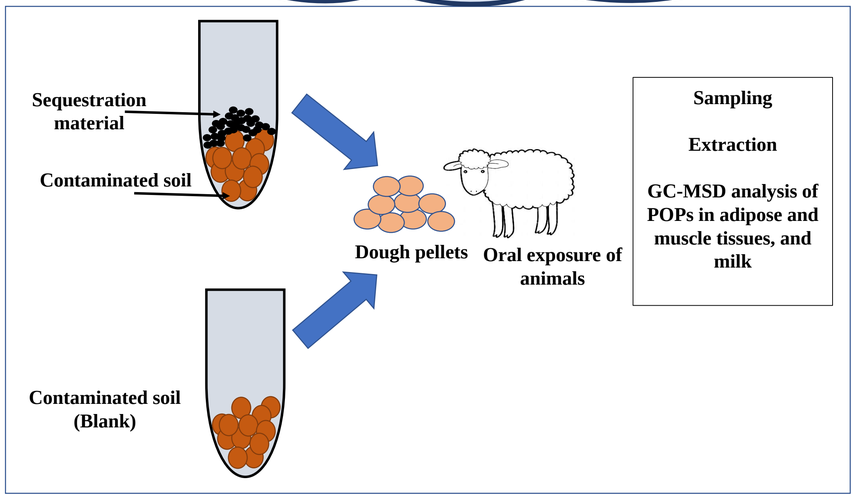
Indication: Numbers correspond to the PCB isomers. Framed congeners are dioxin-like PCBs. Circle with PCBs are the high excreted congeners with the range 37.5-83.5% and 40.5-80.0% for milk and eggs respectively.





SCIENTIFIC PRODUCTIONS (2018-2021)

№	Topics of scientific publication	Type of publication	Status	Year	Journal
1	Transfer of persistent organic pollutants in camel milk	Communication/ poster	published	Aug., 2019	70th Annual Meeting of the European Federation of Animal Science, Ghent (Belgium), 26 - 30 Aug 2019
2	Evaluation of two contrasted activated carbon based sequestration strategies to reduce soil bound chlordecone bioavailability in piglets	Article	published	Dec., 2019	Environmental Science and Pollution Research **(IF - 2.8)**, In press, doi: 10.1007/s11356-019-06494-z
3	Transfer of persistent organic pollutants in food producing animals (meta-analysis)	Article	In process	2020	Chemosphere (IF=4.4)
4	Assessment of PCDD/Fs and PCBs transfer to milk and eggs	Communication/oral report	In process	2020	DIOXIN 2020, the 40th International Symposium on Halogenated Persistent Organic Pollutants (POPs) from 30 August to 4 September 2020.
Additional articles that were recently published not in the topic of PhD:					
5	Volatile organic compounds profiles in milk fermented by lactic bacteria.	Article	published	Jan., 2018	International Journal of Biology and Chemistry 11, № 2, 57, doi.org/10.26577/ijbch-2018-2-345
6	Comparative study of fatty acid and sterol profiles for the investigation of potential milk fat adulteration.	Article	published	Sept., 2019	Journal of Dairy Science. Volume 102, Issue 9,, p. 7723-7733, doi.org/10.3168/jds.2018-15620. **(IF = 3.08)**



1.Jurjanz, S., Germain, K., Juin, H., Jondreville, C. Plant and soil intake by organic broilers reared in tree- or grass-covered plots as determined by means of n-alkanes and of acid-insoluble ash. **2015**, ANIMAL, 9 (5), pp. 888-898.
2.Jurjanz, S., Collas, C., Lastel, M.-L., Godard, X., Archimède, H., Rychen, G., Mahieu, M., Feidt, C. Evaluation of soil intake by growing Creole young bulls in common grazing systems in humid tropical conditions. **2017**, *Animal, 11 (8), pp. 1363-1371.*

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