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Toxicity of poly- and perfluorinated compounds to lettuce (*Lactuca sativa*) and green algae (*Pseudokirchneriella subcapitata*)

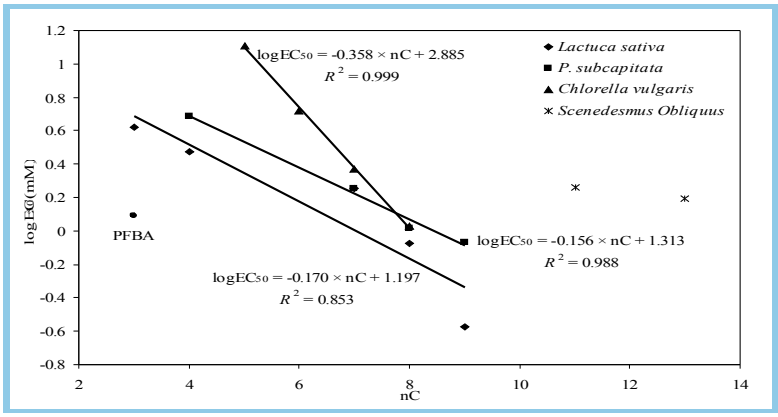
Poly- and perfluorinated compounds (PFCs)
- Partially/fully fluorinated alkyl chain + terminal functional group;
- Manufactured for decades;
- Persistent;
- Detectable in "all" environmental compartments;
- Concern on possible adverse effects;
- Limited toxicity – mostly for PerFluoroOctane Sulfonate (PFOS) and PerFluoroOctanoic Acid (PFOA)

REACH
Some of the objectives:
- Reduce (animal) testing;
- Optimal use of existing data;
- Optimize use of alternative like in vitro-in vivo extrapolation, QSAR, read across;

STUDY OBJECTIVE
1. Exemplify the efficient use of toxicity data to predict toxicity of a group of structurally related PFCs;
2. Develop QSAR models for individual endpoints
3. Apply read across: lettuce versus algae toxicity

MATERIALS AND METHODS
1. Lettuce: OECD test guideline 208
2. Algae: PAM test (acute blocking effects on photosynthesis)

RESULTS



READ ACROSS

Log EC50, lettuce = 1.20 (± 0.40) × log EC50, algae – 0.25 (± 0.16)

$n = 7$, $R^2 = 0.79$, $p = 0.11$

CONCLUSIONS
- Toxicity profiles PFCs ←→ Lettuce/Algae similar
- Toxicity proportional to number of fluorinated C-atoms of chain – QSAR approach
- Read across: possibility of using algae toxicity data to predict toxicity to lettuce (and vice versa)

Chem-ical	nC	Lettuce (*Lactuca sativa*)		Green algae (*Pseudokirchneriella subcapitata*)	
		EC_{50} (95% CL; mM)	NOEC (mM)	EC_{50} (95% CL; mM)	NOEC (mM)
PFBA	3	4.186 (3.90-4.50)	3	1.225 (1.00-1.50)	< 1
5H 4:1 FTOH	4	2.976 (2.50-3.50)	0.1	4.853 (4.10-5.80)	2
PFOA	7	1.801 (1.60-2.00)	1.5	1.807 (1.76-1.86)	1
PFNA	8	0.846 (0.60-1.30)	0.1	1.038 (0.98-1.10)	< 1
PFDA	9	0.266 (0.19-0.38)	0.1	0.851 (0.64-1.12)	< 1
PFUnA	10	0.210 (QSAR-pred.)	-	0.565 (QSAR-pred.)	-
PFDoA	11	0.142 (QSAR-pred.)	-	0.394 (QSAR-pred.)	-

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References
G. Ding et al. (2011) Toxicity of poly- and perfluorinated compounds to lettuce (*Lactuca sativa*) and green algae (*Pseudokirchneriella subcapitata*). Arch. Environ. Cont. Toxicol. (In press).
OECD (2006) Guidelines for the Testing of Chemicals / Section 2: Effects on Biotic Systems Test No. 208: Terrestrial Plant Test: Seedling Emergence and Seedling Growth Test.