



# Toxicity assessment of PFCs by the bioluminescence inhibition of *Vibrio fischeri*



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## Introduction:

The toxicity assessment of perfluorooctanesulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorooctanesulfonamide (FOSA) was carried out according to the standard method (BS EN ISO 11348-1,2 and 3, 1998) based on the bioluminescence inhibition of *Vibrio fischeri*. The toxicity of the individual standard compounds were measured over a wide range of concentrations. A four-parameter equation was fit in each case and the 50 percent effective concentration (EC<sub>50</sub>) was obtained.

The toxicity units (TU) were calculated according to:

$$TUs = \frac{100}{EC_{50}}$$

In addition to the toxicity evaluation vs. *V. fischeri* the toxic response of PFCs were evaluated in front other standardized organisms: *Daphnia magna*, *Selenastrum capricornotum* and *Chlorella vulgaris*.

## Toxicity assays

### PFCs vs *Vibrio fischeri*:

*Vibrio fischeri*: (marine bacterium) Bioluminescence Inhibition (BS EN ISO 11348-1,2 and 3, 1998).

A luminometer in agreement with the DIN/ISO norm was used to measure the light decay during the experiment. Incubations were carried out at a controlled temperature (15 °C) and the incubation times were 15 min and 30 min.

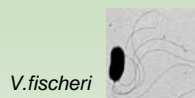


Table 1: the toxicity data obtained in *Vibrio fischeri* assay for studied PFCs.

	EC <sub>50</sub> (ppm) 15min/30min	TU
PFOA	54.48 / 55.70	1.8
PFOS	130.2 / 129.5	0.8
FOSA	70.30 / 70.67	1.4

Inhibition curves after 30 min. exposure

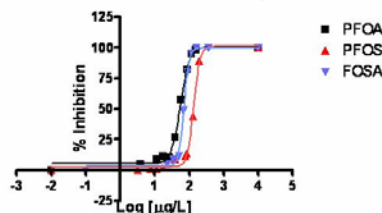


Figure 1: Inhibition curves of selected compounds

These compound have low acute toxicity vs. studied organisms.

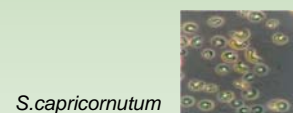
Some synergistic and antagonistic effects between selected compounds (PFOSA, PFOS and FOSA) were carried out. Some synergistic and antagonistic effects between PFOS and FOSA, related to their relative concentrations were observed.

### PFCs vs other standard organisms:

*Daphnia magna*: (planktonic crustacean) 24 h and 48 h survival assay (ISO 6341, 1996)



*Selenastrum capricornotum*: (genus of algae) Cell density assay (OECD 201, 1984)



*Chlorella vulgaris*: (genus of algae) Cell density assay (OECD 201, 1984)

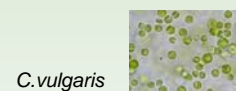


Table 2: the card responses for *S. capricornotum*, *C. vulgaris*, *D. magna* and *V. fischeri*.

	ENDPOINT	PFCs		PFOA		FOSA	
		EC <sub>50</sub>	TU	EC <sub>50</sub>	TU	EC <sub>50</sub>	TU
<i>S. capricornotum</i>	cell density	48.2	2.1	18.2	5.5	20.3	4.9
<i>C. vulgaris</i>	cell density	81.6	1.2	30.7	3.3	35.6	2.8
<i>D. magna</i>	48-h survival	130	0.8	45	2.2	53.2	1.9
<i>V. fischeri</i>	%Inhibition	130	0.8	55.1	1.8	63	1.6

The obtained responses for *V. fischeri* and *Daphnia Magna* were very similar for PFOS and also similar for PFOA. *Selenastrum capricornotum* and *Chlorella vulgaris* were in general more sensitive in front the exposition to these compounds.

The toxicity units (TU) for *S. capricornotum* was the highest values following by *C. vulgaris*.

## Conclusions:

The main conclusion is that these compounds presented low acute toxicity according to the selected tests. However, comparing toxicity between the different compounds, then PFOA was much higher than the toxicity of PFOS and FOSA.