Disinfection by-products in drinking water - Precursor identification and hazard assessment

Karlien Dejaeger, Justine Criquet, Marjolein Vanoppen, Cécile Vignal, Gabriel Billon, Emile R Cornelissen

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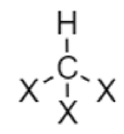
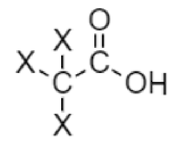
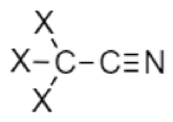
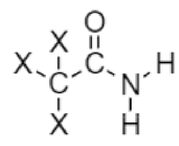
Problem statement

Disinfection by-products (DBPs)?

- Formed during the reaction of chlorine with natural organic matter
- > 700 different compounds identified
- Possibly harmful after exposure
- Organic matter precursors still inconclusive

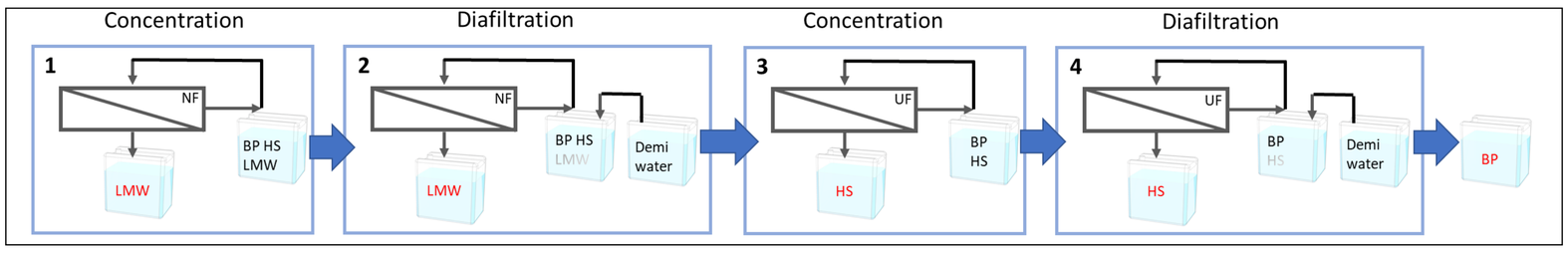
Examples:

X = Cl, Br or I

Trihalomethanes (THM)	Haloacetic acids (HAA)
	
Haloacetonitriles (HAN)	**Haloacetamides (HAcAm)**
	

Objective

1) Develop membrane fractionation protocol to isolate different organic matter fractions



BP = biopolymers, HS = Humic substances, LMW = low molecular weight compounds

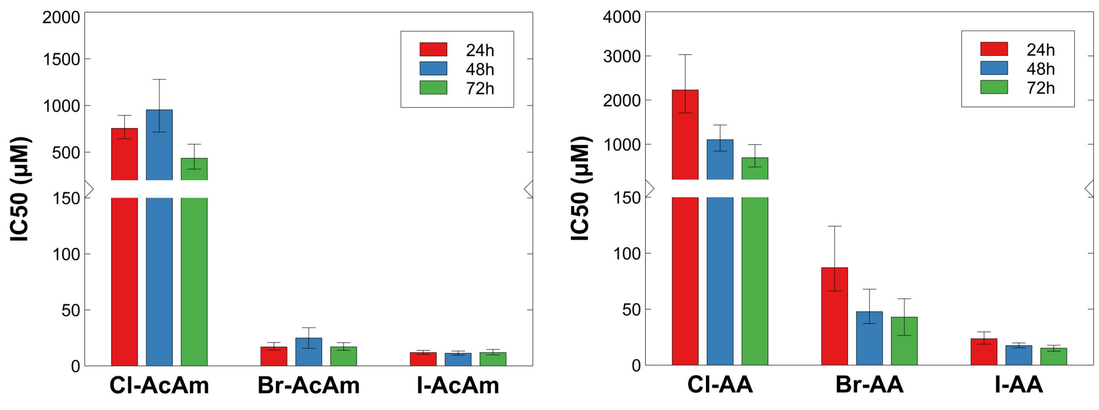
2) Assess the disinfection by-product formation potential of each fraction

3) Perform hazard assessment on human primary intestinal epithelial cells

Hazard assessment (ULille)

Haloacetamides (HAcAm)
Unregulated by law

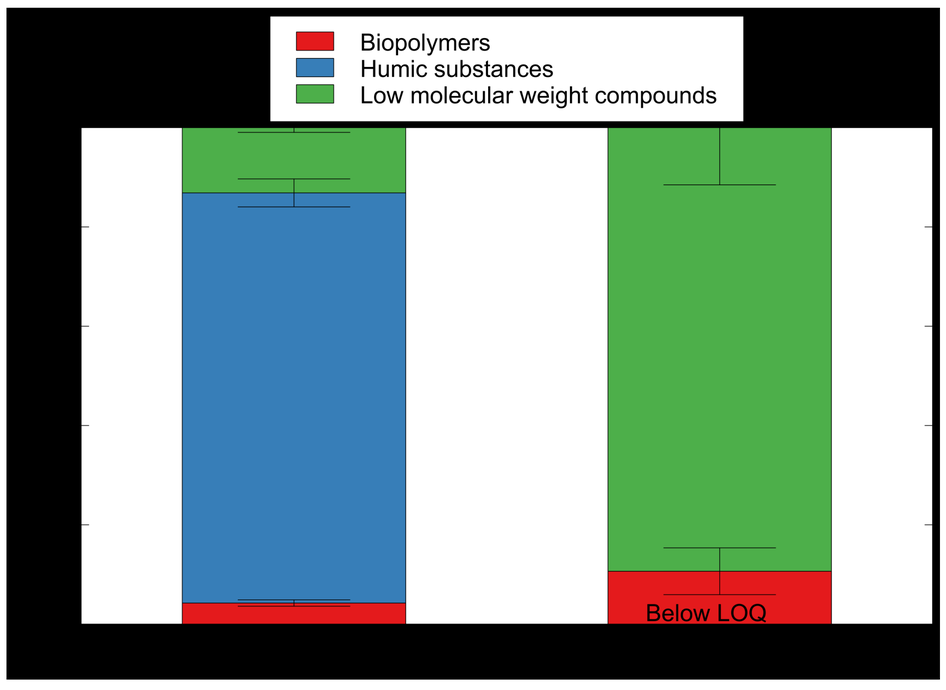
Haloacetic acids (HAA)
Regulated by law



IC50 = the DBP concentration that induces a 50% reduction in cell metabolic activity compared to a control group

Toxicity HAcAm > HAA
Toxicity I-DBP > Br-DBP > Cl-DBP

Organic matter isolation (UGhent)



Successful isolation of low molecular weight compounds

Future perspective

- Further development of the membrane fractionation protocol to isolate the humic substances and the biopolymers
- Assess the disinfection by-product formation potential of each fraction
- Analyze the inflammatory response of identified DBPs on human cells