



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

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Disinfection by-products in drinking water

Precursor identification and hazard assessment



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Problem statement

Disinfection by-products (DBPs)?

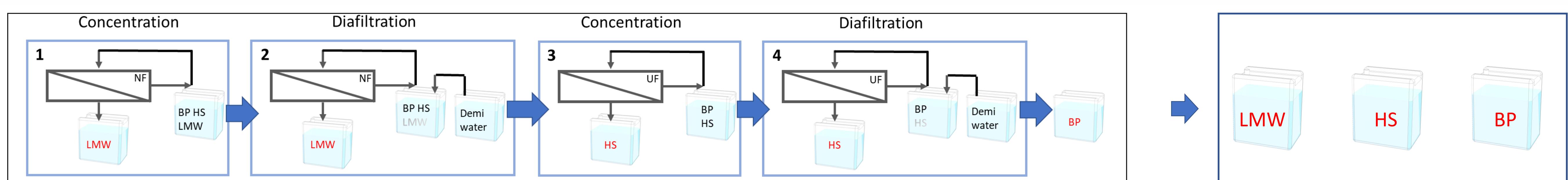
- Formed during the reaction of chlorine with natural organic matter
- > 700 different compounds identified
- Possibly harmful after exposure
- Organic matter precursors still inconclusive

Examples:

Trihalomethanes (THM)	Haloacetic acids (HAA)
$\begin{array}{c} \text{H} \\ \\ \text{X}-\text{C}-\text{X} \\ \\ \text{X} \end{array}$	$\begin{array}{c} \text{X}-\text{C}(=\text{O})-\text{OH} \\ \\ \text{X} \end{array}$
Haloacetonitriles (HAN)	Haloacetamides (HAcAm)
$\begin{array}{c} \text{X} \\ \\ \text{X}-\text{C}-\text{C}\equiv\text{N} \\ \\ \text{X} \end{array}$	$\begin{array}{c} \text{X}-\text{C}(=\text{O})-\text{NH}-\text{H} \\ \\ \text{X} \end{array}$

Objective

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



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

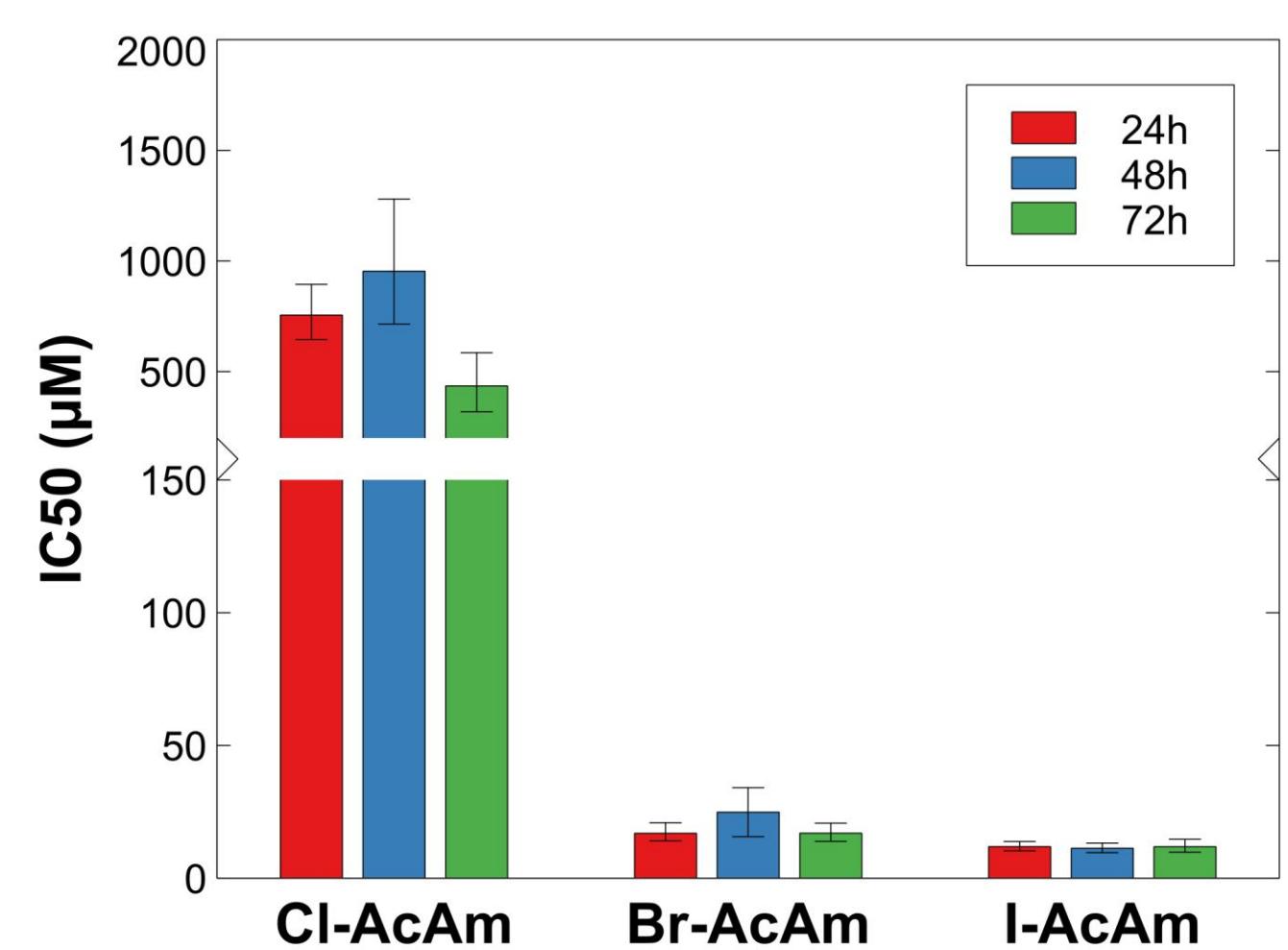
- 2) Assess the disinfection by-product formation potential of each fraction

- 3) Perform hazard assessment on human primary intestinal epithelial cells

Hazard assessment (ULille)

Haloacetamides (HAcAm)

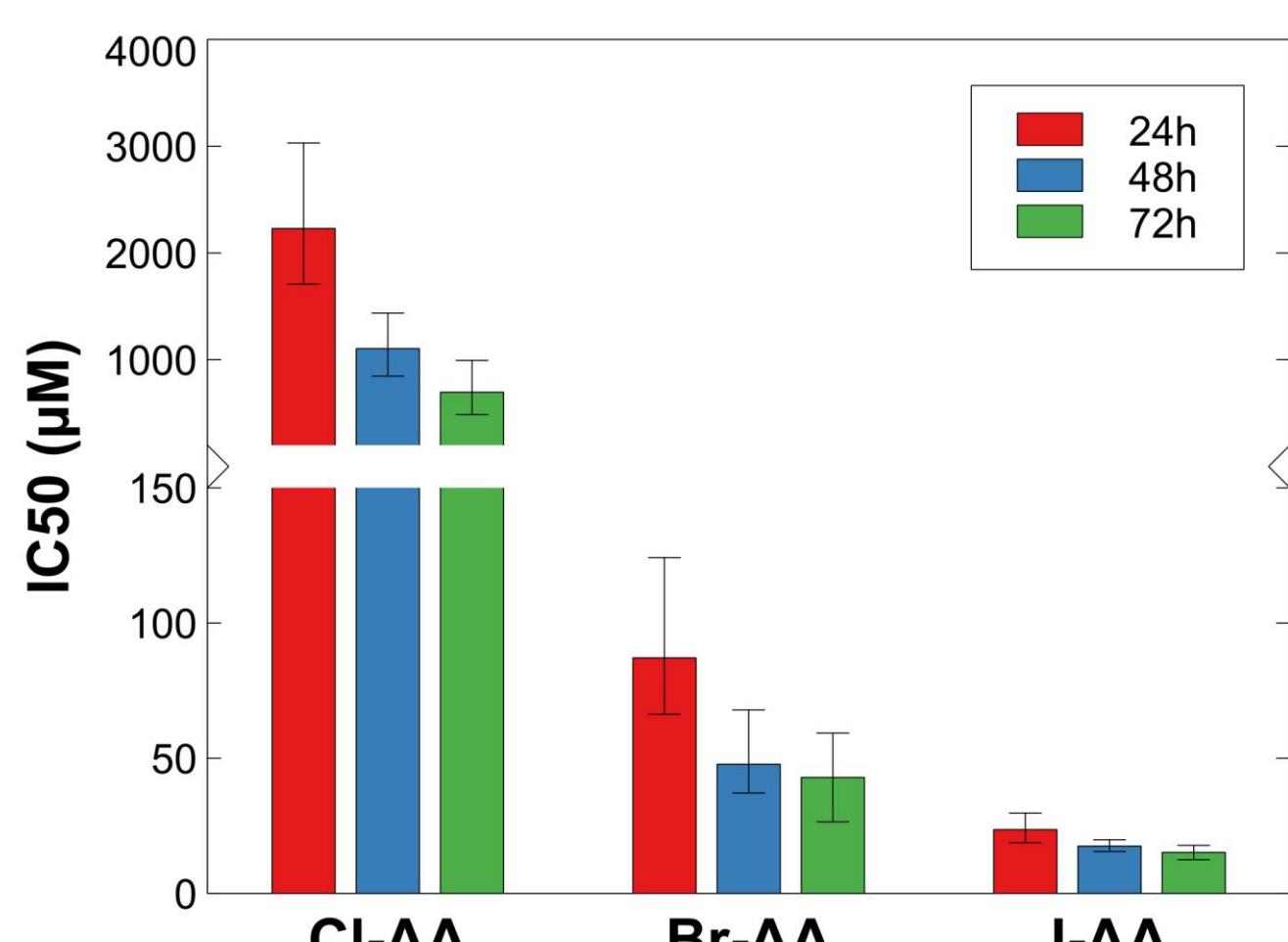
Unregulated by law



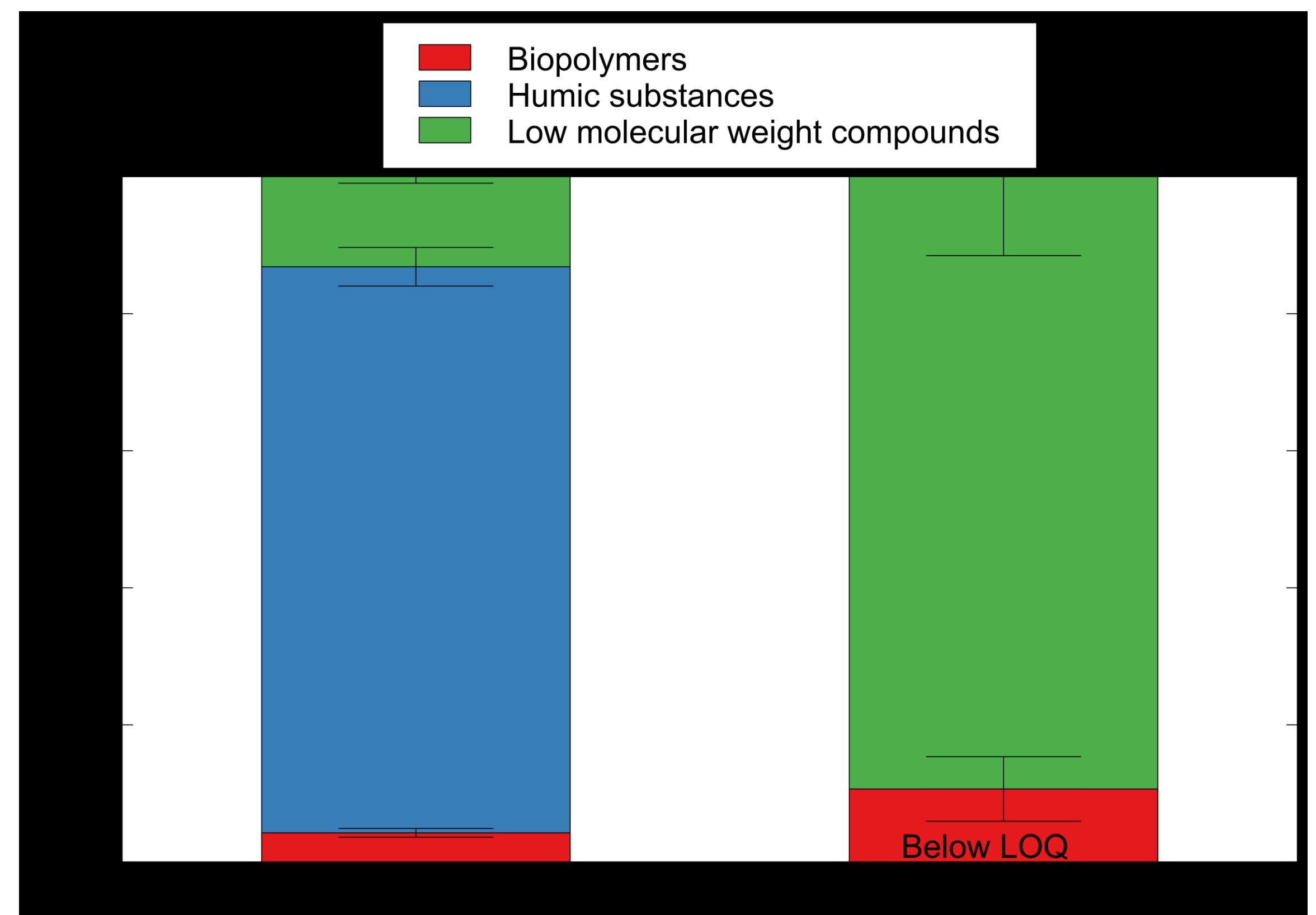
IC50 = the DBP concentration that induces a 50% reduction in cell metabolic activity compared to a control group

Haloacetic acids (HAA)

Regulated by law



Organic matter isolation (UGhent)



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

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