DEMEAU workshop
bioassays wrap-up
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Lots of compounds reach surface water bodies;
How to study the effects on biota?
Bioassays are complementary to chemical analysis;
Bioassays are sensitive, specific, reproducible and do not make use of living animals;
Multiple endpoints are available such as estrogenic activity but also on organismal level such as algae growth;
Regulatory acceptance of in vivo ecotoxicological bioassays is better as compared to in vitro bioassays. The latter requires attention.
Armelle Hebert (VERI-VEOLIA)

• Lots of chemicals in the aquatic environment;
• Alternative testing strategies are required which can assess safety in a more rapid, efficient and cost effective fashion (and make use of fewer animals);
• Paradigm shift: identify early hazard indicators to predict later effects;
• Bioassays can be considered as tools to determine exposure and (sometimes) hazard;
• At present multiple EU projects are ongoing where bioassays play a role (DEMEAU, Solutions);
• An interesting development is Multiplex Screening (ENTOX).
Armelle Hebert (VERI-VEOLIA)

• Trigger values are important for the interpretation of bioassay results;

• Point on the horizon is further acceptance of bioanalytical tools in regulatory frameworks. A workshop at ENTOX (Australia) will be organized in February 2015.
Harrie Besselink (BDS)

- With the bioassays a focus on (toxicological) effects is possible instead of compound concentrations;
- Bioassay validation is a time-consuming process;
- A number of factors are important for widespread implementation such as suitability for high-throughput application;
- Multiple CALUX bioassays are now developed (~30 stable lines);
- On one extract multiple CALUX bioassays can be applied;
- Pharmafilter is a very good example where bioassays can have added value (monitoring of effects during treatment).
Ron van der Oost (Waternet)

- Application of bioassays in the ecotoxicological framework;
- Waternet has worked on a smart monitoring strategy starting with routine chemistry, using bioassays to prioritize and possibly ending with advanced chemistry;
- Environmental trigger values have been established for ecotoxicological purpose;
- The point of departure is a clean reference site and compared to various toxicological endpoints;
- Highest ecological risks are at agricultural area;
- The proposed methodology can reduce costs;
- Uncertainties are missing of compounds.
Merijn Schriks (KWR)

- Acceptable daily intake (ADI), bioavailability, and plasma protein binding data are required to establish trigger values.
- Body weight, drinking water consumption, and contribution of drinking water to total exposure are used to derive tolerable drinking water concentrations based on the ADI.
- Trigger values are based on drinking water concentrations of reference compounds that are unlikely to elicit effects and can safely be consumed.
Merijn Schriks (KWR)

- Validation and harmonisation of bioassays is performed along standards set by different organisations
- *In vitro* bioassays are not formally accepted for drinking water monitoring;
- Trigger values are important for regulatory acceptance of bioassays.
Eszter Simon (BDS)

- Set of 25 CALUX bioassays covering broad range of toxic endpoints;
- Automation with robot for high throughput screening;
- PC10 is taken as a reference;
- Methodology to prioritize a broad range of compounds;
- Toxic profiling;
- Anti-androgenic/progestagenic, genotoxic and xenobiotic metabolism are most relevant;
Merijn Schriks (KWR)

- Glucocorticoid activity was detected in industrial effluent
- Mass spectometry was used to screen waste waters for a range of reference compounds
- Potencies of these substances were expressed relative to dexamethasone
- Concentrations of detected compounds were multiplied by relative potencies to obtain a predicted bioassay response
- Measured responses and predicted responses were compared; differences can be explained by unidentified compounds
• Merijn Schriks (KWR)
  • Oxidative stress response was evaluated in samples of a drinking water treatment plant
  • Ozonation caused an increase in the bioassay response (although the number of compounds present decreased), which was largely removed by activated carbon filtration
  • Oxidative stress response and human health are not quantitatively related, but the bioassay is suited for screening purposes
Kirsten Baken (KWR)

- Genotoxicity as a relevant parameter for water quality assessment;
- Example is the Ames fluctuation assay;
- Can be used as a screening tool, alert for genotoxicity;
- It is not a proof for human health hazard;
- A lot of disinfection byproducts are formed during drinking water treatment;
- Chlorinated byproducts are least known ones (more potent are the brominated /iodinated DBPs);
- Ames test can be applied to study DBP formation during advanced drinking water treatment.
Thank you for your attention!

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