Evaluation of innovative tools for micropollutant research in both urban and industrial waters

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**Context**

- Search for micropollutants and sources is complex, heavy in terms of instrumentation and expensive
- It involves the implementation of measurement campaigns with reference methods adapted to the problems of sites configuration and flow variations, and looking for micropollutants (volumes needed for analysis, sampling precautions to avoid contaminations, samples representativeness)
- Simpler research tools as a first approach that will subsequently limit the number of measurement campaigns implementing the reference method
- Research tools are still poorly applied for urban and industrial wastewater but some of them are well known and implemented on river waters or marine waters

**Objectives**

The aim of this study was to:
- Evaluate the implementation of the tools in the field
- Evaluate the capability to identify and to quantify a list of substances
- Evaluate the advantages and limits of these tools versus the reference method

**Tools and method**

This table describes the characteristics of the tools tested

<table>
<thead>
<tr>
<th>Innovative Tools</th>
<th>CFIS</th>
<th>PREBIO</th>
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</thead>
<tbody>
<tr>
<td><strong>Reference Tool</strong></td>
<td>Automatic sampler</td>
<td>Flow-dependent automatic sampling</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Continuous flow and integrative sampler (CFIS)</td>
<td>Spin Filter (P1), Pre-sorptive Sampling (PREBIO)</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
<td>Pre-filtered water circulation in cell housing sorbents</td>
<td>Pre-sorptive sampling and extraction (SBSE) rods</td>
</tr>
<tr>
<td><strong>Deployment time</strong></td>
<td>24 hours</td>
<td>1 day</td>
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<td><strong>Sorbents</strong></td>
<td>Collection of a volume of around 10/15 liters</td>
<td>Concentration and flux of substances in the discharge</td>
</tr>
<tr>
<td><strong>Detection</strong></td>
<td>Concentration in discharge</td>
<td>Concentration of substances per each innovative tool vs reference method</td>
</tr>
</tbody>
</table>

**Sites and field implementation**

- Deployment between 2017 and 2019 in different areas of the urban and industrial wastewater network of the Eurometropolis of Strasbourg
- Domestic zone (Zone 4)
- Mixed zone, influenced by different types of pollution sources (Zone 1 and 3)
- Industrial zone (Zone 2)
- Several sampling points per zone

**Results**

Data evaluation was carried out by comparison of innovative tools and reference method

- Operational evaluation: advantages and limits of innovative tools vs reference method
- Qualitative evaluation: number of substances quantified or detected per each innovative tool vs reference method

**Some results: PREBIO vs reference method**

- 58 substances commonly searched by both tools
- Number of substances found by both tools: same order of magnitude but greater number of quantified substances for PREBIO

**Conclusion**

- PREBIO
  - Better representativeness of the environment studied
  - Less expensive and easier to deploy than the reference method
  - Alternative tool possible for the detection of metals and certain organic substances in situations where semi-quantitative measurements are sufficient
- CFIS-SBSE and CFIS-CA
  - Data convertible to concentration in water
  - First encouraging results for CFIS-SBSE, especially since the list of substances sought within the framework of the LUMIEAU-Strasbourg project is small compared to the capacities of the SBSE tool
  - Report are available under: www.strasbourg.eu/lumieau-strasbourg

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