Micro- and nanoplastics in drinking water - survey in Sweden

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The Swedish Food Agency (SFA; Livsmedelsverket) has received the following assignment from the government:

- The NFA shall compile knowledge of health risks with microparticles and nanomaterials of plastics and especially by consumption of drinking water,

- mapping the presence of such contaminants in drinking water in Sweden as well as,

- at needs, propose measures to reduce the exposure

The assignment shall be reported no later than 15 December 2019.
Challenges

• No standardized sampling or analytical methods

• Time-consuming analytical methods (sequential filtration, visual characterization/quantification, identification (µRaman, µFTIR)

• No analytical method for nanoplastics
Sampling

- 10 sampling places in Sweden; twice sampled
- Large river lakes, historical presence of other pollutants (both ground- and surface water sources)
- Tap water on 2 different occasions (summer, winter)
- University of Gothenburg
- Suitable sampling device
- Lower limit 0.4 µm
Sampling method

- **Volume 100 µm nylon**
  - Pre-filter

- **10 µm PC filter**
  - LM and Raman

- **1 µm PC filter**
  - Raman, SEM (EDX), SEM-smart PI

- **0.4 µm AlOx filter**
  - Raman, SEM (EDX), SEM-smart PI

- **Water**
  - NTA

- **Large Volume 100 µm nylon filter**
  - LM, FTIR/Raman
Analytical method

• 100 µm filter is analyzed by LM and Fourier-Transformed infrared spectroscopy (FT-IR) imaging
• 10 µm filter is analyzed by LM and µ-Raman spectroscopy
• 1 and 0.4 µm filters are analyzed by scanning electron microscopy (SEM) with energy-dispersive X-ray spectroscopy (EDX)
• Water that passes through 0.4 µm filter is analyzed by nanoparticle tracking analysis (NTA)
Sampling and analytical challenges

• The pressure from the taps varied between sampling places and during sampling
• Air bubbles led to smaller sample volume in some places
• 100 µm; a lot of sedimentation, bio-film, iron oxide
• 10 µm; organic matter in the smaller filters clogging
• Not an even distribution of the particles on the filters
• Purification of the filters, several steps, time-consuming
Survey of microplastics and nanoplastics in drinking water will be finalized this autumn.

However, increasing challenges when analyzed at lower filter pore sizes lead to:
• reduction of sampling places
• and less results from lower filter pore sizes?

A compilation of knowledge of health risks with microparticles and nanomaterials of plastics by the oral route are almost finalized.

Report to the government in December 2019.