

3rd INTERNATIONAL SCIENTIFIC MEUSE SYMPOSIUM

THE MEUSE DISTRICT : CHALLENGES FOR TOMORROW

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Framework and identified needs in France regarding emerging substances

information foreseen to be relevant for the next WFD management plans

P.-F. Staub

ONEMA, France

pierre-francois.staub@onema.fr



The present talk

- What we call « emerging substance » (ES)
- ES in current French RBMPs
- ES and the application of European Directives
 - WFD- Annex 5
 - Drinking water Directive
- The French National Plan for Health and Environment PNSE
- The French National Programme for Research on EDCs (PNRPE)
- The National Plan for Pharmaceutical Residues in Waters
- Upcoming substances prioritization efforts
- Some illustrative R&D activities
 - Environmental occurrence of ES
 - ES in effluents
- Conclusion

Emerging substances / pollutants: what is that?

NORMAN network (norman-network.net) definitions:

Emerging substance:

Substance that has been detected in the environment, but which is currently not included in routine monitoring programmes and whose fate, behaviour and (eco)toxicological effects are not well understood

Emerging pollutant:

Substance currently not included in routine environmental monitoring programmes and which may be candidate for future legislation due to its adverse effects and / or persistency.

EMERGING SUBSTANCES - MOST FREQUENTLY DISCUSSED

- Algal toxins
- Antifoaming agents
- Antioxidants
- Antifouling compounds
- Bio-terrorism/ sabotage agents
- Complexing agents
- Detergents
- Disinfection by-products (drinking water)
- Plasticizers
- Flame retardants
- Fragrances
- Gasoline additives
- Industrial chemicals
- Nanoparticles
- Perfluoroalkylated substances and their transformation products
- Personal care products
- Pesticides
- Biocides
- Pharmaceuticals
- Trace metals and their compounds
- Anticorrosives
- Wood preservatives
- Other



Emerging pollutants as addressed by existing French RBMPs

- Contaminants mentioned: Pharmaceuticals, hormones and endocrine disruptors, CMR, biocides (disinfectants), radionuclides, nanoparticles,
- Purpose: Protect human health (drinking water), protect humans through preserving the environment.
- Means:
 - Improve knowledge on sales, usages, sources, occurrence, environmental behaviour.
 - Follow up changes in practices with professionals, to adapt surveillance.
 - Favor reduction of emissions: source targeting, monitor industrial outlets.

Emerging substances involved by the application of WFD- Annex 5

- Prepare an update of the surveillance monitoring strategy based on the River Basin District characterization (2013, pressures identification and impact assessment):
Investigative monitoring
 - Groundwater: nationwide exceptional groundwater campaign 2011 (~500 sites) with focus on substances less investigated to date (or not at all)
 - 140 pesticides
 - others: pharmaceuticals, plasticizers, detergents, complexing agents, perfluorinated, disinfectants, fuel additives, ...
 - Surface water: similar exercise (likely in 2011) to update the list of basin specific pollutants (ecological status): candidate molecules selection not yet done.
 - Planned pilot studies to characterize effluents:
 - Hospitals - in addition to pharmaceuticals: detergent, biocides, radionuclides.
- Develop metrology and derive new EQS

Anticipation of the revision of the Drinking Water EC Directive 98/83/CE

- Endocrine disrupters: investigative monitoring campaign on drinking water and associated resources by the Health Ministry in 2009-2010
 - 350 water sampling sites spread all over France
 - pharmaceuticals, perfluorinated compounds, tolyfluanides/NDMA, phtalates, nonylphenols
- Chlorination byproducts of pharmaceuticals and cyanotoxins are also being investigated (EHESP-LERES).

National Plan for Health and Environment PNSE2 (2009-2013)

- Emphasize vigilance on emerging risks, with focus on:
 - pharmaceutical residues
 - reduce emissions (health institutions, factories)
 - improve impact assessment, especially aspects related to drinking water resources contamination, estuaries, and fishing
 - investigate drinking water treatment technologies
 - Engineered nanomaterials
 - market accessibility
 - validate risk assessment methods
- Promote research on:
 - Food chain transfer of new technology by-products, nanoparticles, reprotoxic compounds, pharmaceuticals residues.
 - Endocrine disruption

The French National Programme for Research on EDCs (PNRPE)

- Some « emerging » pollutants are also known EDCs (alkylphenols, BPA, brominated flame retardants, synthetic hormones).
- The PNRPE is coordinated by the French Ministry of Ecology and Sustainable Development was set up in 2005 to meet specific knowledge needs on EDCs. The PNRPE supports:
 - both fundamental and applied research
 - both human and environmental health studies
- The PNRPE today:
 - 4 main fields of research:
 - knowledge of mechanisms of action; QSARs; mixtures
 - exposure measurement; epidemiological and ecotoxicological studies; monitoring and risk assessment
 - development of biotests
 - social sciences
 - 60 research teams involved (both in the public and private sectors)
 - A total of 22 projets funded (7 in 2005, 15 in 2009)
 - 3 million euros

National Plan for Pharmaceutical Residues in Waters (2010-2014)

- Environmental & Health risks assessment
 - Prioritize molecules (human and veterinary products)
 - Develop and / or validate analytical methods (metrology aspects)
 - Better assess contamination levels and impacts
 - Support R&D, e.g. risk assessment from exposure of human and ecosystems through water, soil and food.
- Risk Management
 - Determine tox and ecotox target values
 - Estimate relative input contributions to pollution
 - Assess possible reduction measures

Prioritization of molecules

- As part of PNSE 2: national expert group to identify substances of highest concern (not only water, & not necessarily emerging ones).
- AFSSET (Health, Work and Environment Agency) initiated in 2009 a group of 21 institutional partners sharing studies and associated methods to identify water-linked emerging risks for humans (chemicals and pathological agents).
- As part of National Action Plan on Micropollutants in water (2010-2013): national expert group (coordination ONEMA /INERIS) just started for prioritization of substances for protection of aquatic ecosystems (surface and groundwater).
 - Aims at producing a reference but dynamic methodological scheme to assist and harmonize the various future prioritization exercises (e.g. WFD basin specific pollutants)
 - Interacts with the WG of the European NORMAN network on “Prioritization of emerging substances”.

Some R&D actions addressing occurrence of aquatic contaminants

- Endocrine disruptors PBDE, phtalates, alkylphenols and PAH in Seine river basin (PIREN-Seine): biota impregnation and effect measurements.
- PBDE, HBCDD: long term series all along the French coasts (Ifremer)
- PCB, Hg, PBDE, Ag, PFC, ...: biota impregnation or food chain bioaccumulation studies in Mediterranean sea (Ifremer, *Costas* project), Atlantic and Channel estuaries (Ifremer, *Solebemo*), Rhône river (Cemagref).

R&D addressing emerging pollutants in effluents

- The *Armistiq* project (Cemagref 2010-2012)
 - dedicated to the reduction of the occurrence of micropollutants in WWTP.
 - will address detergents, BPA, antibiotics, anti-inflammatory, hormones, anti-hypertensors, cytotoxics, x-ray contrasting agents
 - advanced intensive treatments (ozonation, inverse osmosis, catalytic oxidation), extensive treatments (use of vegetal), knowledge acquisition on degradation mechanisms for activated sludge techniques, development of sampling and analytical techniques for wastewater and sludge.

Conclusions

- Thousands of candidates ES
- Sound prioritization is of utmost importance, but requires pressure and impact data which most often lack for ES: sharing existing data and validated models is critical
- Prioritization should also end up with eliminating formerly monitored pollutants (« vanishing pollutants »), leaving room for EP.
- Analytical screening of the environment is necessary but doesn't tell about biological impact: effect assessment R&D should be carried out as early as relevant
- Localize the source points, understand the current and future usages remain the key condition to an effective pollution management: acquisition of technico-economical information must be developed along with environmental assessment.



MERCI DE VOTRE ATTENTION!

Example of funded projects

- SURVAQUA « *Impacts of the endocrine disruptors on aquatic environment* » (INERIS/Cemagref/LPTC Bordeaux 1/Université du Havre/Université Montpellier 1/UCO)
 - Aim: define and apply an experimental approach for the evaluation of the impact of EDCs on freshwater and estuarine environments
 - Screening endocrine activities in sediment extracts and organisms using bio-analytical tools; *In situ* biological effects on invertebrates and fish evaluated using molecular (Vtg) and physiological biomarkers

Prioritization of molecules

- INERIS maintains the “SIRIS-pesticides” tool and database for identification and ranking of pesticides according to their potential impact on aquatic environment.
- INERIS recently opened on-line access to a Substances Database Portal which should help prioritization based on:
 - regulatory information on reduction,
 - authorization, prohibition,
 - existing monitoring,
 - effect threshold values,
 - usages and technico-economical data, substitution measures...

« New » emerging pollutants

- PIREN-Seine recently advocated for raising interest on some « new » metals with long range transport properties, such as Sb (used in brake technology, flame retardant, PET plastic), Ag (increasing levels in estuaries, used as contact in μ electronics, and nanoparticles in textiles and plastics), Tl (from coal combustion in China).
- Nanoparticles: impact on water; *AquaNano* project (BRGM, INERIS, Cerege, Suez- Environnement) part of the PNANO program by the National Research Agency.