

Emerging pollutants elimination in water
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The presence of emerging pollutants in water, which has been studied for 30 years, and increasingly reported by the media, has to be solved within 10 -15 years, at the request of the European Commission.

These are mainly industrial and domestic chemical products, pesticides and medicinal residues.

Industrial and domestic chemical products must be treated prior to discharge to the environment or in urban waste waterworks, through appropriate in-situ treatments, or elimination in dedicated installations after collection.

Pesticides must also be treated in-situ, because they are considered as "non-point sources".

Medicinal residues will develop because of population aging, and medication of comfort. These are, in principle, "non-point sources", but they can be almost totally collected and treated in wastewater treatment plants which collect most of human activity waste waters, taking into account population urbanisation and the high connection rate to sewage systems in developed countries. The hospitals in-situ treatments do not solve much because of the development of ambulatory medicine.

The European Directive on waste water tends to impose the resolution of this problem circa 2025. There will probably be some delays, but Switzerland and Germany have already launched specific programs. On the economical point of view, only Switzerland has really analyzed the impact of such a commitment, and has taken concrete actions to carry out its program.

A tax (9 CHF per inhabitant) is being collected since January 2016 and allows to finance 75% of the investment costs of the projects for a period of 25 years, that is approximately 1 billion euros.

The additional cost can be estimated between 0,3 and 0,5 euro per cubic meter, which appears to be prohibitive at the moment for most European southern countries which must first reinvest in existing infrastructures maintenance, namely networks, after recovering from the economical crisis.

Prevention policies

Essentially dedicated to domestic, agricultural and industrial pollutions, they must enable a significant reduction of a part of classical and emerging pollutants.

They will be supported by the implementation of water analysis monitoring systems, including decision making softwares which will assist operators, according to the level of risks encountered.

For instance, the ACTIPOL software, developed by VEOLIA, allows to build a comprehensive monitoring program adapted to local industrial activities.

As for pesticides, the development of new, less toxic products, and the optimization of their use, grant to weather forecast data, and satellite follow-up of farming, should allow a drastic decrease of these pollutants in the environment.

The controversy on the prohibition of the most disputed products (glyphosate) shows simply that the R&D efforts on this topics have been done too late.

As long as Europe shall tolerate the importation of products grown with toxic pesticides, the european farming community, facing an unfair competition, will logically resist to more ambitious sanitary and environmental policies.

Treatment

It concerns essentially the residues of medicine: preventive sanitary policies, in order to avoid increase in world active substances consumption, cannot definitely be a solution to our problem.

The medical treatments improvements, the ageing of the population, a wider access to contraception, are massive factors of potential presence of these pollutants, of their by-products and metabolites.

By chance, the demographic evolution, which pushes the world population to live in cities, where connection rates to urban water systems are increasing, will lead to collection and treatment of these domestic pollutants, through classical treatment plants, which, even if not able to treat these products, make water compatible with specific treatment in order to eliminate sophisticated organic molecules.

Treatment processes

In all cases, these organic molecules are complex, and most of the time, they are very active on a biological point of view (they are medicines).

Being complex, these molecules are rather big (therefore, they can be eliminated by membranes), and polar (thus, not very soluble), and then adsorbable on active carbon. These treatments have the inconvenience to be expensive, but the advantage to be non susceptible of generating by-products.

Treatments by oxydation need powerful oxidizers like ozone or hydrogen peroxide, activated by Ultra-Violet radiations. They can be less expensive, but can also generate more or less important quantities of potentially toxic by-products.

Their use will be suspended (Switzerland, which is ahead of us, has taken this option) only if credible measurements of toxicity are done downstream their discharge in the environment, and can demonstrate their innocuity.

This process should allow us to find more acceptable solutions from an economic point of view, and to move forward towards a progressive solution for this important matter, a solution that cannot be delayed indefinitely just because present solutions are not perfect.

If our XIXth century predecessors had decided not to deliver drinking water just because the solutions at that time (slow filtration and massive chloration) were not perfect, millions of people would have died of typhoid, cholera or polio.

We must not adopt attitudes of this type, but promote a continuous and applied progress, and strengthen research in different types of toxicity and exotoxicity measurements.
