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The water we would like

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SESSION

COOPERARE ALLA SALUTE - Le nuove sfide della cooperazione sanitaria in ambito formativo e di ricerca "HEALTH COOPERATION – new challenges in health training and research cooperation".

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oral

poster

Water is needed for our health: it maintains the health and integrity of every cell in the body, keeps the bloodstream liquid enough to flow through blood vessels, helps eliminate the by-products of the body's metabolism, aids digestion, and other exceptional properties. High-quality water is needed to preserve health.

Unfortunately, the environment and all its sectors are differently contaminated. This dangerous state is closely linked to increased anthropic activities (industrial and agricultural) and the use of harmful substances released without control.

Old contaminants (pesticides and substances deriving from industrial activities) and new contaminants, called "emerging" (drugs, phytotoxins, body care products), can arrive in rivers, in surface and deep water, and the sea if they are not removed from the wastewater.

These substances are harmful to human health because they enter the environment in quantities exceeding the natural self capacity purification of the ecosystems.

We can be exposed to water-derived contaminants in different ways. For example, people can ingest small amounts of pollutants by drinking water; they can absorb pollutants through the skin while bathing or showering and during recreational activities, such as swimming, windsurfing, and water skiing; they can inhale droplets suspended in the air or vapors while taking a shower. They can also ingest foods that have been contaminated with water-borne pollutants.



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Wastewater treatment plants (WWTPs) cannot altogether remove most of these substances, which can easily reach the drinking water supplies, causing health problems for adults and children.

Although drinking water quality is regulated and monitored in many countries, today's increased knowledge suggests reviewing standards and guidelines on a near-permanent basis for both well and newly identified contaminants and adopting technologies as tertiary treatment processes, which could promote the easy degradation of recalcitrant compounds. It will be necessary to verify that the degradation products are less dangerous than the original molecules and that no dangerous aggregation products are formed.

This communication reports some of the degradation studies carried out by our Research Teams in collaboration with foreign researchers using Advanced Oxidation Processes (AOPs) on pesticides and pharmaceuticals present in actual water samples.

Photolysis and heterogeneous photocatalysis under simulated solar irradiation using two forms of TiO₂ (suspended or immobilized on the surface of thin glass plates) have been investigated to assess the suitability of different oxidation processes to promote mineralization of recalcitrant substances.

Transformation products (TPs) have been identified by an LC system coupled to a hybrid LTQ-FTICR (7-T) mass spectrometer (MS).

To evaluate the treatment methods' effectiveness, the treated solutions' measurements have been performed using the "Microtox® Toxicity Test" that reports the luminescence inhibition of the marine bacteria *Vibrio fischeri*.

During the degradation process, the temporary formation of toxic fragments was observed, which rapidly degraded to complete mineralization. Samples collected during the degradation process showed the temporary toxicity of the water.

The rate of decomposition was highly dependent on the method used. Advanced oxidation processes such as TiO₂/Xe-arc system, lead to a rapid decrease of the biorecalcitrant chemical concentrations in aqueous solutions, while photolysis and TiO₂-coated glass are less effective.

These promising results push us to continue and improve experimental trials.

What is the future prospect? The creation of prototypes to be used by farmers and artisans to start with the virtuous path of water recycle.

Keywords:

1. Water contaminants
2. Advanced Oxidation Processes
3. Microtox® Toxicity Test