APPLICATION OF ECO-GENOTOXICOLOGICAL AND MICROBIOLOGICAL PARAMETERS FOR THE ASSESSMENT OF THE QUALITY OF WASTEWATER INDUSTRIAL REUSE.

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INTRODUCTION AND OBJECTIVES

In industrial sectors, water is used in large amount in production cycles. In the field of Medical Devices (MDs) production, for example, water is used, both as an ingredient and as a necessary element for production. The re-use and the recycle of the wastewater represents a priority area in the strategic plan of the European Commission for a sustainable water management also considering the scarcity of water resources caused by the climate changes. The aim of this study is the assessment of treated wastewater quality discharged from Medical Device and pharmaceutical industries, by identifying a suitable set of tools in order to support the potential re-use of treated wastewater, taking into account both microbiological and eco/geno-toxicological parameters.

MATERIALS AND METHODS

The study was carried out on three MDs industries in Italy, which perform the recycle of the wastewater in their own system processes. Samples were collected inlet and outlet of wastewater treatment plants. The microbiological parameters investigated were Total Microbial Count (TMC) at 22°C and 37°C using European Pharmacopoeia method (2011), E. coli, Enterococci, Staphylococcus spp., Pseudomonas spp. using membrane filter technique a standard methods (APHA, 2008). A set of ecotoxicological bioassays was selected for this study, namely the bacterium Vibrio fischeri, the algae Pseudokirchneriella subcapitata, the crustacean Daphnia magna, the fish embryo Danio rerio and the plant Sorghum saccharatum, in order to represent different trophic levels and thus to assess any potential effects on the aquatic ecosystems. Seeds of Vicia faba were exposed for assessing the possible genotoxic effect of wastewater using the Micronucleus test (MN-test).

RESULTS AND DISCUSSIONS

The ecotoxicological assays highlight a significant toxicity of the wastewater before the treatment while an evident decrease has been recorded after it; sublethal effects for Danio rerio embryos are also recorded in sample C.

CONCLUSIONS

This study confirms that the Ecotoxicological bioassays are a valid tool to provide useful informations complementary to the chemical analysis especially for the detection of mixtures and unknown substances and underlines the importance of the selection of a suitable eco-genotoxicological battery in order to detect the possible effects of different wastewater treatment.

In conclusion, the results of this study suggest the need to add eco-genotoxicological tests in the legislative parameters in order to have more appropriate evaluation of the treated wastewater. This approach can be considered a useful and promising tool in the reuse management of industrial wastewater and an initial support to the policy in this field.