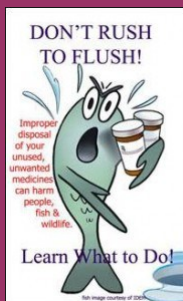


Disposal of unwanted/ expired pharmaceuticals

DON'T FLUSH!! The age-old advice of flushing pharmaceuticals down the toilet is now considered to be the least desirable of all alternatives.



Please contact your pharmacy or the

<http://prairierivers.org/articles/2009/06/illinois-legislature-passes-bills-for-safe-pharmaceutical-disposal/>

Pharmaceutical Services, Ministry of Health, to get informed on the best way of disposing your pharmaceutical and personal care wastes, so that you diminish the possibility of polluting the environment.



**SMART
DISPOSAL™**

A Prescription for a Healthy Planet

<http://greendocvick.wordpress.com/>



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ΠΑΝΕΠΙΣΤΗΜΙΟ ΛΕΥΚΩΣΙΑΣ



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Development of novel methods for the toxicity assessment of multi-component chemical mixtures to humans and the ecosystem



Chemicals in the environment?

It has been estimated that environmental factors, such as chemicals, radiation, and tobacco smoke together are responsible for roughly 80% of all cancers. We live in a world where chemicals found in the air, water, backyards, and homes *can* and *do* interact with each other. A huge amount of chemicals used in our daily lives such as detergents, disinfectants, pharmaceuticals, personal care products, etc. end up in wastewater treatment plants. A fraction of them are not successfully removed and are released in the environment.



A pharmaceutical mixture enters our environment
<http://www.sciencedaily.com/releases/2008/01/080105140107.htm>

Among chemicals present in the environment, pharmaceuticals represent a hot topic nowadays due to the fact

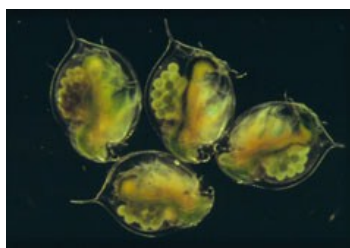
that they have been designed to be biologically active. Up to 100 different pharmaceuticals have been identified in the environment in small concentrations (ng-µg/L) and a lot of unsolved questions are raised regarding the risks from the exposure to such chemicals.

Why mixture effects matter?

The study of chemical mixtures is limited for a number of reasons. It is much easier to study a single compound in an animal study and to obtain traditional dose – response information. An almost infinite number of combinations of contaminants is possible though, and often we do not know which is most important and environmentally relevant, which ranges of doses should be investigated, which biological endpoints should be studied, etc. Although relatively few studies have investigated the interactions of even two chemicals, in real life we are all exposed to multiple substances (chemical cocktails), and the biological effects of more than 20 different chemicals, for example, may be very different from those of just two.

How do pharmaceuticals interact to cause effects?

Regarding toxicity of mixtures, it has been proven that elderly people who take several different medications at a time,



Daphnia magna normally reproducing
<http://www.nc3rs.org.uk/news.asp?id=912>

suffer more often from unwanted side effects of pharmaceuticals during therapy. Furthermore, the potential risk associated with the presence of low levels of pharmaceuticals in aquatic environments is also currently under

debate. For instance, a recent study showed that a population of the aquatic species *Daphnia magna* would not be able to reproduce *at all*, when a mixture of anti-inflammatories drugs would be present at concentrations in which the single substances showed no or very slight effect. The same trend was noticed when the marine bacteria *Vibrio fischeri* was tested against a mixture of quinolone antibiotics.

The complexity of this issue increases more when the various transformation products and metabolites of pharmaceuticals that may be formed in the environment are also taken into account.

TOMIXX objectives

- Investigate the state-of-the-art regarding research on toxicity of pharmaceutical mixtures.
- Assess acute and chronic toxicity of pharmaceuticals as singles and in mixtures to aquatic organisms.
- Assess mutagenicity, estrogenicity, cytotoxicity of pharmaceuticals as singles and in mixtures to human cells.
- Develop novel *omics* techniques to assess toxicity of pharmaceutical mixtures to human cells.

More info: www.eng.ucy.ac.cy/tomixx/