
Environmental Persistent Pharmaceutical Pollutants (EPPP)

**New and Emerging Issues
Strategic Approach for the International Management of
Chemicals, SAICM**

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Environmental Persistent Pharmaceutical Pollutants (EPPP)

The amounts of pharmaceuticals are expected to increase rapidly:

- ❖ Widely used globally by humans;**
- ❖ For food production for an intended purpose;**
- ❖ More people can afford medical treatment;**
- ❖ New treatments are developed.**

Environmental Persistent Pharmaceutical Pollutants (EPPP)

**Pharmaceuticals chemicals are designed to be
“non-degradable” to:**

- ❖ Resist the acid environment in the stomach;**
- ❖ Be long-lasting;**
- ❖ Be administrated according to a specific defined time schedule.**

EPPP an emerging issue

EPPP reach the environment mainly in three ways:

- ❖ They are excreted from humans and animals, intact or metabolized, mainly into the urine, passing on to the environment directly or via sewage plants.
- ❖ Unused reach the environment either via household water or via urban solid garbage handling.
- ❖ Manufacturing plants producing the active substances might unintentionally release pharmaceuticals into the environment.

EPPP an emerging issue

- ❖ Significant adverse effects on environment and human health and special impact in vulnerable populations.
- ❖ Persist entering the environment.
- ❖ The increasing EPPP multiple chemical cocktail that today's population is exposed to.
- ❖ May enter and persist in the environment during their life cycle.
- ❖ Main human pathways:
 - Different species as fish where they may accumulate.
 - Drinking water.

EPPP in water

- ❖ Some pharmaceuticals are degraded to various extents in sewage treatment plants, but others leave the plant in active forms.
- ❖ Active residues of pharmaceuticals have been detected in surface water, and they may persist in the environment for long periods of time.
- ❖ Up to 14 different pharmaceuticals have been found in the drinking water of big cities around the world.
- ❖ EPPPs found in drinking water depends on what resources and detection methods are available.

Examples of EPPP in water and in animals

Estradiol (estrogen, synthetic hormone)

- ❖ Synthetic hormones are endocrine disruptors.
- ❖ Estrogenic compounds like ethinyl-estradiol (estrogen hormone) at concentrations < 1 ng per litre may cause:
 - feminization of species as fish, like frogs, alligators and molluscs, and
 - structural change in species sex organs.

Examples of EPPP in water and in animals

Cardiovascular medicines

- ❖ The non-selective beta-blocking agent propranolol presents significant decrease in egg production.
- ❖ Gemfibrozil (cholesterol and triglycerides lowering drug) lowers the blood levels of testosterone in fish.

Examples of EPPP in water and in animals

Neuro-psychiatric medicines

Citalopram / Fluoxetine (serotonin reuptake inhibitor anti depressants, SSRI's)

- ❖ Citalopram has been detected in liver from wild perch in low μg per kg levels, and fluoxetine affects the serotonin system in the same way that it does in human
- ❖ Fluoxetine has also been shown to affect swimming activity in shellfish; whether this is linked to a disturbance of serotonin function in the brain is still unknown.

Examples of EPPP in water and in animals

Antibiotics

- ❖ High levels of antibiotics in the water are a cause for alarm as there is an increased risk of selecting resistant bacteria. This can lead to some highly effective antibiotics becoming ineffective.
- ❖ For example, in India the bacteriae resistant to ciprofloxacin have been found downstream pharmaceutical plants, genes for multi resistance were found in drinking water, and multi resistant Salmonella in water sprayed on vegetables. In Europe the epidemic with multi resistant EHEC in summer 2011, originating from water sprayed vegetables.

Case studies of EPPP

Case study “Stockholm, Sweden”

❖ In drinking water:

- Atenolol (beta blocker),
- citalopram (antidepressant drug),
- diclofenak (analgesic),
- ibuprofen (analgesic),
- metoprolol (beta blocker),
- naproxen (anti-inflammatory)
- trimetoprim (antibiotic)

❖ In fish caught downstream from the sewage plants:

- citalopram (antidepressant drug)
- propoxyphene (narcotic/anesthetic).

Case studies of EPPP

Case study “India”

❖ In drinking water:

- cetirizin (antihistaminic),
- ciprofloxacin (antibiotic),
- enoxacin (antibiotic),
- terbinafin (antimycotic),
- citalopram (antidepressant drug).

❖ Several broad-spectrum antibiotics in very high concentrations, as well as bacteria resistant to all known antibiotics, were found downstream from a sewage plant.

Proposed cooperative action on EPPP

Dissemination of information:

- ❖ Involve different sectors to create awareness on this important emerging issue.
- ❖ Help to improve the public recognition of pharmaceuticals as chemical environmental pollutants, with possible important negative effects on environment, biodiversity and human health.
- ❖ Help to include all important sector involved in this emerging issue.
- ❖ Help to disseminate the existing information and to identify new emerging information and partners already working in the issue.

Proposed cooperative action on EPPP

Actions addressed to the governing bodies of international organizations, governments, scientific bodies, civil societies stakeholders and private sector:

- ❖ Inclusion of EPPP as one of the emerging issues for ICCM3.
- ❖ Inclusion of Environmental Pharmaceuticals Persistent Pollutants, EPPP, in the SAICM Global Plan of Action.
- ❖ Recommend the main actors to get involved and become leaders in this new and emerging issue, inviting for example WHO to lead the actions.
- ❖ Invite scientific and health bodies and other main private sector and civil society actors to engage and recognize this important issue.

Proposed cooperative action on EPPP

Initiation of follow up:

At ICCM 3:

- ❖ Convene the parties for a one day workshop on EPPP at ICCM3.
- ❖ Identify and invite scientist and researchers experts to expose on the current state of science on EPPP.
- ❖ Identify and invite experts on chemical safety policies to expose on the current state of the art of policies at global, regional and national level.
- ❖ Prepare a document or statement to highlighting the importance of the EPPP and call for action.

Proposed cooperative action on EPPP

Initiation of follow up (cont.):

Inter-sessional work:

- ❖ Maintain the links with the EPPP ad hoc Working Group.
- ❖ Present the discussion and dissemination of already existing information on EPPP and promote the identification of experts at the regional level to complete the global picture.
- ❖ Promote capacity building by including all sectors involved to install the discussion.
- ❖ Prepare a document to report on the state of the science and recommendations for actions to be presented to the parties at ICCM4.

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