

## WHAT DOES THE ICPR DO WITH RESPECT TO THE ISSUE OF MICRO-POLLUTANTS?

During the past years, the International Commission for the Protection of the Rhine (ICPR) has chosen 7 groups of substances from the great variety of chemical substances to develop a strategy aimed at reducing and avoiding micro-pollutant inputs into water bodies. For certain indicator substances among these substance groups the used and applied amounts, the discharge pathways into waters, monitoring data from surface waters, groundwater and drinking water as well as quality criteria and possible measures have been thoroughly analysed.

The evaluation reports for the 7 groups of substances and a summary document on a strategy towards reducing micro-pollutants are found on the ICPR website ([www.iksr.org](http://www.iksr.org)).

## WHAT CAN I DO?

Up to 5000 different chemical substances may occur in a household. Among them detergents and cleaning agents, cosmetics, pharmaceuticals, paints and varnishes as well as plant protection agents and pesticides. In general, the following applies to the use of these products:

- moderate application
- correct application
- correct disposal

When buying the products, you should already pay attention to the substances contained. There are many alternative products containing natural agents. These products are marked with an **Eco label**. Please also respect indications concerning the application and correct dosage of the product. In most cases, a low dosage will be sufficient to achieve a good result and is less expensive.

In general, biocidal agents, anti-corrosive agents and other chemicals should be used sparingly and very targeted only. Furthermore, you might use more environmental friendly alternative products.

Expired pharmaceuticals or chemicals no longer used may in no case be flushed in toilets or poured into the sink. Please get locally informed on how to properly dispose of pharmaceuticals and environmental chemicals.

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The Rhine figures among Europe's most intensively used rivers. About 58 million people are living in its catchment area, in 2012 96 % of them were connected to a wastewater treatment plant. During low water periods, treated wastewater amounts to up to 20 % of the runoff of the lower sections of the Rhine.

During the last years, the water quality of the Rhine and of many of its tributaries has been distinctly improved by reducing the inputs of pollutants and nutrients of industrial and municipal origin. However, micro-pollutants are a new challenge for water protection. In today's normal mechanical-biological wastewater treatment plants many micro-pollutants are not or only partly treated and thus discharged into the water bodies.

Some of these substances are detected in the raw water of drinking water production plants and are even hard to remove during drinking water treatment.

## WHAT ARE MICRO-POLLUTANTS?

Micro-pollutants are synthetic organic substances occurring in water bodies in concentrations between nanograms and, at maximum, few microgram per litre. This is comparable to a sugar cube dissolved in a reservoir. For some groups of substances such low concentrations are enough to detrimentally affect aquatic organisms. Numerous synthetic substances belong to these groups of substances, such as medicinal products for human use, protecting agents for materials, insecticides as well as substances of natural origin, such as hormones.

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## WHICH ARE THE MAIN INPUT PATHWAYS OF MICRO-POLLUTANTS?

An analysis of possible input pathways of micro-pollutants shows that, for many of the substances considered, treated municipal wastewater is the relevant, decisive discharge pathway and that households, industry and trade are the most important sources. Furthermore, complexing agents are directly discharged by industry. For some groups of substances, e.g. biocidal products, plant protection agents and oestrogens diffuse inputs of agricultural or municipal origin may be an additional relevant source.

## WHAT MEASURES ARE TAKEN AGAINST MICRO-POLLUTANTS?

As far as possible, measures aimed at reducing micro-pollutants should be taken at the source to reduce their inputs. Approaches towards a reduction of these substance inputs are a more responsible use and disposal of the products and reduced application in industry, trade and households. Furthermore, wastewater treatment plants may be extended by a supplementary treatment stage implying ozonisation or activated carbon. First experience made in wastewater treatment plants shows that a wide range of micro-pollutants may thus be reduced. The degree of elimination thus achieved depends on the substance. For pharmaceuticals, biocidal agents, oestrogens and odoriferous substances considerable improvements of the elimination performance have been achieved. A number of substances, such as radiopaque contrast agents or certain pharmaceuticals and complexing agents are only withheld to a very limited extent by these treatment methods.

## WHICH MICRO-POLLUTANTS OCCUR IN THE RHINE?

### Medicinal products for human use

In the majority of cases, medicinal products transit by the wastewater from households and institutions such as hospitals before they reach the municipal wastewater. The extent to which they are eliminated in today's wastewater treatment plants varies according to the substance concerned. A large range of medicinal products for human use is detected at the outlet of wastewater treatment plants. At a concentration above 1 microgram per litre some of them may detrimentally affect aquatic organisms. Some substances are even detectable in the raw water of drinking water production plants. With respect to toxicity for man, concentrations measured are not of concern and far below the therapeutically effective dosage. However, they are not desired in drinking water.

### Radiopaque contrast agents

After their application radiopaque contrast agents are largely excreted unaltered and may get into wastewater. These substances are biologically inactive. However, their increasing appearance is not desired in drinking water.

### Oestrogens

Oestrogens are female sexual hormones. They may be of natural or of synthetic origin. Oestrogens are excreted by man (urine, excrements) and transit by wastewater treatment plants before reaching the surface waters. Oestrogens excreted by animals are spread in the environment together with semi-liquid manure from livestock breeding. Artificial oestrogens are excreted by women, for example, who use contraceptive pills. Increased oestrogen concentrations in water bodies may alter the behaviour of water organisms and even cause disruption to development, sex change and infertility. Near the outlets of wastewater treatment plants, such effects cannot be excluded.

### Odoriferous Substances

Synthetic odoriferous substances are used in many household applications (soap, shampoo, cosmetics, detergents, cleaning agents). Some of these substances are only moderately soluble in water and are biologically poorly degradable. A high accumulation (bioaccumulation) is detectable in fish. However, the concentrations of odoriferous substances in the Rhine are below the values for which detrimental effects on aquatic organisms are expected.

### Biocidal products and anti-corrosive agents

Biocidal products are agents used for fighting harmful organisms. They are, e.g. used for protecting walls and facades. Partly, the same substances are applied as plant protecting agents in agriculture in order to protect plants against harmful organisms or to destroy unwanted plants. Anti-corrosive agents protect materials against corrosion which may induce the loss of the material properties. Due to the high consumption and the stability of these substances it is not surprising that they are being detected in surface waters and partly in drinking water. The highest concentrations of biocidal products detected in waters in the Rhine catchment may be in the order of magnitude of ecotoxicologically relevant values. Concentrations measured in municipal wastewater after treatment are distinctly in excess of these values.

### Complexing agents

Complexing agents are industrial chemicals used for many purposes in and by industry and trade, and are mainly discharged into our water bodies by industry and trade, but also by households. Additionally, they are used as food additives to grant the stability of colour, flavourings and texture of the products. In municipal wastewater treatment plants, complexing agents are not completely removed. For drinking water supply, complexing agents are conspicuous, as normal treatment procedures do not remove them from raw water, and, from a preventive point of view, they are undesired in drinking water.

