

# **WATER TOXICOLOGY**

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# THE HISTORY OF AQUATIC TOXICOLOGY

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- A major aquatic environmental problem was generated when sewage systems were built.
- Contaminated household water, urine, and feces were disposed of directly to surrounding waters.
- Although cleaning measures are nowadays taken for most large human settlements, at least in Europe, Japan, North America, and Australia, the eutrophication caused by fertilizing compounds from human settlements, industry, agriculture, and aquaculture is a major threat to inland and coastal waters.

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- Because gut bacteria can cause epidemics of intestinal diseases (e.g. cholera), they are still a major component to be determined when water quality criteria are established.
- The water quality framework is defined for Europe in the Water Policy Framework Directive (WFD) of 26 February 1997, and for the USA in the Clean Water Act and the Water Quality Act, of which the latter is from 1987.

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- Upon industrialization, acid rain became an issue.
- By the end of 1800s, coal burning was already causing acid rain and consecutive acidification of poorly buffered rivers and lakes in the British Isles.
- The acid rain generated came down into poorly buffered streams and lakes in Norway, Sweden, and Finland, where whole fish stocks, especially of salmonids, were wiped out for the mechanism of water.

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- The smoke contains oxides of sulfur and nitrogen ( $\text{SO}_x$  and  $\text{NO}_x$ ), which react with atmospheric water to form  $\text{H}_2\text{SO}_3$ ,  $\text{H}_2\text{SO}_4$ , and  $\text{HNO}_3$ .
- These acids are a part of precipitation and acidify waterways.
- Acidification of freshwater is of major importance, especially in Asia, where none of the measures that are required in Europe to prevent pollution are so far applied.

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- Until the latter part of the twentieth century, wastewater was virtually always uncleaned.
- Whenever the vicinity of effluent pipes became fouled, the solution was to increase the length of the effluent pipe.
- Because of the idea that effluents could be fed into surrounding waters without cleaning, many major catastrophes occurred.

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- For example, the toxic effects of mercury were seen in the **Minamata** incident in Japan.
- Tens or even hundreds of people died of mercury intoxication in 1956, as untreated effluents from a chemical factory were discharged in a bay where local inhabitants took their household water and ate the fish.

## Minamata

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- Although the acute catastrophe could be pinpointed the mercury contamination of the Minamata Bay occurred between 1932 and 1968,
- Up to the present, around 2000 people have died with mercury intoxication, and more than 10,000 people have received some kind of compensation for mercury-intoxication-caused damages.