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Editorial

Environmental impact of toxic pollutants

A pollutant is any natural or unnatural material that is present in the environment at unnaturally high levels. Concern about pollution is meaningful only in the context of a pollutant's impact on the biosphere. How a pollutant affects the biosphere has been conventionally characterized in terms of easily quantifiable measures such as the chemical oxygen demand (COD), biochemical oxygen demand (BOD), pH and total suspended solids (TSS). These measures are important, but they are grossly insufficient for assessing the full impact of a discharge on the biosphere. Many pollutants directly affect the metabolic biochemistry of the diverse life forms that inhabit the various ecosystems. When the biochemical impact is adverse, the pollutant is toxic. (Nontoxic pollutants, of course have the potential to greatly affect the environment and life, but toxic pollutants are a priority concern).

Unfortunately, toxicity is not easily defined and, therefore, barely considered in setting discharge limits on pollutants. Toxicity is a biological response that depends on the measurement system used. Furthermore, because of synergistic and antagonist effects that also depend on the measurement system, a knowledge of the composition of a mixture and the individual toxicities of its components does not translate into a general index of the mixture's toxicity. Toxicities of individual compounds are probably not meaningful for most situations when an effluent contains several pollutants and the discharged pollutants mix with the other compounds already present in the receiving environment.

All this suggests that unless an effluent contains a single component, or there are other unusual circumstances (e.g. one toxic component is highly persistent or can bioaccumulate), the whole effluent toxicity should be a preferred measure in establishing its acceptability for discharge. Furthermore, any evaluation of the toxicity of an effluent should be based on a consortium of sensitive biological species that are relevant in the receiving ecosystem. The definition of the receiving ecosystem should of course extend beyond the immediate discharge environment, depending on the persistence of the pollutant, its rate of dispersal and the ability to bioaccumulate or otherwise build up in the environment.

In view of all these complexities, establishing scientifically justifiable discharge limits is clearly a substantial task. Although we know a lot about the potential environmental impact of individual pollutants, a reliable and broadly useful systematic approach to setting discharge limits continues to elude us. Notwithstanding the difficulties, statutory discharge limits should consider an effluent's toxicity much more than they do currently.

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