

TOXICANTS IN THE AQUATIC ENVIRONMENT AND THEIR EFFECTS ON SELECTED ORGANISMS*

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Our marine environment is being harmed nowadays by discharge of waste materials and run-offs of highly polluted waters. This may, via food chains, contaminate commercial important food species and through them harm human beings. The impairment and progressive deterioration of water systems exposed to pollution was noted long ago, but the first control measures were taken only after some serious accidents involving human victims occurred. The case of Minamat disease¹ caused by mercury is one of the most illustrative cases.

Effective control measures for toxic pollutants require the development of range of standard procedures for the measurement of toxicity on aquatic organism. To create standards for environmental management, there is a need for more knowledge about the effects of pollutants on marine organisms. In most cases it is very simple to speculate but more difficult to identify and explain the primary effects and their eventual environmental consequences.

The general approach to toxicity testing is the exposure of an appropriate biological material to the toxic action of a polluting substance under control laboratory conditions. Later, on the basis

of the results obtained, the predicted effects of the pollutants are estimated in relation to the environment.

Today, it is clear the pollution of the hydrosphere represents a major hazard not only to aquatic life but to the health of the whole biosphere.

Toxicity tests conducted to measure the toxicity limits of pollutants on aquatic organisms are classified according to the duration of the experiment and the methods of adding the toxicant to the test solution. In these tests, test organisms are exposed to increasing concentrations of a toxicant for various lengths of time to determine changes in the organisms. The 96-hour, 50% live-death response-method is the most frequently used in conducting toxicity tests because of the minimal laboratory requirements and rapid results. With this kind of tests, it was found that toxicants have effects on the activity, feeding and reproduction of marine organisms.

The solubility of pesticides influences their effects on marine species. They are less toxic when their solubilities are high. Salinity, organic materials, pH and temperature affect the solubility of pesticides in water. On the other hand, contaminated sediments were found to

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undergo a slow biodegradation which causes a reduction of the dissolved oxygen in water. Suspended particles reduce visibility in the water thereby limiting the foodgathering capacity of aquatic animals. These pollutants cause water to become turbid, lowering the rate of photosynthesis which fact results in plant death. The presence of these toxicants also causes water temperature to rise. Only few species can exist in water temperature of over 40°C. Oils and allied petrochemicals interfere with natural reaction, endangering aquatic life. These toxicants cause a variety of adverse effects at lower concentrations and potential damage to marine food chains at higher concentrations.

Heavy metals are considered the most harmful aquatic pollutants. These metals produce physiological poisoning after accumulation in the tissues of marine organisms and the effect produced varies with the composition of the pollutant, the concentration in the tissues, and the metabolism of the organism. Copper and zinc are considered among the essential nutrients for marine organisms as long as they are present at tolerable levels. Lead, cadmium, mercury and chromium accumulate in human organs causing damage and malfunctioning especially in the nervous system and the effects vary from brain damage to damage of peripheral nerves causing uncoordinated muscular control and poor eyesight.

Recommendations:

The production of wastes cannot be eliminated and its disposal is a necessity.

The diversity and quantity of wastes produced will continue to increase in the future and to protect the aquatic environment, toxicity tests play a vital role. The knowledge of toxicity test procedures that can be done on common toxicants is useful to assist in the research on and application of measures for the protection of the aquatic environment.

The following are also recommended to resolve problems of pollution in the aquatic environment:

1. The development and application of sensitive and expeditious laboratory techniques to measure, explain and confirm the biological significance of the exposure of test organisms to actual or potential pollutants in the aquatic environment.
2. The study of basic biological, physiological and bio-chemical characteristics of single species to differentiate between pathological effects and normal physiological response to natural and artificial environmental pressure.
3. The development of satisfactory hazard evaluation plan, which would include the essential steps and possible alternatives for evaluating potential environmental pollutants and prescribing the necessary limitations and control.

Finally, public authorities and administrators can make their contribution through the enactment and enforcement of legislations designed to manage and protect the aquatic environment.