FREQUENCY OF CHROMOSOMAL ABERRATION IN FISH INHABITING POLLUTED ECOSYSTEM

A. OUSEPH+, D. SUDARSANAM* AND P. GANDHEESWARI**

+M. S. Swaminathan Research Foundation, Taramani, Chennai 600 113, India  
*P.G. and Reasearch Dept. of Zoology Loyola College, Chennai 600 034, India  
**P.G. and Research Dept. of Zoology Quid-E-Millath College, Chennai 600 008, India

Fish have survived millions of years in the most diverse, adverse and advance environment. It is expected that all known mechanisms of chromosomal changes could have occurred in the evolution resulting in a characteristic karyotype. Pollution of estuaries is difficult to assess because of the special qualities of this ecosystem. Estuarine pollution is different from river pollution as the pollutants remain trapped in the ecosystem for a long period due to tidal isolation. Pollution damage of estuaries is due to the product of man's activities. Pollutants have turned the sea and ocean into vast cesspools. Thus nature's cleansing pool turn into septic tanks due to the accumulation of wastes. Contrary to the opinion that the seas are bottomless pits, man is now realising that they have very specific ocean floors and limit to the quantum of solute they are holding.

Water samples and fingerlings of Mugil cephalus were collected every month for two consecutive years, 1994 and 1995 from the site of Napiar bridge (mouth of estuary). Water samples (2 l) were collected in polythene container and immediately taken to the laboratory and analysed for their physicochemical attributes, using the standard method (APHA, 1989). Mugil cephalus were collected from Napiar bridge adjoining the mouth of the estuary throughout the year and reared in inhabiting-water and every other day, the holding water was renewed. Rapid chromosomal preparation of tissues of gill and kidney were made from the fish species following the method of Kligerman and Bloom (1977).

Physicochemical parameters of pond water and estuarine sample collected at Napiar bridge revealed marked differences. Turbidity, total solids, total hardness, alkalinity, chlorides, silicates, iron, and heavy metals such as cadmium, chromium, nickel, mercury, zinc were found to be characteristic. The degree of toxicity of pollutants affects the quality of water with varying pH and hardness and in fact toxicity of ammonia affected the pH.

Some substances become more toxic at low oxygen concentration due to an increase in the respiratory rate thereby increasing the amount of exposure of the animal to the toxin. Dissolved oxygen was significantly very low in the experimental area (2.1 ml/l) than the control pond (6.21 ml/l). The concentration of cadmium and mercury fall in line with each other with increasing trend from rainy to summer through other seasons, while chromium and zinc show uniform concentration throughout the year,
though a slight hike was observed in the summer season. By contrast, the concentration of lead is maximum during normal season, minimum during rainy, and optimum during summer seasons.

Environmental impact and chromosomal variation have been two sides of a coin as they are inseparable. Off late the impact of environment factors on the biosystem reveals in chromosomal aberration expressed in the form of ploidy. In the same way endoreduplication also occurs which is an internal doubling of chromosomes resulting from two successive DNA synthesis without intervening cytokinesis. The exposure of fish to various concentration of chemical under investigation reveals marked increase in the frequency of chromosomal aberration over control. Mugil cephalus obtained from Napiar site seem to be susceptible to tremendous variation in relation to the seasons, particularly in summer. This may be attributed to the fact that in summer months the Indian coastal system is subjected to precipitation with consequent elimination of water thereby condensation of aquatic system which imposes the osmoregulatory pressure on the gill and kidney cells of fish species. Furthermore, high temperature of water is also an additional stress on the fish.

Key words: Chromosomal aberration: Ploidy, Endoreduplication, Genotoxicity, Heavy metals, Mugil cephalus