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RESEARCH PAPER

Genotoxicity evaluation of acute doses of endosulfan to fresh water teleost, *Anabas testudineus* by cytokinesis block micro nuclei technique

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ABSTRACT

The fresh water, edible, air breathing teleost, *Anabas testudineus* was exposed to different concentrations of the organochlorine pesticide, endosulfan. Acute toxicity of endosulfan (35EC) was studied to evaluate its risk and toxic factors in view of human safety. The LC_{50} values of endosulfan for 24, 48, 72 and 96h on *A.testudineus* were 27.58, 23.35, 18.79 and 16.91 ppb, respectively. Endosulfan induced somatic DNA damage on *Anabas testudineus* was determined by cytokinesis block micro nuclei (CBMN) technique. Endosulfan toxicity produced significant DNA damage in fish exposed to endosulfan (14 ppb and 16.91 ppb) for 96h than those in control. CBMN frequency increased as the concentration of endosulfan increased. The presence of DNA strand breakage in exposed specimens indicated the genotoxic potential of endosulfan.

Key words : Endosulfan, Cytokinesis block micronuclei (CBMN) technique, Micronuclei (MN), Teleost, *Anabas testudineus*.

Endosulfan, a chlorinated cyclodiene insecticide is, a broad spectrum insecticide which controls insects by contact action and by ingestion of endosulfan treated plant material. It was first introduced in the 1950s. Organochlorines are the most important of the persistent organic pollutants or POPs. There is now a move for a world-wide ban on POPs because of their link to cancer and long-term subtle effects on hormones, the immune system, and reproduction. Unlike other POPS which travel across the globe, endosulfan tends to remain in the region of its use. Yet, it has been found in high concentrations in many areas around the world because it is very widely used. Endosulfan is persistent in soil and its major degradation product, endosulfan sulfate, is as toxic as endosulfan (ATSDR,1993). In India, the manufacturing of endosulfan is restricted to only two states, namely Kerala and Maharashtra, which produce 1600 and 2400 tons/yr, respectively (Jaffery *et al*., 1990).

The genetic integrity of animal population is increasingly under threat due to industrial activities which result in exposure to chemical and physical genotoxins. Earlier studies on the genotoxicity of endosulfan have yielded consistent results. (Pednekar *et al*., 1987; Chaudhuri *et al*., 1999; Falck *et al*., 1999) In the present study endosulfan induced somatic DNA damage on *Anabas testudineus* was determined using micronucleus assay (MN). Micronucleus assay was performed on blood lymphocytes since only dividing cells can express micronuclei. This goal was achieved by the development of the cytokinesis-block micronucleus (CBMN) technique which employs cytochalasin B to stop dividing cells from performing cytokinesis and thus allows cells that have completed one nuclear division to be recognized by their binucleate appearance (Fenech and Morley, 1985). CBMN assay is more accurate and more sensitive than convention methods which do not distinguish between dividing and non dividing cells. This technique can detect between 60%-90% acentric fragments.

The *in vitro* micronucleus (MN) assay is currently being considered as a suitable method for testing the genotoxicity of chemicals and pharmaceuticals. The reason for this stems from the relative ease of scoring MN and the versatility of the assay, which can detect chromosome breakage and chromosome loss. This assay is being used to: (i) compare genetic damage rate between populations exposed to different environmental, occupational and lifestyle factors (Fenech *et al*., 1999); (ii) assess differences in radiosensitivity between individuals at risk for cancer both as a predictor of cancer risk as well as for optimization of radiotherapy (Scott *et al*., 1998); (iii) assess the genotoxic potential of new chemicals produced by the agrochemical and pharmaceutical industries (Kirsch-Volders *et al*., 2000).

MATERIALS AND METHODS

Live specimens of adult fresh water fish, *Anabas testudineus* were collected locally. The fish weighing 45–50 g with the length of 14-15 cm were brought to the laboratory and acclimatised to the laboratory conditions for 15 days in large glass aquaria. The fish were fed daily