GENOTOXIC EFFECTS OF BISPHENOL A TO SEA URCHIN *PARACENTROTUS LIVIDUS* (LAMARCK, 1816)

Özlem Cakal Arslan * and Hatice Parlak
Ege University, Faculty of Fisheries, Department of Hydrobiology, Bornova 35100, Izmir, TURKEY - ozlem.cakal@ege.edu.tr

Abstract
Bisphenol-a (BPA) is one of the most important industrial chemicals that are synthesized for diverse applications: BPA is, for instance, used in the manufacture of polymers, epoxy resins, polycarbonates, and packing industry. In this study, genotoxic effects of BPA (0.3-3.5 m/L), were evaluated using the embryos of the sea urchin *Paracentrotus lividus*. Results of cytogenetic analysis showed decreasing curve in mitotic index (number of mitosis per embryo) with increasing concentrations of BPA.
Keywords : Ecotoxicology, Echinodermata, Pollution.

Introduction
Bisphenol-a (BPA) is one of the most important industrial compounds which belong to the bis (hydroxypheny) methane's. BPA is used primarily to make polycarbonate plastic and epoxy resins, both of which are synthesized for wide variety applications; for example, polycarbonate is used in eyeglass lenses, medical equipment. Because of the high production and widespread uses of BPA, it is entered in the environment in important quantities [1]. BPA is not naturally available in the environment therefore environmental concentrations result from diffuse sources (waste products, products in use) and point sources (industrial wastewater discharges). Several studies have been completed to determine the possible impacts of BPA [2]. The sea urchin bioassays are frequently used for determined the biological effects of pollutants on aquatic organisms [3].

Material and Methods
Analytical grade bisphenol-a [$(CH_3)_2C(C_6H_4OH)$, Cas No: 80-05-7] purchased from Aldrich, Germany. Test chemicals were dissolved in dimethylsulphoxide (DMSO) as 100 mg-BPA/L. Test concentrations were 0.3, 0.5, 0.8, 4, 1.5, 2.3 and 3.5 mg/L of BPA. Adult sea urchins, were collected from the Aegean Sea coast (Seferihisar, Turkey), immediately transported dry to the laboratory. Sea urchin cytogenetic bioassays were carried out as described previously by Pagano et al. 2001. For cytogenetic analyses sea urchin embryos which exposed to BPA, were fixing in Carnoy's fluid (absolute ethanol: chloroform: acetic acid: 6:3:1) 5 hours after fertilization. Observations were carried out using a light microscope (using an immersion oil and 100x objective). Quantitative endpoints were evaluated according to criteria defined by Pagano et al (2001). Student-t tests were used to compare the differences in the frequency distribution of evaluated parameters between control and treatment groups by applying the logarithmic transformation to normalize distributions.

Results
The cytogenetic analysis was carried out in *P.lividus* embryos exposed to BPA. In test, mitotoxic effects were detected all tested concentrations which changes in the number of mitoses per embryo (MPE) (1) and increasing mitotically inactive embryos (IE) ($p<0.0005$).

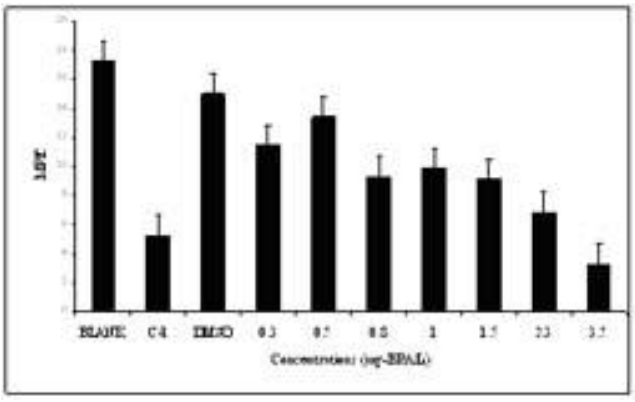

Fig. 1. Mitotoxic effects of Bisphenol-a on number of mitoses per embryo (MPE).

Test results showed that the mean MPE were decreased with increasing concentrations of BPA ranging from 0.3 to 3.5 mg/L. In contrast, they caused an increase in IE ratios .The differences in Metaphase/Anaphase was not statistically significant for each set of experiments. A few morphological aberrations (bridges, scattered chromosomes etc.) were observed at highest BPA concentrations.

Discussion
Several studies have focused on the toxicity of BPA and a significant amount of literature is available at present especially on estrogenic activity. A lack of information about the toxicity of BPA to the developmental stages of the sea urchin *P. lividus* was observed. .Some previous reports focused on acute and chronic effects of BPA on aquatic organisms in both freshwater and saltwater by using several species and tropic levels. The LC50 has been determined for variety of aquatic organisms, including freshwater and saltwater algae, invertebrates (daphnids and mysid shrimp) and fish with reported values ranging from 1000 to 20.000 μg/L [2]. In this study, genotoxicity of BPA was tested and adverse effects were observed on sea urchin embryos at concentrations of 0.3-3.5 mg-BPA/L. Our previous studies about same concentrations of BPA results show that its exert spermiotoxic effect on *P. lividus* fertilization. In this study results are consistent with other studies, Roepke et al., (2005) noted that estradiol and all EDCs including bisphenol-A (BPA) (250 to 750 ng/ml) inhibited normal development in two echinoid species *Strongylocentrotus purpuratus* and *Lytechinus anamesus*. It can be concluded that bisphenol-a affects the *P. lividus* during embryonic developmental stages. Therefore, to keep the environmental concentration of BPA under control is of great ecological importance in order to maintain sustainable ecosystems due to the hazard at the population level.

References

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