

Synergistic Effect of Combinations of Bisphenol A and Nonylphenol to Japanese medaka (*Oryzias Latipes*)

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Various chemicals introduced into the aquatic environment by sewage, industrial waste, and agricultural effluent cause adverse effects on living organisms such as fish. Many compounds including bisphenol A and nonylphenol are suspected as endocrine disrupting chemicals (EDCs), and they coexist with different combinations in the environment. In order to investigate the possible influence of combinations of bisphenol A (BPA) and nonylphenol (NP) on toxicity and reproductive responses, mortality rate, hatching rate and time, growth, sex ratio, and plasma levels of vitellogenin (VTG) were measured in Japanese medaka (*Oryzias latipes*). Embryos within 24-hr post-fertilization were exposed to control, solvent control (17 β -estradiol), and different combinations of BPA and NP under continuous flow-through condition up to 60-days post-hatch. During the exposure period (about 70 days), no significant effects in combinations were observed on mortality (embryo and juvenile), hatching rate and time, and growth compared to the control. However, imbalance of sex ratio from combination of 80 ppb BPA + 6 ppb NP was observed. In addition, concentration of vitellogenin from homogenized whole-body in male fish increased significantly from the combination of 80 ppb BPA + 6 ppb NP. The results showed that the mixture of two suspected EDCs had potential to alter sexual development and induce vitellogenin in male medaka. The finding suggests that the synergistic effect by combination of various compounds in the environment has to be considered carefully in order to better understand ecological risk assessment.

Key words: Synergistic effect, Bisphenol A, Nonylphenol, Reproductive responses, Medaka