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〈NOTE〉

Effect of Nonylphenol on Plasma Glutamate Oxaloacetate Transaminase (GOT) and Glutamate Pyruvate Transaminase (GPT) in the Juvenile Rockfish, *Sebastes schlegeli*

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Effect of 4-nonylphenol (4-NP), endocrine disrupting compounds (EDCs), on glutamate oxaloacetate transaminase (GOT) and glutamate pyruvate transaminase (GPT) were investigated in the plasma of juvenile rockfish, *Sebastes schlegeli*. Fish were injected with 4-NP (10, 50, 100 and 200 mg/kg body weight) in 70% ethanol twice at 3-day intervals and plasma sampling were extracted at 7 days after the last injection. Controls received solvent only. 4-NP significant increased GOT in a dose-dependent manner. GPT was markedly elevated to 61% ($P<0.05$) and 82% ($P<0.01$) than that of the control at the 4-NP doses of 100 and 200 mg, respectively. These results suggest that the estrogenic activity of 4-NP increase plasma GOT and GPT by toxic effect on hepatocyte.

Key words: 4-Nonylphenol, EDCs, GOT, GPT, Juvenile rockfish

The several compounds of surfactants such as alkylphenols, e.g. nonylphenol (NP) and octylphenol, have been regarded as endocrine distrupting compounds (EDCs) (Nimrod and Benson, 1996; Christensen et al., 1999). The estrogenic activity of compounds can be determinated using the synthesis of *zona radiata* proteins (ZRP) and vitellogenin (VTG) in the plasma of juvenile rainbow trout (*Oncorhynchus mykiss*) or male Atlantic salmon (*Salmo salar*) (Jobling et al., 1996; Arukwe et al., 2000). ZRP and VTG are synthesized in the liver in response to estrogen (estradiol-17β, E_2), released into the circulation, and transported into oocytes for accumulation as eggshell proteins and yolk proteins in sexually maturing female, respectively. The synthesis of ZRP and VTG are initiated by the binding of E_2 to estrogen receptor (ER) in hepatocyte, in which receptors are upregulated by E_2 itself (Lazier and MacKay, 1993; Flouriot et al., 1996; Pakdel et al., 1997). It is well known that 4-NP bind to ER in the hepatocyte with a potency approximately 10^{-4} to 10^{-5} times than that of estrogen (Lutz and Kloas, 1999) and promote the synthesis of ZRP and VTG (Christensen et al., 1999; Arukwe et al., 2000). Maybe, the estrogenic activity of 4-NP for the synthesis of ZRP and VTG in the hepatocyte will be toxic to hepatocyte. The plasma GOT and GPT has frequently been used to detect an eventual damage to the hepatocytes (Racicot et al., 1975; Vedel et al., 1998). The present study was undertaken to determine the toxic effect associated with injection of 4-NP on plasma GOT and GPT in juvenile rockfish.

Juvenile rockfish, *Sebastes schlegeli*, weighing about 50 g were kept in indoor tanks with continuously running water with about 32‰ salinity at constant temperature of 18℃. Fish were intraperitoneally injected with 4-NP (4-*t*-nonylphenol hydroxyl, Fluka) (10, 50, 100 and 200 mg/kg body weight) in 70% ethanol twice at 3-day intervals. Controls received solvent only. At 7 days after the last injection, fish were anesthetized with 2-phenoxyethanol (1 mL/1 L sea water) and the blood was collected from caudal vessel of seven fish tail in the control and 4-NP-injected groups, and each of these

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samples was transferred into heparinized capillary tubes. Plasma was separated by centrifugation (350 ×g, 8 min) and frozen at −20℃. The plasma GOT and GPT were examined using clinical assay kit (Asan Pharm. Co., Ltd) by the method of Reitman-Frankel (Racicot et al., 1975).

GOT was increased with increasing 4-NP dose (Fig. 1). Significant increase was confirmed at 4-NP doses of 10, 50, 100 and 200 mg, in which the GOT was increased to 32% ($P<0.05$), 56% ($P<0.01$), 52% ($P<0.01$), and 67% ($P<0.01$) than that of the control, respectively. GPT was also increased with increasing 4-NP dose (Fig. 2). GPT was increased to 61% ($P<0.05$) and 82% ($P<0.01$) than that of the control at the doses of 100 and 200 mg, respectively.

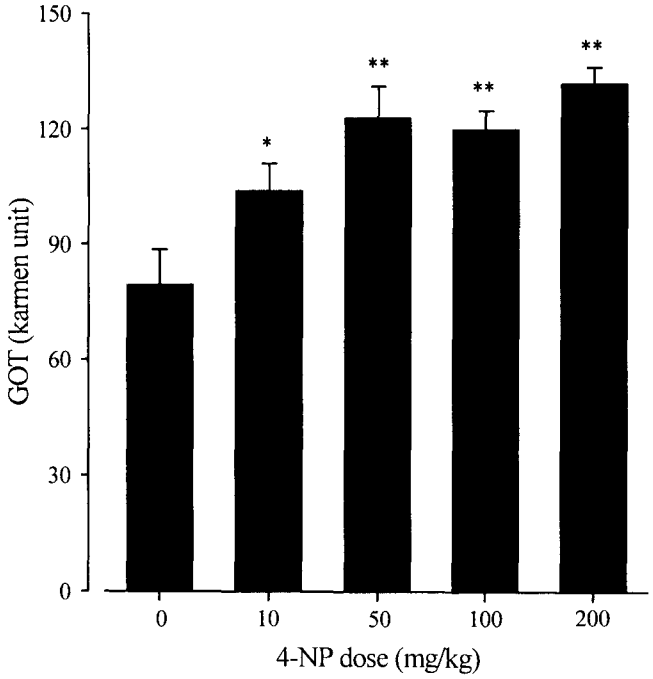

Fig. 1. The increase of GOT in the plasma of 4-NP-treated juvenile rockfish. Vertical bars represent the SE of the mean for seven fish. *P<0.05 and **P<0.01 for control (solvent only).

Christensen et al. (1999) reported that VTG production and GOT concentration were increased in the plasma of 4-NP-treated male flounder (*Platichthys flesus*). Similarly, in this study, 4-NP increased plasma GOT and GPT in a concentration-dependent way. Also, a newly synthesized VTG band was detected by estrogenic activity of 4-NP in the plasma of juvenile rockfish (data not shown). Therefore, increased plasma GOT and GPT could reflect that some of demage in hepatocyte of juvenile rockfish was affected by the estrogenic activity of 4-NP.

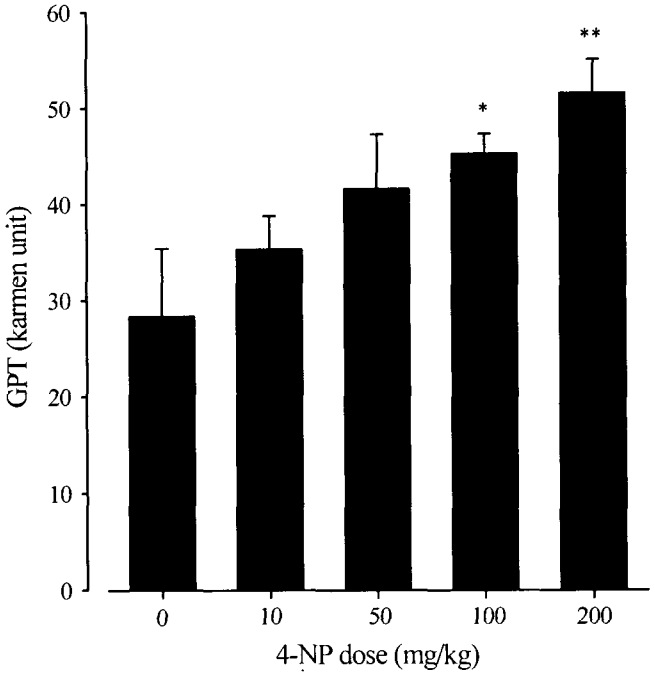

Fig. 2. The increase of GPT in the plasma of 4-NP-treated juvenile rockfish. Vertical bars represent the SE of the mean for seven fish. *P<0.05 and **P<0.01 for control (solvent only).

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