

Effect of ethinylestradiol on sperm quality of the tropical fish *Barbodes binotatus*

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This study was aimed to evaluate the in vitro toxicity of ethinyl estradiol (EE₂) in different concentrations (0; 10; 15; 25; 50 IU/mL) using sperm cells of model organism tropical fish, *Barbodes binotatus*. Sperm quality parameters, including mass and individual time of sperm motility (second), viability (%), and sperm velocity ($\mu\text{m/s}$) were measured by digital inverted microscope and DNA fragmentation of sperm after exposure to EE₂ was examined with fluorescence microscopy. *Barbodes binotatus* sperm was collected by stripping then exposed to EE₂. The results showed that EE₂ exposure could negatively affect some sperm quality parameters, which might significantly reduce the mass and individual time of sperm motility, sperm viability and sperm velocity rate of this animal. DNA fragmentation in sperm of *B. binotatus* was increased after EE₂ exposure compared to the control group. We conclude that administration of EE₂ concentration 10 IU/mL decreased mass and individual motility time, velocity, viability of sperm and increased DNA fragmentation in sperm of *B. binotatus*

Keywords: *Barbodes binotatus* ethinyl estradiol, fish, sperm quality.

INTRODUCTION

Over the last 50 years, the use of chemical pollutants and their releases in the environment has increased and affected the wildlife, such as fishes. Industrial development, agrochemicals and human chemical consumption produce an increasing amount of chemical pollutants into the environment, especially in surface water (Lecomte et al., 2017). Among these contaminants, estrogenic compound represent a significant proportion.

Estrogenic chemicals synthesized in pharmaceuticals raise exposure levels of estrogenic chemical in living things to the naturally occurring estrogen. The most pronounced effect occurred in aquatic species that make their homes in waters with elevated levels of estrogens. Many researchers have found estrogenic compound in streams, rivers, and lakes throughout the world,

as well as in the effluent of wastewater treatment plants in the United States, Europe, Asia, South America, and Australia. Synthetic estrogens from contraceptive pills, hormone-replacement therapy all end up in wastewater and can be discharged into rivers and lakes (Lundgren and Novak, 2010). Estrogens have been detected in numerous studies of wastewater influents and effluents, specifically estrone (E₁), 17 β -estradiol (E₂), estriol (E₃), and ethinylestradiol (EE₂) (Caldwell et al., 2010).

Ethinyl estradiol is an active component of drugs including oral contraceptives. This compound is also used as a cattle growth regulator and can be used to evaluate the estrogenic effects on the reproductive system. Ethinyl estradiol affects the reproductive system through the mediation pathway of the estrogen receptor (Metcalfe et al., 2001).