

# Behavior Related Neurotoxicity Assessment via Image Analysis on Planarians: Application to Microplastic-Induced Synaptic Impairment

You, Chaewon (School: Gyeonggibuk Science High School)

Yang, Jaehyun (School: Gyeonggibuk Science High School)

Microplastics (MPs) have been reported to accumulate in biological tissues and induce neurotoxicity; however, non-invasive quantitative models for evaluating their neurotoxic effects remain limited. This study aimed to develop a low-cost, non-invasive neurotoxicity assessment model using the planarian, *Dugesia japonica*. Classical conditioning was induced using blue light as the conditioned stimulus (CS) and vibration as the unconditioned stimulus (US). Planarian contraction responses were quantified using OpenCV-based image analysis to measure behavioral learning performance. Compared to the control group, the MP-exposed group showed a reduced conditioned contraction response rate, indicating impaired learning ability at the behavioral level. Furthermore, qRT-PCR analysis revealed significant downregulation of learning and neural function related genes, including *Grin1*, *Tubb3*, and *Synapsin-1*, suggesting synaptic dysfunction associated with microplastic exposure. These results demonstrate the neurotoxicity of microplastics and the fact that planaria can serve as an effective model organism for behavior-based neurotoxicity assessment. This study proposes a behavioral and molecular integrated platform for evaluating environmental neurotoxicity caused by microplastics and suggests its potential application as an environmental neurotoxicity screening system.

**Awards Won:**

