Probiotic Modulation of Microplastic- Induced Locomotor Dysfunction in Caenorhabditis elegans: A Functional Model of Environmental Toxicity

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Microplastics are emerging environmental contaminants that have been detected in diverse ecosystems and biological systems. Increasing evidence suggests that these particles can induce oxidative stress and physiological disturbances in living organisms. This study investigated the effects of microplastic exposure on locomotor function in the model organism Caenorhabditis elegans and evaluated whether the probiotic Lactobacillus could modulate these effects. It was hypothesized that exposure to microplastics would impair locomotion, while probiotic supplementation would improve locomotor performance. Four experimental groups were established: control (CTRL, n=6), microplastics (MP, n=6), probiotic (Lactobacillus, PB, n=3), and microplastics plus probiotic (MP+PB, n=3). Locomotion was assessed by measuring the time required for each organism to travel 2 cm from point A to point B, with a maximum observation period of 90 minutes. Results showed reduced locomotor performance in the MP group, where only 33.3% of organisms completed the distance within the observation period. In contrast, the probiotic group showed rapid locomotion, with all individuals completing the distance within 13 minutes. The combined MP+PB group also showed improved performance compared to the MP group. These findings suggest that microplastic exposure may negatively affect locomotor function in C. elegans, while Lactobacillus supplementation may improve locomotor performance under these experimental conditions. This model provides a functional framework for studying biological responses to emerging environmental contaminants.

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