

1 **Probiotics Alleviate Reproductive Damage Induced by Polystyrene**
2 **Microplastics in Male Rats**

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5 **Outline**

- 6 1. Introduction
7 2. Characterization of polystyrene microplastics and their effects on cells
8 3. Effects of probiotics on polystyrene microplastics-induced reproductive system in
9 male rats
10 4. Conclusion

11 **Abstract**

12 Normal regulation of the mammalian hypothalamic-pituitary-gonadal axis is critical
13 for normal reproductive capacity and representation of secondary sexual characteristics.
14 However, a variety of factors can lead to abnormal reproductive system, including
15 eating habits, sleep quality, chronic diseases, environmental hormones, gut microbes,
16 etc. Microplastics refer to plastic debris, particles or thin films with a diameter less than
17 5 mm, which can be divided into primary and secondary microplastics. Due to their
18 small size and low degradation rate, they are easily ingested and accumulated by
19 various organisms. Therefore, the purpose of this experiment is to explore the damage
20 of polystyrene microplastics (PS-MP) to the reproductive system of male rats, and to
21 investigate the improvement effect of probiotics on this damage. After pretreatment of
22 PS-MP samples, ZETA potential was measured and particle size was observed with
23 Scanning Electron Microscope (SEM). Then, the viability of PS-MP on Raw264.7 and
24 LC-540 cells was determined. Reactive oxygen species (ROS), nitric oxide (NO)
25 production, and testosterone concentrations can be determined after finding the lowest
26 harmful concentration. The results show that the PS-MP has a particle size of about
27 0.42, a potential of -32.85mV, and a very low PDI value. Cell experiments showed that
28 at the lowest harmful concentration, ROS and NO increased, and the testosterone
29 concentration of LC-540 was significantly lower than that of the control group. The 7-
30 week-old SD rats were divided into control groups, tube-fed 1、5、10 mg/kg PS-MP,
31 10 mg/kg PS-MP with 10^8 CFU/day probiotics and only 10^8 CFU/day probiotics. After
32 6 weeks of tube feeding, sacrifice them and take out blood, liver, testes, epididymis, etc.
33 for biochemical and histological analysis. The results showed that PS-MP reduced
34 sperm count, motility, and increased the percentage of abnormal sperm. In addition, it
35 also significantly damaged the testicular tissue and reduces blood concentration of sex
36 hormones, however, the administration of probiotics can improve reproductive damage.
37 Conclusively, PS-MP can indeed cause reproductive system damage in male rats, which
38 can be improved by probiotics.

Reference

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