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ALTERED GUT MICROBIOTA BY VOLUNTARY EXERCISE IN DONOR MICE MAY CONTRIBUTE TO HIGH PHYSICAL ACTIVITY IN RECIPIENT MICE

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KEYWORDS: wheel running, cecal microbiota transplantation

INTRODUCTION

Recent studies have shown that the changing composition of the gut microbiota is linked with changes in human and animal behaviors, suggesting that behaviors might be regulated via the microbiota-gut-brain axis⁽¹⁾. Although germ-free conditions are associated with increased spontaneous motor activity in mice⁽²⁾, the mechanisms underlying the relationship between locomotive activity and the gut microbiota of mice are unknown. In the present study, we determined whether the effects of exercise-induced changes in the physical behavior of mice occurred through alterations in the gut microbiota.

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MATERIALS & METHODS

Four-week-old male donor C57BL/6 mice were treated to voluntary wheel running (WR) or were kept in a sedentary condition (SED) for 12 weeks, and then the cecal contents were collected. After antibiotic treatment, the cecal microbiota transplantation (CMT) was initiated by placing of the donor cecal contents directly into the oral cavity of recipient mice. These recipient mice were 4-week-old male C57BL/6 mice and had been fed a high-fat diet (HFD). The CMTs were carried out 3 times over a 3-week period⁽³⁾. The physical activity of

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all of the HFD recipient mice was examined for 7 days⁽⁴⁾. The physical activity was evaluated by wheel-running activity, which was performed on a wheel adjacent to the cage for 24 hours.

RESULTS & DISCUSSION

In donor mice, the increases in body mass were attenuated by WR. Moreover, we observed low body fat and hypertrophy of the heart in WR donor mice. The CMT from WR and SED donor mice did not have an effect on the body, heart and fat mass in recipient HFD mice. Nevertheless, CMT from the WR donor mice into recipient mice induced high physical activity ($p < 0.01$).

CONCLUSION

These results suggest that gut microbiota transplantation from exercised mice might regulate physical activity in recipient mice.

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