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Contribution of *Lactobacillus casei* to the recovery from chemically induced skeletal muscle damage under chronic stress

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ABSTRACT

Background: Regeneration of damaged skeletal muscle requires sufficient supply of nutrients. Fully functional intestine and colon assure sufficient supply of nutrients. Gut commensal bacteria are known to support intestinal function. Previously lactobacillus treatment of elite athletes was shown to be effective in attenuating fatigue and impaired performance. We hypothesized that *Lactobacillus casei* (*L.casei*) administration may facilitate recovery of damaged skeletal muscle when the gut function is suppressed under chronic stress in which muscle regeneration is compromised.
Objective: To investigate the contribution of *L.casei* under chronic stress to the recovery of damaged skeletal muscle in young and older adult mice.
Methods: *L.casei* was given orally at a dose of 10^{-8} /day for 7days to 10 weeks old (young) and 45-55 weeks old (older adult) male C57BL/6J mice. Vehicle control mice received an equivalent volume of water for 7 days. On the eighth day, cardiotoxin (CTX) was injected to gatrocnemius muscle to induce muscle damage. Both groups were assigned 2 hours repeated-restraint stress everyday (chronic stress). On days 3, 5, 7, 10, 14 and 20 after CTX injection, mice were sacrificed. Excised gastrocnemius muscle was subjected to weight measurement and immunohistochemical analyses.
Results: There were significant differences in both the recovery of muscle weight and the regeneration process of gastrocnemius muscle examined immunohistochemically between control and *L.casei* treated young and older adult groups. Especially, the expression of developmental MHC (dMHC), a marker of premature regeneration, was positive up to 3 days in older adult groups. The delay in the recovery of muscle weight was obvious in older adult mice regardless of the treatment. However, while the expression of dMHC was prolonged up to day 7 in the vehicle control, dMHC expression was notable only up to day 3 or day 5 in the *L.casei* treated. Therefore, in older adult mice *L.casei* treatment under chronic stress may have facilitated the maturation process of regenerating skeletal muscle.
Conclusion: Our result suggests that *L. casei* favor under chronic stress favors the recovery of skeletal muscle from muscle damage. The maintenance of gut function by *L. casei* treatment may have facilitated the maturation process of regenerating skeletal muscle.
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