

**COMBINED EFFECTS OF PROBIOTICS SUPPLEMENTATION AND
RESISTANCE EXERCISE ON IMMUNE RESPONSES AND BONE METABOLISM
MARKERS AMONG YOUNG MALES**

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Introduction: Nowadays, there are many evidence suggesting regular consumption of probiotics may affect the immune responses and enhance bone health. Despite numerous researches carried out on the effects of endurance exercise on immune responses, the effects of resistance exercise on immune responses are limited to date. With regards to the effects of exercise on bone, weight-bearing exercises have been recommended as they are associated to the development and maintenance of strong bones. Therefore, the aim of this study was to investigate the combined effects of probiotics supplementation and resistance exercise on immune responses and bone metabolism markers among young males.

Methods: Forty-eight healthy sedentary males were recruited and randomised into four groups: sedentary placebo control (C), probiotics (P), circuit training with placebo (Ex), and circuit training with probiotics (PEx) groups. Participants in the Ex and PEx groups performed a progressive load of circuit training 3 times/week for 12 weeks. Each circuit comprised 10 exercises with work to rest ratio of 1:2. Participants consumed either multi-strain probiotics or placebo twice daily for 12 weeks. Blood samples were collected before (pre-test) and after (post-test) the intervention period.

Results: Total lymphocytes, total T lymphocytes(CD3⁺), T-helper (CD4⁺), T-cytotoxic (CD8⁺), serum alkaline phosphatase (ALP), osteocalcin (OC) and parathyroid hormones (PTH) were not significantly different ($p > 0.05$) between groups. However, within group effects showed that total lymphocytes, CD3⁺ and CD4⁺ counts were significantly higher compared to pre-test in the Ex group; CD8⁺ count was significantly higher at post-test compared to pre-test in the P, Ex and PEx groups; ALP and OC concentration exhibited increasing trend in PEx group; 1CTP concentration exhibited decreasing trend in all groups; and PTH concentration exhibited decreasing trend in the P and PEx groups.

Discussion: It is postulated that the possible mechanism that may explain the probiotics actions in the body is via competitive elimination or by producing the antimicrobial agents. In addition, probiotics enhanced bone health by increasing the mineral solubility. However, this

study found no significant effects of probiotics, resistance exercise and its combination on immune responses and bone metabolism markers compared with the previous findings. This may be attributed to several factors which include differences in individual fitness, nutritional status of the individuals, age and the exercise protocol employed.

Conclusion: Hence, it can be concluded that in general, 12 weeks of exercise alone, probiotics alone, and the combination of probiotics and exercise are more effective in affecting the immune responses and bone metabolism markers compared to sedentary without probiotics.