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The Effects of Orally Administered Bacillus Coagulans and Inulin on Prevention and Progression of Rheumatoid Arthritis in Rats

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Abstract : Probiotics have been considered as an approach to treat and prevent a wide range of inflammatory diseases. The spore forming probiotic strain Bacillus coagulans has demonstrated anti-inflammatory and immune-modulating effects in both animals and humans. The prebiotic, inulin, also potentially affects the immune system as a result of the change in the composition or fermentation profile of the gastrointestinal microbiota. An in vivo trial was conducted to evaluate the effects of probiotic B. coagulans, and inulin, either separately or in combination, on down regulate immune responses and progression of rheumatoid arthritis using induced arthritis rat model. Forty-eight male Wistar rats were randomly divided into 6 groups and fed as follow: 1) control: Normal healthy rats fed by standard diet, 2) Disease control (RA): Arthritic induced (RA) rats fed by standard diet, 3) Prebiotic (PRE): RA+ 5% w/w long chain inulin, 4) Probiotic (PRO): RA+ 109 spores/day B. coagulans by orogastric gavage, 5) Synbiotic (SYN): RA+ 5% w/w long chain inulin and 109 spores/day B. coagulans and 6) Treatment control: (INDO): RA+ 3 mg/kg/day indomethacin by orogastric gavage. Feeding with mentioned diets started on day 0 and continued to the end of study. On day 14, rats were injected with complete Freund's adjuvant (CFA) to induce arthritis. Arthritis activity was evaluated by biochemical parameters and paw thickness. Biochemical assay for Fibrinogen (Fn), Serum Amyloid A (SAA), TNF-α and Alpha-1-acid glycoprotein (α1AGp) was performed on day 21, 28 and 35 (1, 2 and 3 weeks post RA induction). Pretreatment with PRE, PRO and SYN diets significantly inhibit SAA and Fn production in arthritic rats ($P < 0.001$). A significant decrease in production of pro-inflammatory cytokines, TNF-α, was seen in PRE, PRO and SYN groups ($P < 0.001$) which was similar to the effect of the anti-inflammatory drug Indomethacin. Further, there were no significant anti-inflammatory effects observed following different treatments using α1AGp as a RA indicator. Pretreatment with all supplied diets significantly inhibited the development of paw swelling induced by CFA ($P < 0.001$). Conclusion: Results of this study support that oral intake of probiotic B. coagulans and inulin are able to improve biochemical and clinical parameters of induced RA in rat.

Keywords : rheumatoid arthritis, bacillus coagulans, inulin, animal model
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