EFFECTS OF EPS-PRODUCING LACTOBACILLUS PARAPLANTARUM BGCG11 ON STREPTOZOTOCIN INDUCED DIABETES IN RATS

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Introduction:
Diabetes mellitus type 1 (T1D) is a group of metabolic disease which main characteristic is hyperglycaemia. It has recently been shown that T1D develops only in genetically predisposed infants that have dysregulated lipid metabolism. Some of the significantly disturbed metabolic markers (succinic acid and choline) are metabolised by GI microbes, and it has been hypothesized that in addition to genetic factors, GI microbiota plays a crucial role in the onset of T1D. It is believed that intestinal colonization with certain bacteria strongly influences systemic immune responses early in life and may play a significant role in modulating the development of various chronic diseases. Experiments with animal models, have shown that GI microbiota is an important factor in development of T1D. The strain Lactobacillus paraplantarum BGCG11 produces the exopolysaccharide EPS-CG11 with high immunomodulatory potential. Specifically, the purified polymer EPS-CG11 elicited the increased production of the IL-10 and IL-1β, downregulating the immune response.

Methods:
Experiments were performed on 2.5-month-old adult albino Wistar rats. All animal procedures were approved by the local Ethical Committee (IBISS). Diabetes was induced by streptozotocin. Rats were randomly divided into four groups: (i) non-diabetic group (n=8); (ii) non-diabetic group (n=8) with orally administered L. paraplantarum BGCG11; (iii) diabetic group (n=8); (iv) the diabetic group (n=4) with orally administered L. paraplantarum BGCG11. After 4 weeks of treatment with probiotic, the rats fasted overnight and blood serum was collected to determine serum total cholesterol, triglyceride, blood glucose levels. Liver function was evaluated by determining the serum levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST). Kidney function was evaluated by measuring blood urea nitrogen (BUN). The level of DNA damage in liver and kidney was examined using the alkaline Comet assay. The pancreas from all experimental groups were removed and fixed in 10% buffered formalin for histological and immunohistological examination.

Results:
With the aim to develop novel strategies for prevention and/or therapy of T1D, we tested the influence of probiotic strain L. paraplantarum BGCG11 on the health parameters of streptozotocin-induced diabetic rats. The results obtained in this study showed that consumption of the strain BGCG11 regulates glucose levels in serum and restores pancreatic islets in diabetic rats. The level of blood sugar, BUN, as well as AST and ALT levels from liver were reduced when the rats were fed with BGCG11 strain resuspended in milk. Moreover, the improvements in the crypts architecture in duodenum and the Langerhans islets in pancreas were noticed, as well as less damage in DNA level of liver and kidney cells in the diabetic rats fed with BGCG11. The results indicate that BGCG11 is able to ameliorate the effect of induced diabetes in rats.

Discussion:
Lactobacilli may help in the prevention and treatment of diabetes by immunomodulation, preventing the inflammation and thus the destruction of insulin-producing beta cells of the pancreas.

Keywords: Diabetes mellitus type 1, Lactobacillus paraplantarum BGCG11, Exopolysaccharide EPS-CG11, Wistar rats, Immunomodulation, Probiotics
Citation: