

Probiotics as beneficial agents in the management of diabetes mellitus: a systematic review

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Summary

Probiotics have been suggested to play an important role in the management of diabetes. We conducted a systematic review on the role of probiotics in modulating parameters related to diabetes in animal and human experiments. We searched Pubmed, Scopus and Cochrane central until June 2014, concerning the effects of probiotics on hyperglycemia, hyperinsulinemia and their anti-diabetic efficacies by modulating the activities of proinflammatory and antioxidant factors. Our initial search retrieved 1120 reports. After screening titles and abstracts, 72 full-text articles were reviewed for eligibility. Ultimately, 33 articles met our inclusion criteria consisting of five human and twenty eight animal reports. *Lactobacillus* strains were, in particular, used in all studies with or without other strains. We found that probiotics have beneficial effects on glycemic controls, as all human studies showed significant reductions in at least one of the primary outcome endpoints which were the levels of fasting plasma glucose, postprandial blood glucose, glycated haemoglobin, insulin, insulin resistance and onset of diabetes; similarly, all the animal reports, except for two, documented significant changes in these parameters. Regarding secondary outcome measures, that is, lipid profiles, pro-inflammatory and anti-oxidant factors, only one human and one animal study failed to show any significant changes in any of these parameters. This systematic review generally demonstrated beneficial effects of the probiotic administration, especially *Lactobacillus* sub-strains, on the management of diabetes-related blood parameters, although, more evidence, especially from human trials, is needed to confirm these effects and also to conduct a meta-analysis. Copyright © 2015 John Wiley & Sons, Ltd.

Keywords probiotics; diabetes; hyperglycemia; onset of diabetes; lipid profile

Abbreviations ADA, American Diabetes Association; CFU, colony forming units; CRP, C-reactive protein; FPG, fasting plasma glucose; GPx, glutathione peroxidase; GLUT4, glucose transporter 2; HbA_{1c}, glycated haemoglobin; HDL-C, high density of lipoprotein cholesterol; HFD, high fat diet; HFFrD, High fat fructose diet; HFrD, high fructose diet; HOMA-IR, homeostatic model assessment-insulin resistance; hs-CRP, high sensitivity C-reactive protein; IDF, International Diabetes Federation; IFN- γ , interferon gamma; IL, interleukin; LDL-C, low density of lipoprotein cholesterol; MDA, malondialdehyde; NCIMB, National Collections of Industrial, Marine and Food Bacteria; OGTT, oral glucose tolerance test; RCT, randomized clinical trial; SOD, superoxide dismutase; STZ, streptozotocin; T2DM, type 2 diabetes mellitus; TC, total cholesterol; TG, triglyceride; TGF- β , transforming growth factor beta; TNF- α , tumour necrosis factor alpha