PROSPECTS FOR THE USE OF NANOCRYSTALLINE CERIUM DIOXIDE AS A PREBIOTIC FOR MICROBIOME CORRECTION

Babenko L, Bubnov R, Tymoshok N, Lazarenko L, Spivak M.
D.K. Zabolotny Institute of Microbiology and Virology of the NAS of Ukraine,
Department of interferon and immunomodulator problems
e-mail: babenkolidiia@gmail.com

Microbiome modulation is a pillar intervention to treat metabolic syndrome and cascade of related pathologies such as atherosclerosis, among others. *Lactobacillus* and *Bifidobacterium* probiotic strains demonstrate efficacy to reduce obesity, dyslipidemia, and improve metabolic health. Novel prebiotic substances composed with known probiotics may strongly synergize health benefits to the host. The aim of this study was to evaluate beneficial effects of *Lactobacillus* and *Bifidobacterium* strains if composed with nanoceria (potential prebiotic) to reduce cholesterol levels and restore gut microbiota in obese mice.

Two lines of mice were used in the study: BALB/c mice (6 – 8 weeks, 18 – 24 g) and CBA mice (11 – 12 months, 20 – 26 g); experimental animals were fed by fat-enriched diet 3 weeks before the evaluation. Animals were divided into groups to test probiotic strains and nanoceria. All groups received probiotic strains orally and cerium dioxide orally or intravenously in various composition. A group of untreated animals was used as a control. Cholesterol level and gut microbiota of mice were studied.

Cerium dioxide nanoparticles, probiotic strain *L. casei* IMV B-7280, and composition *B. animalis* VKB/*B. animalis* VKL applied separately and in different combinations all reduced at different levels free and bound cholesterol in blood serum of mice fed by fat-enriched diet. The combination of 0.01 M nanoceria and probiotic strain *L. casei* IMV B-7280 resulted in the fastest cholesterol level decrease in both young and mature animals. Oral administration of CeO_2 applied alone reduced the number of microscopic fungi in the gut of mice and Gram-positive cocci (staphylococci and/or streptococci). Application of *L. casei* IMV B-7280 as a probiotic strain increased most significantly the number of lactobacilli and bifidobacteria in the gut of mice. The most significant normalization of gut microbiota was observed after oral administration of alternatively either *L. casei* IMV B-7280 + 0.1 M CeO_2 or *L. casei* IMV B-7280 + 0.01 M CeO_2.

The presented results provide novel insights into mechanisms behind nutritional supplements and open new perspectives for application of probiotics combined with substances demonstrating prebiotic qualities benefiting, therefore, the host health. If validated in a large-scale clinical study, this approach might be instrumental for primary and secondary prevention in obese individual and patients diagnosed with diabetes. To this end, individualized prediction and treatments tailored to the person are strongly recommended to benefit the health condition of affected individuals.