



## Bioperspectives in the treatment and prevention of enterobacteriosis of bees in organic production of beekeeping products

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The animal kingdom has almost 45,000 species of vertebrates and up to 8 million species of invertebrates, among which the main pollinators of ecosystems are bees. The basis of organic beekeeping — obtaining environmentally friendly products. The problem of finding effective organic remedies for the treatment of intestinal infections of bees, which are widespread in apiaries around the world, remains relevant.

The purpose of the work is to search for biomedicines, to develop a scheme for the treatment and prevention of bee enterobacteriosis.

After conducting comprehensive clinical and laboratory studies of unfavorable apiaries of the North-Western region of Ukraine at the Department of Veterinary Medicine of Polissya University and at the State Institution “Zhytomyr Regional Laboratory Center of the Ministry of Health of Ukraine” were isolated enterobacteria of the genus *Klebsiella*.

Wellness measures were based on the use of organic drugs — “Enteronormin with Jodis+Se” (LLC “SGP” MBS), “EM<sup>®</sup> probiotic for bees” (“EMRO Corporation”, Japan together with LLC “EM Ukraine”), which include useful microorganisms of different species, and disinfectant “Biocontact-plus” (“Kronos-Agro”). The effectiveness of the applied scheme was determined by statistical processing of the results of a random sample (*Microsoft Excel* and *LPG*) for 2019–2021 based on the data of beekeeping journals.

Bees were fed diluted with 50% sugar syrup for therapeutic purposes: 0.15% solution of “Biocontact-plus” (300–350 cm<sup>3</sup> of the preparation per 1 family) — 5 treatments every 3–4 days; followed by 2.5–5% solution of “EM<sup>®</sup> probiotic for bees” (300–400 cm<sup>3</sup> of the preparation per 1 family) — 3–4 treatments every 3–4 days. Thus, the disinfectant “Biocontact-plus” in the indicated concentration has weakly toxic effect, which leads to activation of immune defence of bee organism. Specific microorganisms for bees contained in the “EM<sup>®</sup> probiotic for bees” modulates the qualitative and quantitative composition of the intestines of the bee.

Prevention application of “Enteronormin with Jodis+Se” at a dose of 20 cm<sup>3</sup> diluted with 200 cm<sup>3</sup> of 50% sugar syrup 3–5 times with an interval of 5 days *per os*. The disinfectant effect of the 1% aqueous solution of “Biocontact-plus” is interpreted by the influence of formaldehyde glutaric, glyoxalenic aldehydes, which cause lysis of bacterial cells, by breaking chemical bonds between components of their cell walls.

During the last three years, the preparations “Enteronormin with Jodis+Se” and “Biocontact-plus” treated more than 70000 bee families. After successful overwintering no clinical signs of dysbiosis have been observed, which confirms the possibility and high efficiency of the use of alternative antibiotic organic means in the treatment of honeybee enterobacteriosis.

Health and preventive measures in organic beekeeping should be aimed at increasing the level of resistance of the bee organism, its rehabilitation, normalization of the qualitative and quantitative composition of the intestinal microflora of insects.

The combined use of drugs of different groups (probiotics and disinfectants) provides a comprehensive impact of their components on different systems of the bee, on mutual synergy, which increases the profitability of apiaries.

**Key words:** organic beekeeping, prevention, treatment, probiotic, disinfectant