# The influence of bee pollen on animals

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***European Journal of Medical Technologies***
*2019; 4(25): 33-37*

www. medical-technologies.eu
Published online 23.12.2019

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## Abstract

Bee pollen is a veritable cornucopia of organic and non-organic compounds, such as proteins, fats, amino acids, and provitamins. The percentage of specific compounds in pollen depends on its geographic origin as well as the species from which it is collected, and even on the season. Bee pollen is used as an additive in fodder for animals. Numerous laboratory tests were conducted in mice, rats, rabbits, and broilers, which showed various biological and biochemical features of bee pollen. The product affects biochemical blood parameters, an organism's detox functions, as well as histological and immunological changes in animal organisms. Research conducted into broilers showed bee pollen to decrease pH and protein content in fat. Adding bee pollen and propolis causes blood cholesterol to drop. Bee pollen-rich diet causes ASP (aspartate transaminase), ALT (alanine transaminase), and total bilirubin to drop in rats. Furthermore, bee pollen extract shows anti-inflammatory properties. Also, feeding bee pollen to dogs has been shown to improve the look of their coat. Lastly, pollen positively affects an organism in stressful situations, as well as during physical exertion, e.g. in race dogs.

## Key words:

bee pollen, feeding, rats, mice, broilers

## Significance of bee pollen for a bee family

A bee family needs a stochiometrically balanced diet, which requires a suitable proportion in nutrients. On the contrary, a monoculture-based diet might restrict bees' growth and development [1]. Using such a diversified conglomerate of compounds from bee pollen (Fig. 1) considerably affects the vitality of a bee family and guarantees appropriate development of throat glands in a honeybee [2]. Collecting bees mostly use the pollen from entomophilous plants and only occasionally the pollen from anemophilous plants. May and June may see daily yields of pollen up to 0.5 kg [3], whereas a bee family annually uses 30–40 kg of pollen [4]. Honeybee workers bring pollen loads which they then deposit into empty comb cells, position in layers, mix with honey and the discharge from their salivary glands [5]. Anaerobic conditions cause this mixture to ferment, which turns the substance into bee bread that provides protein food for the growing brood. Furthermore, it conditions the development of bees' fat bodies that increase insects' immunity to certain diseases. According to Wilde [6], a 10 000 of nurse bees may use as much as 56 g of bee bread per day. Bee bread has greater energy value than bee pollen because it includes animal-originating enzymes [7]. Therefore, chemical composition of bee bread differs from that of flower pollen. Proteins make up the greatest component (20.3-21.7%), whereas fats make up 0.67-1.58%, carbohydrates 24.4-34.8%, and lactic acid 3.06-3.20% [8].

## The influence of bee pollen on broilers

Ross 308 breed of broilers were fed pollen-including diet for 42 days. The amounts of pollen in respective groups was as follows: group 1–2500 mg/kg, group 2–3500 mg/kg, group 3–4500 mg/kg. In comparison to the control group, the meat from the investigated broilers had more water content and lower protein and fat content [9]. The research by Šulcerová et al. [10] showed Ross 308 breed broilers' meat to be brighter, furthermore a drop in its pH was observed. Follow-up studies consisted in chickens being fed pollen for 42 days in their fodder mixture in the following doses: 400 mg/kg and 800 mg/kg. Next, their blood was taken for further analysis. Significant differences were found the blood of broilers fed with pollen-including fodder in comparison to the control group with respect to the content of sodium, potassium, chlorides, and phosphorus [11]. Furthermore, adding bee pollen

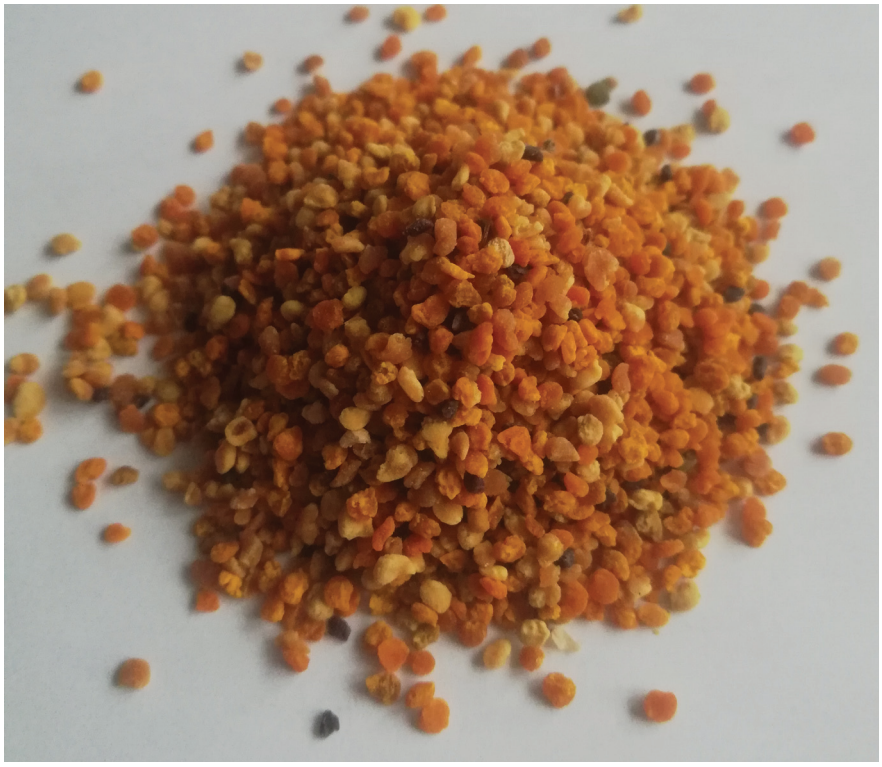

**Fig. 1.**
Bee pollen.

to broilers' diet caused the number Enterobacteriaceae family bacteria isolates to drop in the chickens' ilea [12]. Attia et al. [13] noted an influence of additives of pollen, bee bread, and their mixture on the alanine transaminase (ALT) content in animal blood. Adding bee pollen and bee bread in the proportions of 100 and 150 mg/kg to laying hens' fodder causes cholesterol to drop in their blood [14].

## The influence of bee pollen on rats

Research was conducted into rats whose livers had been damaged by means of tetrachloride or trichloroethylene. Next, a diet was used that included bee pollen additives from chestnut trees in the proportions of 200 mg/kg and 40 mg/kg. A decrease in indicators such as ASP, ALT, total biliburin and alkaline phosphatase was observed [15, 16]. According to Yıldız et al. [15] chestnut pollen protects hepatocytes against the oxidation stress and fosters liver regeneration. Kolesarova et al. [17] conducted research into the influence of bee pollen on rat ovary functions. Her team showed pollen to be a strong regulator for ovary functions in a bee. Experiments conducted on rats sowed bee pollen to cause total lipid and triglyceride content in the blood plasma to drop [18]. Kurek-Górecka [19] claims that incorporating bee pollen into rats' diets induces an increase in hemoglobin, red blood cells, and vitamin C in blood. Adding multiflorous pollen and bee bread to rats' standard diet affects metabolism in rats with ferropenia. Iron deficiency was observed to increase the number of platelets in blood, whereas adding pollen or bee bread causes them to drop [20]. Bee pollen extract has a strong anti-inflammatory effect. An edema of a rear paw was induced in rats, which was later eased by means of concentrated ethanol extract including bee pollen suspended in Vaseline [21]. Adding bee pollen to rats' diet affects their total body mass. Salles et al. [22] proved supplementation with monoflorous bee pollen in old malnourished rats causes their muscle mass to increase.

## The influence of bee pollen on other animals

Bee pollen was found to decrease total lipid and triglyceride content in blood serum of rabbits, similarly to the decreases observed in rats [23]. Bee pollen extract in the form of the Cernitin T60 preparation was observed to have cytotoxic effects. Mice that had been transplanted mouse Lewis lung cancer and were subsequently fed with water extract of flower pollen and were observed to have their lives extended by 20.8 to 32.9 days. Synergy effects of this extract were noted with respect to methotrexate [24]. The research conducted by Kuczyńska et al. [25] showed a positive decrease in LKS in milk below 400,000/cm$^3$ in result of adding 150 g/animal/day of bee pollen to the fodder of cattle in sub-clinical *mastitis*. An improvement was observed sooner in the group being fed bee pollen additives than in groups being fed other extracts, such as onion, garlic, and herbs [25]

It is advisable to use 5 g per 20 kg of body mass in race dogs, as this diet results in increased efficiency and stamina. Furthermore, adding bee pollen improves the look of the coat in show-participating dogs [26]. Trichanow et al. [27] advise using bee pollen additives to feed birds, reptiles, and amphibians. Bee pollen improves the coat of feathers in birds. Powdered bee pollen may be fed to reptiles in their food on a weekly basis. Ground bee pollen is used as fodder for crickets, cockroaches, and other animals, which provides them with suitable nutrients [26].

## Conclusion

Bee pollen affects processes at cellular, tissue, organ, and systemic levels. Adding bee pollen to fodder improves efficiency and stamina of an organism. Supplementation with bee pollen facilitates strengthening the effects of anti-cancer medication, e.g. in case of Lewis lung cancer. Bee pollen affects biochemical blood parameters in rats and broilers. Research into laboratory animals makes it possible to predict the influence of bee pollen on the human organism.

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