Beta-glucans enhance the protection of puppies

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First months of a puppy

The first months of life are critical for puppies, due to their fast body development and to the influence of their early experiences on their personality throughout their lives. Moreover, during this early age, puppies are more susceptible to infections that may cause severe disease if not immediately treated.

Some practices are essential to ensure the health status and the development of puppies, such as socialization with humans and other animals, proper nutrition to ensure the supply of their nutritional requirements, deworming to eliminate parasites, and vaccination to prevent the development of diseases.

The diseases that commonly affect puppies may have bacterial (such as leptospirosis) or viral (such as rabies, parvovirus and distemper) origin. These diseases may cause death or sequelae, and therefore, intensive vaccination schemes are common practice to prevent these diseases.

Vaccination as a prophylactic measure

Vaccination is a strategy used to promote an immune response similar to that produced by a natural infection without causing disease or potential complications[1]. Furthermore, vaccines are capable of producing an immune memory that ensures protection against one or more diseases for a certain period of time.

There are essentially two types of vaccines. Live attenuated vaccines are typically used against viral diseases, and are produced by changing the pathogenic agent to prevent it from causing the disease, but still allowing it to replicate and to elicit an immune response. Killed or inactivated vaccines consist of virus or bacteria fragments, and their immunization principle is related with the proteins and polysaccharides with antigenic potential present in those pathogens.

After inoculation, the antigens present in the vaccine trigger a response that results in the production of antibodies and memory cells. These memory cells ensure long-term protection because, when in close contact with the pathogen (recognized by the body through the antigen), they promote faster antibody production, thereby preventing the development of the disease.

Despite being highly effective[2], vaccination efficacy may vary according to antigen and vaccine types, pathogen, as well as to vaccine manufacturer[3], resulting in variable responses and failing to ensure 100% protection of the animals.

Beta-glucans and immunity

Beta-glucans are carbohydrates extracted from the cell wall of the yeast *Saccharomyces cerevisiae*. These compounds are not broken down in the gastrointestinal tract of animals, and have the capacity to activate the immune cells present in the intestinal mucosa (e.g. macrophages and dendritic cells), increasing their phagocytic capacity. In addition, once activated, these cells are more efficient to signal the antigen to other cells of the immune system[4]. As a result, the response capacity of both the innate and the adaptive immune system is enhanced and better prepared to fight infections and to promote longer lasting protection through the production of antibodies and memory cells[5,6,7].

Study in dogs

A study[8] was conducted at the University of Louisville (USA) to evaluate the effect on beta-glucans on the innate and adaptive immunity of dogs. In total, 18 male and female dogs, considered healthy after clinical examination, were divided into 2 experimental groups: Control and Treatment. The Treatment dogs were fed a diet supplemented with 0.1% MacroGard® (purified beta-glucans, Biorigin, Brazil). The dogs were fed their respective diets for a period of 21 days. On days 0 and 14, the dogs were challenged with the antigen ovalbumin, which is capable of triggering immune response and antibody production. On days 16 and 21, blood samples were

Figure 1. Effect of beta-glucans on the phagocytic activity of leukocytes

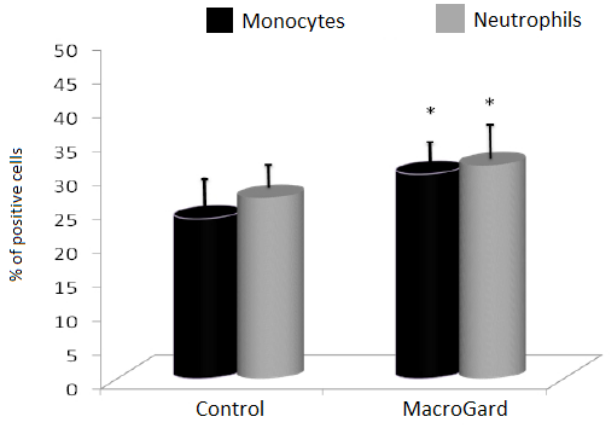
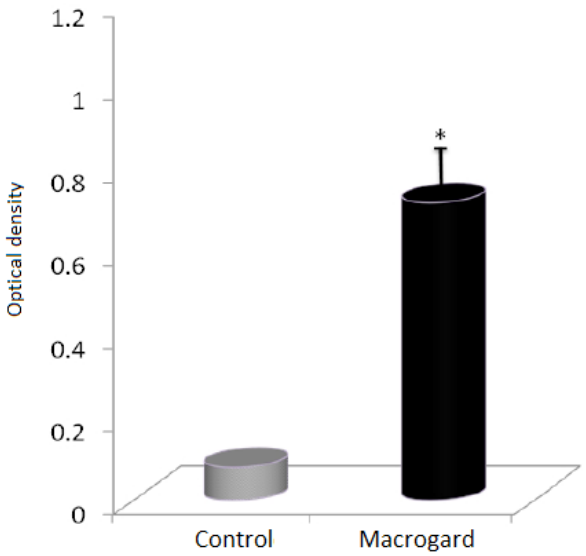


Figure 2. Effect of beta-glucans on the production of specific antibodies



collected to assess the phagocytic capacity and the production of specific antibodies, respectively.

The results showed that the beta-glucans were able to enhance both phagocytosis, as shown by the higher activity of monocytes and neutrophils in the supplemented group (Figure 1), and to increase the production of specific antibodies (Figure 2).

Together, these results demonstrate the capacity of beta-glucans to enhance the body's first line of defence, which includes innate immunity mechanisms, such as phagocytosis, and to support the maintenance of long-lasting protection. It should be emphasized that in order to be bioactive, beta-glucans should be obtained by a purification process to ensure their high concentration in the supplemented product (concentration ≥ 60%) and that the beta-1,3/1,6-glucan structure is not damaged in the purification process.

Conclusions

Considering that the immune system of puppies is still immature, the supply of beta-glucans to these animals to maximize their natural defences and the protection obtained is highly recommended.

Moreover, due to the action of beta-glucans on adaptive immunity mechanisms, these compounds may act in synergy with vaccines, potentiating their action.

Therefore, the continuous inclusion of beta-glucans in puppy diets during the first months of life and until vaccine protocols are completed is recommended.

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