

Nutrition and the Immune System: Advances, Implications, and a Case Study

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Dr. Ebenezer Satyaraj said a healthy immune system is central to overall health and longevity. He encouraged participants to view the immune system not simply in anatomical terms, but from a functional point of view. These cells, tissue, and organs function “as a single entity in cooperation with other systems of the body, with the primary role of protecting the individual from two kinds of threats—internal and external.”

The gut is the largest immune organ, housing 60–70% of all immune cells in the body. Nutritional immunologists have an opportunity to incorporate agents into the diet that can “talk to” the immune system and influence the immune response. “It’s an exciting field that is evolving every day,” Dr. Satyaraj said.

Immune response is regulated by three elements: genes, life stage, and lifestyle. A puppy’s immune system takes several weeks or months to mature, so for its first 8–12 weeks, a puppy is protected by immune antibodies transferred from its mother. Maternal antibodies may not always be sufficient, Dr. Satyaraj said. If a puppy is raised in one region and then moved to another, for example, its antibodies may not be as effective against a potentially different set of diseases.

A dog’s life stage can also affect its immune response. There are times in the life of a dog when its immune system is not working at an optimum level. Among other challenges, the dog may not be able to fight infection. Lifestyle factors influencing immune response include stress, diet, exercise, and veterinary care, among others. Dr. Satyaraj said dogs are stressed when they are left alone, travel to a show, or move to a new home. Working dogs can be subject to fatigue because of their routine; fatigue has been shown to significantly lower the immune response in human athletes.

Unlike humans, pets must eat what their owners put in front of them. This presents a good opportunity to mediate the dog’s immune system by feeding a nutritious diet.

There are potentially four stages at which humans can interact with their pets’ immune system, Dr. Satyaraj said:

- The first stage is the basic feeding of a complete, balanced diet.
- In the second stage, nutrients such as vitamin D, copper, and selenium—all shown to nurture a healthy immune system—can be added.
- The third stage requires the owner or breeder to actively select completely natural ingredients, such as probiotics and whey proteins, to strengthen and train the dog’s

immune system.

- In the final stage, the diet is tailored to the individual needs of the animal.

Dr. Satyaraj described how he evaluated, tested, and formulated a diet using whey protein, an immune-enhancing ingredient. First, he said, he conducted research and evaluated data from other studies, including safety implications. Whey protein is an excellent source of glutamine, the preferred fuel for both immune and muscle cells. Following a bout of strenuous exercise, glutamine levels drop. If the immune system faces an infection while glutamine levels are low, it may not be able to mount an effective response. Whey protein also is a source of glutathione, which helps build the body's defense against free radicals.

Next, Dr. Satyaraj said, he conducted nutritional trials, selected subjects, and developed the diet. The final step was to develop the product, including packaging and communications.

As part of the discovery phase, he said he conducted a pretrial test in which 48 Alaskan sled dogs, between two and six years of age, were fed one of four diets—one control and three test diets, named WPC-1, 2, and 3. The trial lasted 40 weeks. During a four-week pretest period, all four groups were given the same control diet. At the end of the pretest period, the test dogs were shifted to one of the three whey protein-enhanced diets. All subjects were given a canine distemper virus vaccine, Dr. Satyaraj said, and immune measurements were taken several times throughout the trial.

Systemic immune response was tested as a response to the vaccine. The immune response in all groups was boosted immediately following the vaccination, but it did not last long. The control group response dropped to its starting level. One test group showed a similar profile to the control group, but the other two test groups, WPC-1 and WPC-3, showed enhanced antibody levels that remained elevated throughout the trial. These animals were able to respond better and more strongly to the vaccine, Dr. Satyaraj said.

Local immune response was evaluated by measuring fecal IgA, an indirect measure of the activity level of gut-associated lymphoid tissue. By the end of the trial, the WPC-1 and WPC-3 groups showed higher levels of fecal IgA—and enhanced local immune status—than the other two groups.

The third test was designed to confirm whether the immune systems of these animals, having shown an enhanced response, were being over-stimulated. Levels of canine c-reactive, an acute phase protein produced by the liver in response to injury, infection, or inflammation, were measured. All groups had very similar readings, and all were within the normal range. The test showed the immune system in these animals was not hyperactive, Dr. Satyaraj said, but only responded when challenged. This is usually the hallmark of a healthy immune response.

The study also looked at fecal scores as a measure of balanced microflora. The animals were stressed by breaking their exercise routine. After two days of rest, the normal exercise schedule was resumed. Fecal samples were taken before and after exercise, and tested for stress-related shifts in gut microflora. The WPC-1 and WPC-3 groups showed nearly 80% similarity in their before- and after-stress patterns. Dr. Satyaraj said this result suggested the dogs had enhanced immune responses and were able to resist stress-related changes in the gut, a clear sign of a healthy dog.

Other biological measures, including body weight and blood profiles, were also tested. There were no significant differences among the groups.

Results of the study indicated that WPC-1 and WPC-3 provided enhanced systemic immune responses, enhanced local immune responses, no hyperactivation, increased gut microflora diversity, and greater stability of that microflora before and after the test.

These tests were used to launch a Nestlé Purina product called OptiStart Plus, currently on the market in Europe and South America. Dr. Satyaraj said he hoped it would be available to US consumers soon.

Discussion

Responding to a participant's question, Dr. Satyaraj said WPC-1 and WPC-3 are not commercially available, and are processed using a technology that even Nestlé Purina does not know. The participant also asked about the similarity of the dogs used in this trial. Dr. Satyaraj said he did not have this information, but that he would find out.

Another participant asked whether, if she wanted to feed an immune support enhancement diet and joint mobility diet simultaneously, she should buy two separate foods and mix them, or whether a multiple formula would be available. Dr. Satyaraj said he would take her suggestion back to the nutritionists who design these diets.