Avian immune system
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The avian immune system operates on the same general principles as the mammalian immune system. Both are divided into two mechanisms – non-specific and specific.

**Non-specific immune mechanisms** include the inherent ways in which the chicken resists disease. This protective system is often not considered when designing a poultry health program. The non-specific mechanisms include:

- **Genetic factors** – Through generations of selection chicken strains have been developed which do not have the required receptors needed before a specific disease organism can infect them. For example, some strains of chickens are genetically resistant to the lymphoid leukemia virus.

- **Body temperature** – The high body temperature of the chicken prevents a number of common mammalian diseases from affecting them. For example, blackleg disease and anthrax of cattle are not problems in poultry. If the body temperature of the chicken is lowered, however, the disease may occur.

- **Anatomic features** – Many disease organisms cannot penetrate intact body coverings (skin and mucous membranes) or are trapped in the mucus secretions. Some nutritional deficiencies (biotin deficiency) or infectious diseases compromise the integrity of the body coverings, allowing penetration of disease organisms.

- **Normal microflora** – The skin and gut normally maintain a dense stable microbial population. This stable microflora prevents invading disease organisms from gaining a foothold. Improper use of antibiotics or poor sanitation can disrupt the balance of the microflora removing this barrier.

- **Respiratory tract cilia** – Parts of the respiratory system are lined with cilia which remove disease organisms and debris. High levels of dust or ammonia in a poultry house can cause the ciliary system to become overwhelmed and become ineffective.

The reason that good management practices are important in maintaining poultry health is better understood when the non-specific immune mechanisms are taken into consideration. For example: the overuse of antibiotics or poor sanitation may lead to a disruption of the normal microflora; poor nutrition may lead to deficiencies which allow disease organisms to penetrate the protective body coverings; and selection of disease resistant strains of chickens may prevent or lessen the effects of certain diseases.

**Specific immune mechanisms** (acquired system) is divided into cellular and non-cellular (humoral) components. The **non-cellular component** includes immunoglobulins (antibodies) and the cells which produce them. Antibodies are specific for the foreign material (antigen) to which they attach. For example, the antibody against Newcastle disease virus will attach only to the Newcastle virus, not to the infectious bronchitis virus. The **cellular component** of the specific immune mechanisms includes all the cells that react with specificity to antigens, except those associated with antibody production. The cells associated with this system, the T-lymphocytes, begin as the same stem cells as the B-cells. However, the T-lymphocytes are programmed in the **thymus** rather while B-cells mature in
A chicken may become immune to a disease organism by producing antibodies itself or by obtaining antibodies from another animal. When the chicken produces its own antibodies following exposure to a foreign material, the process is called **active immunity**. This occurs after the bird is exposed to a vaccine or a field disease challenge. Active immunity is adversely affected by anything which damages the cellular or humoral immune systems.

When the chick receives pre-made antibodies from the hen through the egg, this is termed **passive immunity**. These antibodies are not produced by the chick. Maternal antibodies are present in the yolk, albumen, and fluids of the egg. If the hen has a high antibody titer level to a disease, the chick should also be immune for several weeks. However, since the immune system of the chick is not stimulated, there will be no antibodies produced by the chick and no memory cells to produce more antibodies. The flock manager must be aware of the maternal antibody levels in the chicks to schedule vaccinations. If chickens are vaccinated when maternal antibody titer levels are elevated, the vaccine may be buffered excessively resulting in a reduced response. Conversely, if vaccinations are delayed and maternal titer levels are low, a severe vaccine reaction may result.

The lymphoid organs play a major role in avian immunity. As previously indicated the bursa of Fabricius (site of B-lymphocytes or B-cells) and the thymus (T-lymphocytes or T-cells) are considered primary lymphoid organs. Functional immune cells (the T– and B– cells) leave these organs and accumulate in the secondary lymphoid organs. These include the spleen, bone marrow and gland of Harder.

The lungs have a collection of lymphoid tissues that help to protect against inhaled disease organisms. This is referred to as the Bronchial-associated lymphoid tissue, or BALT. Similarly, there is a series of lymphoid tissues in the digestive tract which make up the Gut-associated lymphoid tissue (GALT). The GALT include the cecal tonsils and the Peyer’s patches of the intestines.

**SUMMARY**

The avian immune system is complex and composed of several parts that must work together to effectively protect a flock from disease.