

## Vaccine 101

A quick way to start a debate amongst dog folk is to discuss vaccines. As in everything in medical technology and data has changed our views and protocols. The goal is to protect our dogs from disease while limiting risks. It is important to have an understanding of immunology and vaccines to make an informed decision for your 4 legged family member.

Vaccines work by priming the immune system to be able to respond to infection. The body has 2 mechanisms for eliminating infectious/foreign agents: humoral and cellular immunity. Humoral immunity involves antibodies in the blood. A specific white blood cell (B lymphocyte) has the job of producing antibodies. When exposed the cells recognize the intruder by characteristics on the cell surface and makes antibodies to destroy it. The cells can rapidly produce antibody when exposed to the foreign agent. These antibodies are what are measured when vaccine titers are performed. Ideally, we should vaccinate our dog then look at antibody titers approximately 3 weeks later to see how well the B lymphocytes respond.

Many people do vaccine titers to determine if their dog should get vaccinated. This can lead to some confusion. The antibodies produced by the B lymphocytes are proteins that break down over time. In a patient that has not been vaccinated for years may have a low titer but that does not mean the patient is not protected. It could be the proteins have broken down and the lymphocytes have not been tasked to make more. There is a very real chance that when challenged the lymphocytes would mount a health response to foreign agents.

The other side of the immune system is cellular immunity. These are specific white blood cells that are in tissue that have the role of destroying foreign agents. The cells include macrophages, that basically consume the invaders, and T cells that destroy them. This branch of the immune system is not tested with vaccine titers. So again, a pet with low titers may be susceptible or may be able to mount a response to prevent an infection.

With the development of 3-year vaccinations, many are moving to longer acting vaccines rather than vaccine titers. The technology of vaccines has changed over the years. In the author's experience, this has decreased side effects and immune disease noted in patients. There are 3 major classes of vaccines: modified live, killed, and recombinant.

Modified live vaccines contain a weakened version of the entire pathogen. These vaccines introduce multiple surface antigens for the immune system to recognize. They typically generate a large immune response, provide a long duration of immunity, and have low revaccination rates. Killed vaccines again use the entire organisms

but it is no longer alive. Killed vaccines need an adjuvant to stimulate an immune response. Adjuvants can cause local reactions and have a shorter duration of action compared to modified live vaccines. Recombinant vaccines use technology to introduce only a portion protein that is produced by the pathogen. This is a very targeted approach and as a result, do not produce high levels of antibodies. Recombinant vaccines may need to administer more often but they also offer a lower level of overall immunostimulation compared to modified life and killed vaccines.

It is important to do a lifestyle assessment yearly to determine what, if any, vaccines are required. As dog's age and we move risk factors change with time. It is not uncommon to have dogs in the same household be vaccinated differently based on the risk assessment.

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