Enhancing immunity in poultry

**Vaccines and immune strategies to help control viral diseases**

More people are eating chicken—in fact, there has been a steady increase in consumption from a little more than 22 kg/person in 1992 to more than 30 kg/person in 2014. That increasing market demand is driving new poultry research efforts in many fields, including infectious disease control.

Pathobiology professors Shayan Sharif and Éva Nagy are studying chickens’ immune response to viral infections to develop more effective vaccines and disease control strategies.

“Our goal is to reduce clinical disease and virus shedding from vaccinated and infected birds,” says Sharif. “By researching chicken immune systems, we can work towards improved disease resistance in poultry flocks.”

Specifically, Sharif and Nagy are looking at avian influenza virus, Marek’s disease and fowl adenovirus. Avian influenza, commonly known as bird flu, has only a few vaccines available for particular strains of the virus. So Sharif and Nagy are developing new killed or inactivated vaccines to provide a more comprehensive arsenal against the disease.

Marek’s disease virus is another pathogen on their hit list. The existing vaccine doesn’t prevent this highly contagious virus from being shed to the environment or transmitted to other chickens, so those are priorities for Sharif’s vaccine work.

For her part, Nagy is looking at ways of using fowl adenovirus as a vaccine vector. The adenovirus is harmless and, when used as a vector, can transport and express genetic codes of other viruses. Once in the vaccinated bird, it stimulates an immune response against those viruses.

Nagy has worked with fowl adenovirus FAdV-9, a strain that does not cause disease in poultry. She hopes to use this virus as a vector to enhance immunity against diseases such as avian influenza and infectious bronchitis virus.

The researchers are also screening adjuvants, substances that help a vaccine to stimulate a stronger and long-term immune response. Sharif and Nagy have investigated an adjuvant called CpG-ODN, a synthetic DNA molecule that showed significant effectiveness in stimulating chickens’ immune systems.

The researchers are incorporating adjuvants into vaccines to be delivered to chickens’ mucosal tissues, such as the respiratory system, and oral and nasal cavities. These tissues are exposed to the environment, and many of the microbes that cause disease in chickens or humans are acquired through this route. Sharif and Nagy say this underscores the importance of developing a strong line of defence in these tissues to protect animals against disease-causing microbes.

— Mallory Kohn

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