FOOD SAFETY RESEARCH: A FOCUS ON
Salmonella Vaccine

Reducing the prevalence of Salmonella enteritidis infection among flocks through the use of poultry vaccinations is a significant way to control egg-borne human salmonellosis. Scientists at the USDA Agricultural Research Service have developed a poultry vaccine to decrease S. enteritidis infection among flocks. The vaccine reduces shedding 10 to 40 percent more effectively than the three commercial vaccines used by the U.S. poultry industry today.

Shedding of Salmonella in the feces is the primary method by which S. enteritidis infection spreads through a flock. A vaccine that effectively reduces the amount of S. enteritidis present in the bird’s digestive tract helps eliminate pathogen shedding in the bird’s feces. It also assists with eliminating pathogen invasion of the bird’s internal organs such as the ovaries where eggs are infected internally.

The vaccine developed by the USDA is an experimental oil emulsion vaccine that differs from commercial preparations because it increases specific levels of antibodies in the digestive tract thereby reducing Salmonella in the hen’s intestinal tract and preventing infection of eggs and disease transmission.

In the study, the vaccine was administered to the birds subcutaneously in two doses four to six weeks apart before exposing them to S. enteritidis. Strict measures were in place to ensure no other pathogens were present in the hens prior to and during the investigation. A patent for the vaccine has been filed (March 21, 2002, SN 10/101,943), and it is available for licensing.

In the 1970s stringent procedures for cleaning and inspecting eggs were implemented to reduce salmonellosis caused by external fecal contamination of egg shells.

S. enteritidis became a public health concern in the 1980s when it was understood that the pathogen systemically colonizes poultry often implicating the reproductive organs leading to the contamination of eggs.

In the 1990s scientists began developing poultry vaccines against S. enteritidis. Today 25 million doses of S. enteritidis vaccine are used annually by the industry.

Unlike egg-borne salmonellosis of the past, the current epidemic is due to intact and disinfected grade A eggs because S. enteritidis silently infects the ovaries of hens contaminating the eggs before the shells are formed.

The Salmonella family contains over 2,300 serotypes of bacteria.

RESEARCH AREAS

Understand the molecular ecology of Salmonella and develop effective intervention strategies to reduce their transmission in livestock.

Determine the effect of stress on the migration and numbers of Salmonella in swine.

Determine if S. enteritidis infections are exacerbated in commercial hens that are undergoing molt via feed withdrawal.

Develop a poultry vaccine against Salmonella enterica serovar Enteritidis.

Use a novel genetic system to identify Salmonella proteins that are essential for growth, virulence or antibiotic resistance.

Develop improved methods for detecting Salmonella enteritidis (SE) infections in laying flocks and SE contamination in eggs.

Understand antibiotic resistance and prevent its spread and acquisition by other bacteria and other hosts.

Monitor animal Salmonella isolates to determine frequency and trends of resistance determinants in bacterial population studies.

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