

Beating Salmonella

New vaccine opens door to treatment possibilities.

Story by

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If salmonella is an existing problem or concern in your operation, a new vaccine may be just what the doctor ordered. And, in the long run, the technology used to develop the new vaccine may address more than just salmonella issues for Angus producers.

The U.S. Department of Agriculture (USDA) late last year granted a conditional license for the Salmonella Newport Bacterial Extract vaccine — a license that is used to get “fast track” approval of key vaccines. (A conditional license was used to obtain approval of the West Nile vaccine, for example.)

New technology

The vaccine was developed through a new process, known as SRP® technology, created by microbiologists at EpiTopix LLC, Willmar, Minn., an affiliate of Willmar Poultry Co. Compared to

conventional whole-cell vaccines produced with core antigen technology, the new salmonella vaccines are produced with highly purified extracts of specialized bacterial proteins known as siderophore receptors and porins (SRPs).

“The SRP technology represents the first real advance in animal vaccines in more than 100 years,” says Steve Schram, president of Agri Laboratories Ltd., Saint Joseph, Mo. AgriLabs is marketing the vaccine to veterinarians and animal health suppliers. “The advantages over conventional vaccine production are significant,” he says.

SRP technology is considered revolutionary because of its unique bacteria destruction process. Salmonella bacteria use proteins to acquire iron from host animals and transport it into a salmonella cell (see Fig. 1). The salmonella cell must have iron for growth and reproduction. But when animals are immunized with an SRP vaccine, they develop antibodies to the proteins and block the transport of iron back into the salmonella cell (see Fig. 2), regardless of serotype or strain. The process starves the bacteria and kills the pathogen.

“One of the major benefits of SRP technology is that the bacterial SRP proteins are common to all strains of salmonella, so protection against multiple strains of bacteria is much broader. In the past, producers had to use a specific whole-bacteria vaccine to cover just one serotype or strain,” says Brett Terhaar, director of technical services for AgriLabs. “SRP technology offers cross-protective immunity against diseases caused by multiple salmonella serotypes. The siderophore receptors and porins are similar across different serotypes, so vaccines created with SRP technology provide the cross-protection, including all of the 18-20 common salmonella serotypes.”

In addition, Terhaar says the new vaccines contain very little endotoxin naturally found in whole-cell bacterins, so producers see a lower incidence of reactions with SRP technology. “This vaccine is what I call a ‘clean vaccine,’ because it is not made up of the whole bacteria,” he explains. “As a result, endotoxins are not found in the vaccine, so the post-vaccination sweat or rough look animals often have is eliminated.”

Industry applications

While most interest in the salmonella vaccine is expected from the dairy

Fig. 1: Siderophore receptors and porins help acquire and transport iron into the salmonella cell.

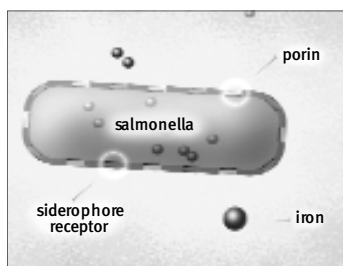
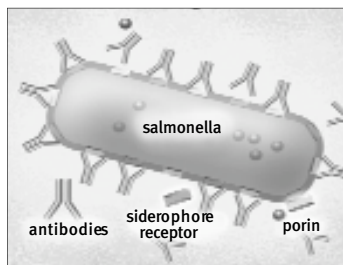


Fig. 2: Antibodies achieved through vaccination with SRP technology block iron's pathway into the salmonella cell, thereby starving and killing the pathogen.



industry. Terhaar anticipates applications in the beef industry. SRP bacterial vaccines have been used in the poultry industry since 1996, and EpiTox reports they have significantly reduced salmonella shedding prevalence among individual turkeys.

"Use will depend on the beef operation's management, but typical applications might include situations with stressed cattle, or highly managed operations with maternity pens or confined wet areas," Terhaar explains.

Salmonella issues can erupt in an operation where birds or animals bring the bacteria to the farm. Terhaar warns that newly purchased animals may be carriers. Such animals may maintain a disease reservoir in the herd and pass on salmonella through manure. Feedbunks and water tanks can be other salmonella sources.

Terhaar encourages producers to be proactive in determining whether or not the new vaccine is warranted. "You need to talk to your local practitioner, decide whether you need to use the vaccine and establish a good game plan. For producers who determine they need to

use the vaccine, the benefits will far outweigh the cost," he says.

Down the road, Terhaar says, Angus producers could see even greater benefits from SRP technology. "In the future, we will see this technology applied to other bacteria, including *E. coli*, pasteurella and other common respiratory and enteric ailments in cattle," he says. "SRP

technology will change the way we look at and use vaccines."

"We believe SRP technology could revolutionize the way bacterial vaccines are produced," adds Jim Sandstrom, EpiTox veterinarian and co-developer of the technology. EpiTox owns a family of patents relating to bacterial iron acquisition proteins for use as vaccine

antigens, and is focusing on developing more veterinary vaccines against bacterial diseases affecting both livestock health and human food safety.

More information about the new salmonella vaccine and SRP technology can be found at www.agrilabs.com and www.epitox.com.



Sidetracking salmonella

W. Dee Whittier, Extension cattle veterinarian, Virginia-Maryland College of Veterinary Medicine, noted in a May 2002 Extension livestock update that salmonella can be considered "almost a normal inhabitant of the cattle digestive tract."

Since cattlemen can do little about the strain of salmonella present on their farms, preventing losses is a function of two factors:

- **Decreasing exposure to salmonella.** Biosecurity measures that decrease exposure are the major approaches to prevention. These include preventing manure contamination of feed and water, being careful with new animal introductions, being sure feed sources are clean, and isolating cattle that have the disease.
- **Keeping cattle resistance high** to prevent losses from many common cattle diseases. Approaches include supplying adequate nutritional management, especially at stressful times (shipping, weaning, calving, etc.), providing plenty of colostrum to newborn calves and preventing diseases that can lower resistance.