



*Our strength is innovation. Our commitment is to improving the quality of life.
Notre force, c'est l'innovation. Notre engagement, c'est d'améliorer la qualité de la vie.*

Q&A re: Canadian Approval of *Econiche* October 30, 2008

Q: What does the recent CFIA news mean?

A: It means that Bioniche can sell its *E. coli* O157 vaccine - *Econiche* - without restriction.

Q: What is the selling price of *Econiche*?

A: \$3 per dose, including administration costs.

Q: Who pays for the vaccine?

A: Producers may pay for it themselves, or integrated businesses that market a specific brand of beef may purchase it for their members. Bioniche is also exploring other options to minimize the cost to producers.

Q: How many doses are given to each cow?

A: The vaccine label calls for a three-dose regimen.

Q: Will all cattle be required to be vaccinated?

A: The decision to vaccinate will be made by the individual cattle producer. It is expected that processors and retailers will also have an interest in adoption.

There are approximately 115 million cattle in North America, 25 million of which are conditioned on feedlots. Feedlot cattle producers are expected to be the primary adopters of vaccination, with other cattle segments, such as, the dairy industry and cow/calf operations to follow.

Q: How is *Econiche* manufactured, and where?

A: *Econiche* is manufactured in Belleville, Ontario - at a Bioniche-owned facility. We grow the bacteria, and extract certain key proteins. The proteins are necessary for the unique attachment mechanism employed by the bacterium, and the vaccinated cow's immune system will produce antibodies which interfere with the bacteria's attachment proteins. The bacteria are not able to attach and reproduce in a cow that is vaccinated.

Q: What makes the *E. coli* O157:H7 strain different from other *E. coli* bacteria?

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A: *Escherichia coli* (*E. coli*) bacteria are normal organisms found in the intestinal tract of all animals. There are hundreds of strains, most of which are non-pathogenic (disease causing) to their host; however, certain types cause digestive disturbances and, occasionally, other significant systemic disease.

The O157:H7 variant of *E. coli* is a mutant that has acquired an extremely potent toxin from another bacterium: *Shigella Dysenteriae*. There are a number of theories about how this bacterium mutated, but the exact cause is not known. *E. coli* O157:H7 has been found in the intestines of healthy cattle, deer, goats, and sheep.

The O157:H7 strain attaches differently than other *E. coli* strains. Rather than attaching to a pre-determined receptor site in the host's intestine, it creates its own attachment site - a pedestal - that is developed through an interchange of proteins. Bacteria colonize on the pedestal, and its toxin can be released directly into the bloodstream. This can result in significant damage to human organs, including the kidneys, pancreas and brain.

Econiche causes the development of antibodies in the cow, which prevent the attachment of *E. coli* O157. If the bacteria cannot attach, they do not have an opportunity to colonize the animal's intestine where they would replicate extensively. Instead they pass through the intestine, without establishing a base from which to multiply.

Q: How will this vaccine make a difference in preventing food contamination outbreaks (e.g., spinach and lettuce)?

A: This vaccine is intended for use in cattle, to reduce the shedding of *E. coli* O157:H7 by cattle. It is speculated that the reduction of shedding in cattle will have a positive effect on the level of environmental contamination and so reduce contamination of produce. Produce may become contaminated with *E. coli* O157:H7 through the use of contaminated water for either irrigation or washing of the produce.

The reservoir of contamination is primarily the cow, however, there is also evidence to suggest that wildlife (specifically, deer) are carrying O157:H7 and may be responsible for some of the contamination of the food chain, particularly contamination of apples, resulting in contamination of unpasteurized apple juice and cider.

Effective pathogen management consists of multiple interventions against a pathogen. The vaccine is part of a multiple hurdle approach, along with existing methods for the reduction of bacterial contaminants. These methods include hide washing, steam cabinets, etc. in the meat processing facility.

Q: Can the Bioniche vaccine be used in deer and other wildlife?

A: The Bioniche vaccine has not been tested in any other species beyond cattle. Vaccination programs against other diseases have proven to be of some benefit in wildlife populations in the past when used in conjunction with the vaccination of domestic animals (e.g., rabies). At this time, the Bioniche vaccine is only intended for use in cattle.

Q: How was this vaccine developed?

A: Dr. Brett Finlay at the University of British Columbia (UBC) made the original scientific discoveries that led to the development of the vaccine. He was doing basic research in the laboratory in 1995 when he made two fundamental discoveries: that the *E. coli* O157:H7 bacteria secrete proteins; and that, when injected directly into an intestinal cell wall, one of these proteins serves as a receptor, to which the bacteria adhere, allowing them to colonize the intestine.

Dr. Finlay realized that it might be possible to immunize against the attachment proteins of the bacteria. It initially occurred to him that this would be very useful in childhood vaccines. He subsequently determined that a cattle vaccine might be the better opportunity to pursue. He approached the Vaccine and Infectious Diseases Organization (VIDO) at the University of Saskatchewan to assist in making secreted proteins to immunize cows.

Bioniche Life Sciences, through the Canadian Bacterial Diseases Network (CBDN), became the commercial partner on the recommendation of Dr. Dragan Rogan, V-P of Animal Health research at Bioniche, who recognized the potential of the vaccine and the need for it. The partnership of UBC, VIDO, the Alberta Research Council and Bioniche, led by Dr. Rogan and his team, developed the vaccine.

In terms of financing, Bioniche Life Sciences was granted a contract (repayable loan) with Technology Partnerships Canada (TPC) in 2001, for the development of this vaccine. TPC agreed to contribute \$7.6 million Cdn. to this project.

Q: Are you looking to register the vaccine elsewhere in the world?

A: Yes we are. Earlier in 2008, we received notice from the United States Department of Agriculture (USDA) that once we complete a manufacturing step in the United States and provide a protocol to satisfy final efficacy requirements, we will receive a conditional license. The Company is addressing these requirements. There are longer term plans to apply for registrations in Europe and other countries with significant cattle populations.

Q: Will this vaccine be effective against other strains of *E. coli* besides O157:H7?

A: Providing the strain utilizes the same attachment mechanism as *E. coli* O157:H7, we expect that *Econiche* will be effective. Studies are ongoing to assess this.

Q: Does the vaccine have potential application in cattle beyond those harvested for meat?

A: Given that some of the outbreaks of foodborne illness in produce from this bacterium are being traced back to contamination from non-beef cattle operations, there is potential for this vaccine to be utilized in dairy and cow/calf settings for reduction of shedding of *E. coli* O157:H7. Additionally, some human illness has been traced to exposure at show barns and petting zoos, demonstrating another cattle population that should be vaccinated.

Q: Will this vaccine eradicate the pathogen?

A: No vaccine is 100% efficacious. *Econiche* will reduce the risk of Canadians becoming exposed to *E. coli* O157, a persistent public health issue, by reducing the amount entering the environment, food and water supplies.

Q: Are there people currently using this vaccine?

A: Yes. The first 2 market segments to adopt this innovation are show cattle and branded beef operations. An example of this is Top Meadow Farms Artisan beef. Top Meadow Farms are using this vaccine to add value for their customers.

Q: How much has been sold in terms of dollars?

A: Sales have been limited due to limited supply. Until we complete our manufacturing scale-up in Belleville (June, 2010), we are producing small quantities of vaccine in our product development laboratory.

Q: What is the impact of *E. coli* O157:H7 on Canada?

A: A 2007 study conducted by the George Morris Centre for Bioniche analyzed the costs and benefits of vaccinating the national cattle herd. The report estimated that costs associated with illness, death and a reduction in consumer demand related to *E. coli* O157:H7 amount to \$63M per year for the Canadian economy.

Q: Where can I get more information?

A: Bioniche has an informative website on *E. coli* O157:H7 located at www.fightecoli.com.