Foot and Mouth Disease and Vaccine Use

Foot-and-mouth disease (FMD) is a severe and highly contagious viral disease. The FMD virus affects cows, pigs, sheep, goats, deer, and other animals with divided, or split, hooves. Animals with FMD typically develop a fever and blisters on the tongue and lips, in and around the mouth, on the mammary glands, and around the hooves. Other signs of illness include depression, anorexia, excessive salivation, lameness, and reluctance to move or stand. Most affected adult animals will not die from FMD, but the disease leaves them weakened, resulting in reduced meat/milk production. Younger animals may not survive.

As part of its overall mission to protect American agriculture, the United States Department of Agriculture’s (USDA) Animal and Plant Health Inspection Service works to ensure the continued health of the nation’s livestock and poultry healthy. USDA works to keep foreign animal diseases out of the country and to deal with outbreaks of serious animal diseases. If a foreign animal disease like FMD occurs in the U.S., USDA would be the lead Federal agency responding to the outbreak, working closely with state animal health agencies and other agencies.

FMD is a worldwide concern as it can spread quickly and cause significant economic losses. A single detection of FMD could close international export markets for meat, dairy and other products, causing billions of dollars in lost trade for the United States. If FMD is found in the United States, USDA with its partners would need to act quickly to eradicate the disease and keep it from spreading throughout the country.

FMD Vaccination
One of the most powerful tools for combatting an FMD outbreak is vaccination. FMD vaccination is a safe and standard practice used in many parts of the world where the disease is commonly detected and controls the spread of infection by reducing the amount of virus being shed by animals and by controlling clinical signs of illness. Vaccinated animals may still become infected, but would not be able to spread the disease to other animals. Vaccinated animals will not develop signs of clinical disease and can move normally through production channels. It is safe to consume the meat and milk of FMD exposed or vaccinated animals.

In the event of an FMD outbreak, USDA would evaluate the size, scope and species involved, as well as the availability of the proper vaccine, before deciding if vaccination is appropriate. Vaccination could be used to help slow the spread of an FMD outbreak or to protect specific animals, depending on the situation.

If an outbreak takes place, USDA and State authorities will determine how and where FMD vaccine is to be deployed working under the joint incident command structure. USDA will control the vaccine supply. Animals will be vaccinated under the direction of
USDA accredited veterinarians, who will ensure that vaccinated animals are properly identified.

If we used vaccine to control an FMD outbreak, we would use high potency vaccines manufactured by USDA-approved companies. Vaccine is given to cattle, swine, sheep, and goats by intramuscular injection, typically in the neck area. However, USDA is assessing whether needle-free vaccine guns may be used, which would be faster, use less vaccine, and provide higher carcass quality.

In addition to vaccination, enhanced biosecurity and surveillance testing, strategic depopulation, movement controls and quarantines, and other virus-spread control methods can also help end outbreaks. USDA’s priority is to as quickly as possible eradicate the disease and restore the livestock industry to full production and exports.

**Limits of FMD Vaccination**

Vaccination is not a “magic bullet” practice that solves all FMD problems. While it is useful in certain circumstances, there are limits. There are seven known types and more than 60 subtypes of the FMD virus. Immunity to one type does not protect an animal against other types or subtypes. This means that to be effective, vaccines must be closely matched to the virus strain circulating in livestock. In assessing the potential effectiveness of vaccine, USDA would need to determine which strain of the virus is causing an outbreak before determining which vaccine would control it.

Time is also a concern. FMD vaccine provides immunity for up to six months. Cattle, sheep, and goats require a single vaccine dose for full immunity, while swine require two doses two weeks apart. Animals would need to be re-vaccinated every six months for as long as vaccination is being used as a control measure.

FMD vaccination could impact export markets as well. Many countries will not accept live animals or untreated products from a country or region where FMD is present. Vaccine use is often considered an indication that there is a risk of FMD in the livestock population, and therefore trade in various commodities may be limited when vaccine is used, or even when vaccinated animals remain present in a country or region.

USDA does not use vaccine proactively to prevent FMD. It is impossible to know which strain of the virus we might face, and extremely expensive to revaccinate the millions of cattle, pigs, sheep and goats throughout the country every six months. This could also severely limit our trade opportunities, which our producers depend upon for their livelihoods.

**Using FMD Vaccine**

The United States, Canada and Mexico established the North American Foot and Mouth Disease Vaccine Bank years ago so the countries would have a ready stock of FMD vaccine in case of an outbreak. The bank contains a variety of FMD vaccines concentrates, which can rapidly be processed into finished vaccine by manufacturers when the vaccine is needed. If one of the countries has an outbreak and needs to use FMD vaccine, the bank provides vaccine, assuming there is an appropriately matched
vaccine in the inventory. The vaccines in the bank are all high potency inactivated vaccines, which means they do not contain live virus and are shown to be effective in cattle, swine, sheep and goats.

However, the current quantities in the bank are only sufficient to address small outbreaks. If countries use all the doses from the bank, they would need to rely on vaccine manufacturers to provide a continuous supply to conduct a vaccination campaign. It takes at least 14 weeks for newly manufactured vaccine to be available.

If an appropriately matched vaccine is not available in the bank, it may take longer to have any vaccine available. An appropriate vaccine would need to be developed and tested before it could be manufactured and used. This could take many months.

The vaccines are all DIVA (differentiate infected from vaccinated animal) capable, meaning that certain testing can distinguish between naturally-infected and vaccinated animals. DIVA capability would allow us to move live animals and their products within the U.S. during an outbreak, and support recovery of trade after the outbreak has been contained.

It is possible that in a prolonged outbreak, retail sale of FMD vaccine would be mandated in affected areas to ensure containment of the disease. In this situation, the livestock producer would buy the vaccine from a federally accredited veterinarian rather than receiving it from USDA.

**FMD Vaccine and the Food Supply**
In countries where FMD is common, meat and animal commodities from vaccinated animals are consumed every day without public health concerns. During a widespread FMD outbreak where vaccination is used, animal and public health officials may determine that meat and milk from vaccinated and recovered animals can be sent into the food supply.

**Post-Vaccination**
Because countries may limit trade as long as FMD-vaccinated animals remain in the country, eventually the vaccinated animals may need to be removed from the national herd before trade can be fully restored. This may be done through normal attrition or through targeted depopulation, depending on the circumstances and how we used vaccination.

**For More Information**
To learn more about FMD and emergency response and find helpful resources on these topics, go to:

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