

# Scientists discover how foot-and-mouth disease virus begins infection in cattle

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U.S. Department of Agriculture (USDA) scientists have identified the primary site where the virus that causes foot-and-mouth disease (FMD) begins infection in cattle. This discovery could lead to development of new vaccines to control and potentially eradicate FMD, a highly contagious and sometimes fatal viral disease of cloven-hoofed animals that is considered the most economically devastating livestock disease in the world.

The discovery was made by scientists with the Agricultural Research Service (ARS) Foreign [Animal Disease](#) Research Unit at the Plum Island Animal Disease Center at Orient Point, N.Y. ARS is USDA's principal intramural scientific research agency, and this research supports the USDA priority of promoting international food security.

Veterinary medical officer Jonathan Arzt, research leader Luis Rodriguez and microbiologist Juan Pacheco found that after just six hours of exposure to the FMD virus through the cow's nasal passages, the virus selectively infects epithelial cells in the nasopharynx, a specific region of the back of the cow's throat.

"Because we have determined the actual route the FMD virus takes in infected cattle, we can now begin to target the virus-host interaction in an effort to develop better vaccines and biotherapeutic countermeasures against the disease," Arzt said.

Although the United States has not had an FMD outbreak since 1929,

the disease is still considered a serious threat. Epidemics in other countries have resulted in the slaughter of millions of infected and uninfected animals to prevent the virus from spreading. Outbreaks of this disease in previously FMD-free countries could cause billions of dollars in economic losses related to eradication efforts and trade bans.

Vaccines that offer temporary immunity for livestock have been developed, but there is no universal FMD vaccine against the disease. Because there are seven different types of FMD viruses and more than 60 subtypes, vaccines must be highly specific, matched to the type and subtype present in the area of an outbreak, to protect animals against developing clinical signs of disease. Blocking the initial site of infection may be the most effective way to achieve complete protection.

The research was published in the November issue of *Veterinary Pathology* and featured on the cover of that issue.

The findings have allowed Arzt and his colleagues to answer some basic, yet long-standing mysteries regarding how the FMD virus first invades and propagates in susceptible cattle. The scientists now are conducting further research to answer questions about why the particular epithelial cells are susceptible, and how the initial infection site can be blocked.

"The answers to these questions will result in a new era of FMD prevention in which highly effective vaccines will provide rapid and long-lasting immunity to even the most virulent strains of FMD [virus](#)," Arzt said.

Provided by United States Department of Agriculture

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