



## Researchers Close in on Vaccine For \$64 Million Swine Disease



Top of page: Pigs used for finding an antibody to swine dysentery bacteria were fitted with tubes for access to a segment of the digestive tract. (Photo by Glenn Songer.)  
Above: Dr. Lynn Joens. (Photo by George Kew.)

From the gut of pigs, University of Arizona researchers have isolated an antibody that can kill the bacterial cause of a costly worldwide disease of swine.

They expect the discovery to lead soon to a vaccine against the disease, swine dysentery. The methods for this project could also speed the development of vaccines against other digestive diseases of livestock or people, said the researchers.

In this country alone, swine dysentery costs pig producers about \$64 million per year, said Dr. Lynn A. Joens, immunologist for the University of Arizona Veterinary Science Department. By reducing pork production, the disease raises meat prices for consumers. It kills pigs in every nation where they are raised.

Antibodies are infection-fighting proteins produced in animals' bloodstream or digestive tract. Joens and Dr. Donald W. DeYoung, a veterinarian for the UA Health Sciences Center, have used innovative surgery to find an antibody that works specifically against the bacterium that causes swine dysentery.

They are using that antibody to identify potential vaccine material. They expect that, by artificially breaking up the dysentery-causing bacterium, they

will be able to find a fragment that reacts with the same antibody but does not cause the disease. Such a fragment, said Joens, "could probably be developed easily into a vaccine against the disease."

Vaccines work by mimicking disease-causing germs in order to trigger a body's immune system into producing antibodies against the real germs, he explained. Almost all existing vaccines work on diseases that produce an antibody reaction in the bloodstream. Antibodies that work inside the gut have been harder to identify.

He and DeYoung implanted plastic tubes in young pigs for outside access to a detached section of each pig's colon. (The colon is the lower portion of the gut.) The detached section, about 10 inches long, continued to secrete antibodies and to function in other ways, but was bypassed in the digestion of food. The researchers could take fluid samples easily from these colon sections.

Pigs that have survived a bout of swine dysentery have immunity to the disease. The researchers found that fluid from the colons of such pigs contains two types of antibodies absent from the colons of unexposed pigs. They determined that one of these antibody types can kill the disease-causing bacterium when a protein called complement is also present. The protein exists naturally in the bloodstream and is found in the gut of pigs with swine dysentery.

Similar techniques to those used for finding the dysentery antibodies in pigs' digestive tracts might lead to antibodies and vaccines against such human digestive diseases as colibacillosis of infants or shigellosis of adults, predicted Joens.

His research, though, has been directed specifically against swine dysentery for more than seven years. Part of his motivation comes from growing up on an Iowa farm where hogs were raised.

"There are some drugs that are now used against swine dysentery," he said, "but (biological) resistance to the drugs has been developing." The bacteria are becoming less susceptible to them.

The disease is marked by diarrhea and loss of appetite. It makes pigs gaunt, weak and dehydrated. More than half of the newly weaned pigs that catch the disease die from it, though older hogs stand good chances of surviving.

Swine dysentery does not affect humans, but rodents, birds, dogs and flies are potential carriers, said Joens. The disease agent, a spirochete-type bacterium, can survive for weeks in feces or mud.

The president of Arizona Pork Producers Association, Elvin Spitler of Mesa, said that swine dysentery is not as widespread in Arizona as it is in many other areas.

He said, "Geographically, we're pretty spread out in this state, so there's not much chance for it to spread from one farm to another." The hot, dry climate also helps limit the problem, he said. Both factors also help Arizona pork growers control other swine diseases.

However, some swine dysentery outbreaks do occur. In one episode on Spitler's farm several years ago, "I couldn't keep ahead of it," he recalled. "I ended up medicating every hog on the farm. The death loss wasn't so great, but the medicine got pretty costly."

Joens said, "Control of this disease with methods that are available now can be very difficult and expensive for pork producers, so a practical method of immunization would be extremely helpful."



Hank Willcox of the Arizona Health Sciences Center prepares for surgery on a pig. (Photo by Ted Bundy.)