

## Probiotics for Pigs: Less Manure, Better Health

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Pigs that consumed a fiber-rich diet and a bacterial probiotic supplement reduced their manure output by 20 percent, gained more weight, and had better blood cholesterol and glucose levels.  
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Pig producers would like to keep their costs down by supplementing livestock feed with dried distiller's grains with solubles (DDGS) and other agricultural coproducts generated from biofuel production. But adding hard-to-digest fiber to livestock diets also increases the production of manure—never a good thing, especially when it threatens to exceed on-farm storage capacities. So Agricultural Research Service microbiologist Cherie Ziemer and others conducted the first published investigation of using bacteria as a probiotic to increase fiber fermentation rates and reduce manure output in pigs consuming high-fiber diets.

A high-fiber diet can also serve as a source of energy if the fiber can be broken down during digestion. Other researchers have investigated using carbohydrase enzyme supplements to break down dietary fiber and release sugars that can then be absorbed in the small intestine. Bacterial fermentation of these same fibers, on the other hand, takes place in the large intestine and results in the production of small-chain fatty acids that pigs use to meet metabolic energy demands.

Ziemer and animal scientist Brian Kerr, who works with Ziemer in the ARS Agroecosystem Management Research Unit in Ames, Iowa, fed the pigs in their study either a typical diet or a high-fiber diet. The high-fiber diets contained 10 percent soybean hulls and 20 percent corn DDGS. The pigs were also given one of three bacterial supplements the scientists developed from different strains of *Bacteroides ovatus*, which had been obtained from human fecal samples and cultured in fiber-rich media. The three bacterial supplements were designated Bacterium B, C, and D.

The pigs that consumed the fiber-rich diets and the three different probiotics had strikingly different levels of manure production. The pigs given Bacterium D produced about the same amount of manure daily as the pigs that did not receive a probiotic. The

group given Bacterium C produced 4 percent *more* manure than the probiotic-free group.

But pigs that received the bacterial supplement designated as Bacterium B reduced their manure output by 20 percent. These pigs also gained more weight and had better blood cholesterol and glucose levels—both indications of an improved energy status—than pigs not given probiotics.

Ziemer believes the probiotic could improve pig performance and reduce manure volumes, which in turn would increase producer profits and reduce the environmental footprint of pork production. She thinks the bacterium could be fed in a liquid supplement or possibly freeze-dried and mixed with feed.

This work was supported by a grant from the Defense Advanced Research Projects Agency as part of the Intestinal Fortitude Program, which investigates how to help people obtain more energy from fiber. Results were published in the *Journal of Animal Science* in 2012, and ARS has submitted a patent application for Bacterium B.

*This research is part of Agricultural and Industrial Byproducts, an ARS national program (#214) described at [www.nps.ars.usda.gov](http://www.nps.ars.usda.gov).*

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