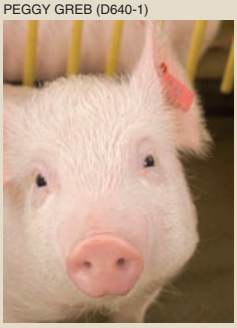
Boosting Immunity Using Beneficial Bacteria

PEGGY GREB (D640-1)



2-month old pig.

Contrary to popular belief, not all bacterial "bugs" are bad. Healthy people normally have trillions of friendly bacteria living within their intestinal tracts. These beneficial bacteria are busy changing the intestinal environment and keeping bad bacteria from gaining a foothold that could lead to disease. Maintaining a healthy balance between helpful and harmful bacteria is important and can be influenced by diet.

ARS scientists are now using the pig as an experimental model to study potential beneficial effects when helpful bacteria are added to the diet. Called "probiotics," these living microorganisms, when added to foods in sufficient numbers, can benefit the consumer in one or more ways.

Microbiologist Gloria Solano-Aguilar, with the ARS Nutrient Requirements and Functions Laboratory in Beltsville, Maryland, has been leading the effort to study the effects of dietary probiotics on the immune system and gastrointestinal function, with funding from Nestlé Nutrition, Glendale, California. The laboratory is part of the Beltsville Human Nutrition Research Center. She presented some of her findings during a session on allergy, rheumatology, and immunology at the Pediatrics Academy Societies' 2006 annual conference.

Solano-Aguilar tested the effect of the probiotic strain *Bifidobacterium lactis* (Bb 12; from Chr. Hansen, Denmark) on maturation and stimulation of the immune systems of piglets. Bb 12 is a beneficial bacterial strain commonly used in probiotic products available to U.S. consumers and in baby products overseas.

A treatment containing probiotic Bb 12 was first fed to three pregnant sows, and a placebo was fed to three control sows. The scientists then fed the same treatment to half of each sow's litters, resulting in four experimental groups.

Solano-Aguilar studied tissue taken from each animal's lymph nodes, liver, spleen, and intestine. She also studied the animals' intestinal contents.

"We analyzed tissue samples from treated and nontreated pigs to determine the level of gene expression in those tissues and the amount of related Bb 12 present in the intestine," says Solano-Aguilar.

The scientists then used a molecular technique to analyze 46 biomarkers to document the activity of immune- and nutrition-related genes. The biomarkers were selected from the ARS-developed Porcine Immunology and Nutrition database of annotated swine genes related to immunity (www.ars.usda.gov/services/docs.htm?docid=6065). They compared gene-expression patterns in the treated pigs with those of the control pigs.

The probiotic was found to induce innate immune activity in the colon, where it was most concentrated.

"The animals that were both treated through their mother and treated themselves had the best immune response," says Solano-Aguilar.

In a separate study, she administered the Bb 12 strain of probiotic to pigs, initiated a worm-induced infection, and assessed the pigs' response to the infection. Preliminary results show a better response to the worm infection because of improved nutrient absorption in the piglets that were fed the probiotic bacteria.—By **Rosalie Marion Bliss,** ARS.

This research is part of Human Nutrition, an ARS National Program (#107) described on the World Wide Web at www.nps.ars.usda.gov.

Gloria Solano-Aguilar is with the USDA-ARS Nutrient Requirements and Functions Laboratory, 10300 Baltimore Ave., Bldg. 307-C, Room 225, Beltsville, MD 20705-2350; phone (301) 504-8068, fax (301) 504-9062, e-mail gloria.solano-aguilar@usda.gov. ✷

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In tests to evaluate the effect of beneficial bacteria on the immune system, microbiologist Gloria Solano-Aguilar administers a probiotic treatment to a young pig.