

Pork from Swine Fed Biotech Feeds – Is it Safe?

by: Gary L. Cromwell
Professor, Swine Nutrition

One of the most controversial issues facing animal agriculture today is the topic of biotechnology. Much of the controversy is fueled by activist groups who seem to believe, and want others to believe, that anything that has been modified by biotechnology is “unnatural” and that it will introduce undesirable genes that adversely affect human health or the environment. From a scientific perspective, nothing could be further from the truth.

Agricultural biotechnology is simply a more precise means of doing what has been done for centuries with conventional breeding techniques. The improvements in yields of hybrid corn, wheat, soybeans, and other crops over the past 50 to 100 years are examples. Today, with modern biotechnology tools, desirable traits can be selected and more quickly incorporated into these and other crops rather than waiting decades for positive results.

The first biotech plant, a tomato with superior ripening characteristics, was introduced into agriculture in the early 1990s. Biotech crops that are now fed to livestock were first commercialized in the mid-1990s. One of the first crops made available to farmers was insect-protected (*Bt*) corn. This corn has been genetically enhanced to protect it from the European corn borer. Soybeans that were tolerant to the herbicide, Roundup®, were commercialized a few years later. Today, more than one-half of the soybeans and over one-third of the corn raised in the United States are insect-protected and/or herbicide-tolerant, and a large proportion of these crops are fed to swine and other livestock.

These new biotech crops obviously benefit corn and soybean farmers because they can produce good quality crops with less herbicides and pesticides. Also, because *Bt* corn is resistant to insect damage, the grain is less susceptible to molds that produce mycotoxins such as aflatoxin and fumonisin, which are potent carcinogens. New crops such as low-phytate corn and soybeans, and crops with improved amino acid profiles also mean that less nitrogen and phosphorus are excreted into the environment.

Biotechnology benefits humans as well as animals. Risk of human exposure to fumonisin from corn-based products is reduced, thanks to biotechnology. In addition, nutritional quality is being improved. New crops such as “Golden Rice” are being developed with increased levels of vitamin A and iron, as well as oilseeds with more healthful fatty acid profiles.

Several very important questions have been asked about biotech crops. For example: **Is the composition of biotech crops different from conventional crops?** The answer is **no**. Insect-protected corn and herbicide-tolerant soybeans have essentially the same composition as conventional corn and soybeans. The minute amount of introduced DNA and specific protein that provided plants with insect protection and herbicide tolerance have no effect on the overall composition. Many research studies in the past five to six years have confirmed this.

Another question: **Are biotech crops safe for animals that consume them?** The answer is **yes**. Numerous studies conducted in the past several years show that production traits (growth rate, feed efficiency, milk and egg production, etc.) are the same for animals fed conventional or

biotech crops.

Interestingly, this was demonstrated in an experiment conducted this past year at the University of Kentucky where we compared dehulled soybean meal prepared from conventional and herbicide-tolerant, Roundup Ready® soybeans. Table 1 shows that the composition of the two soybean meals was essentially the same. Table 2 shows that performance of the animals, carcass traits, tissue composition, and eating quality of the pork was essentially the same for pigs fed the two types of soybean meal. This was the first experiment ever conducted with pigs that compared these two types of soybean meal. Previously, studies had been conducted with dairy cattle, chickens, catfish, and rats, but not swine. Studies have also been reported this past year with swine showing these same kinds of results with *Bt* and conventional corn.

Another important question: **Are the nutrients in meat, milk, and eggs different?** The answer is **no**. Nutrients in pork from pigs fed biotech crops are not different from those of pigs fed conventional crops. The same holds for other animal products – milk, eggs, and other meat. Animals digest plant proteins in their digestive tract, and these proteins are not found in animal products.

The final and most important question: **Are meat, milk, and eggs from animals fed biotech crops safe to eat?** The answer is absolutely **yes**. The safety of foods derived from animals is assured by science-based risk assessment procedures used by government agencies and product developers. The Food and Drug Administration ensures that food derived from biotech plants is safe, and the U. S. Department of Agriculture and the Environmental Protection Agency ensure that biotech plants do not endanger the environment, wildlife, and “non-target” species. The introduced DNA in biotech crops and the specific proteins produced by the crops have never been detected in the meat, milk or eggs from animals fed biotech crops. In our study, the specific protein that makes Roundup Ready soybeans herbicide tolerant was not detectable in the tissues of pigs fed the biotech soybean meal (Table 2).

Over 40 biotech crops have now been developed for animal feeds and human foods, and others are on the horizon. The use of agricultural biotechnology as a tool to enhance the production and quality of food will continue to be an exciting area of research and technology in future years.

Table 1. Composition of dehulled soybean meal from conventional and Roundup Ready® soybeans

Item	Conventional %	Roundup Ready %
Dry matter	90.3	91.0
Crude protein	51.5	51.2
Crude fiber	3.41	3.12
Calcium	0.24	0.20
Phosphorus	0.73	0.83
Amino acids		
Lysine	3.16	3.09
Methionine + cystine	1.46	1.51
Threonine	1.95	1.94
Tryptophan	0.77	0.75
Isoleucine	2.32	2.27
Valine	2.44	2.43

University of Kentucky (2000)

Table 2. Performance, carcass and tissue composition, and eating quality of pork from pigs fed corn-soybean meal diets containing conventional or Roundup Ready® soybean meal^{a,b}

Item	Conventional	Roundup Ready
Performance data		
Daily gain, lb	1.84	1.88
Feed/gain	3.04	3.09
Carcass data (scanned)		
Backfat, 10 th rib, in.	0.74	0.75
Loin eye area, sq. in.	5.41	5.24
Estimated carcass lean, %	52.9	52.5
Lean gain, lb/day	0.75	0.74
Loin tissue		
Water, %	72.8	72.5
Protein, %	23.4	23.3
Fat, %	3.0	3.4
Ash, %	1.1	1.1
Eating quality of pork loin chops ^{c,d}		
Juiciness score	5.52	5.58
Tenderness score	5.91	6.10
Overall acceptance score	5.80	6.05
Biotech protein in pork tissue	n/a	none

^aEach treatment mean based on ten pens of five pigs/pen from 52 to 244 lb body weight. Experiment conducted at the University of Kentucky's Research and Education Center, Princeton, KY, in the summer of 2000.

^bNo significant treatment differences ($P < 0.05$).

^cIn collaboration with Dr. Benjy Mikel and Ms. Carrie Armstrong, Food Science Section, Animal Sciences Department, University of Kentucky.

^dBased on a scoring system of 1 to 10 with the highest score being the most desirable.

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