

Fuel for Cars and Leftovers for Livestock

Biofuel research isn't just a matter of finding the right type of biomass—corn grain, soybean oil, or other material—and converting it into fuel. Scientists must also find environmentally and economically sound uses for the coproducts from biofuel production.

For example, producing a gallon of biodiesel from soybean oil also yields around two-thirds of a pound of crude glycerin. When this glycerin is refined to 99 percent purity, it can be used in many products, including pharmaceuticals, foods, drinks, cosmetics, and toiletries.

Livestock and poultry producers are looking for new sources of feed supplements to save costs and boost nutrition. "Several

Kristjan Bregendahl to see whether crude glycerin could be used to supplement livestock feed.

Glycerin Supplements Are a Success

Kerr led studies that examined how crude glycerin feed supplements affected swine energy use. In five different experiments, he supplemented the diets of starter pigs and finisher pigs with different levels of crude glycerin. Overall, these studies showed that the sample of crude glycerin contained an apparent metabolizable energy (AME) concentration of 3,207 calories per kilogram (kcal/kg). AME is a standard measure of energy used in nutritional studies.

Pigs fed the crude glycerin were able to digest it efficiently, and it provided them with a supply of caloric energy that basically equaled that of corn grain. A followup study showed no effects on weight, carcass composition, and meat quality in pigs fed diets containing 5 percent or 10 percent crude glycerin from weaning to market weight.

Meanwhile, Dozier and Bregendahl evaluated the use of glycerin supplements in poultry feed. They used 48 egg-laying hens and 1,392 broilers in 4 research studies.

After feeding four levels of crude glycerin to laying hens, Bregendahl determined the AME in the crude glycerin to be 3,805 kcal/kg. He also compared feed consumption, egg production, egg weight, and egg mass (calculated by multiplying egg production and egg weight) and found no significant differences among the four groups.

"Glycerin supplements were well utilized for egg production by the hens," he says.

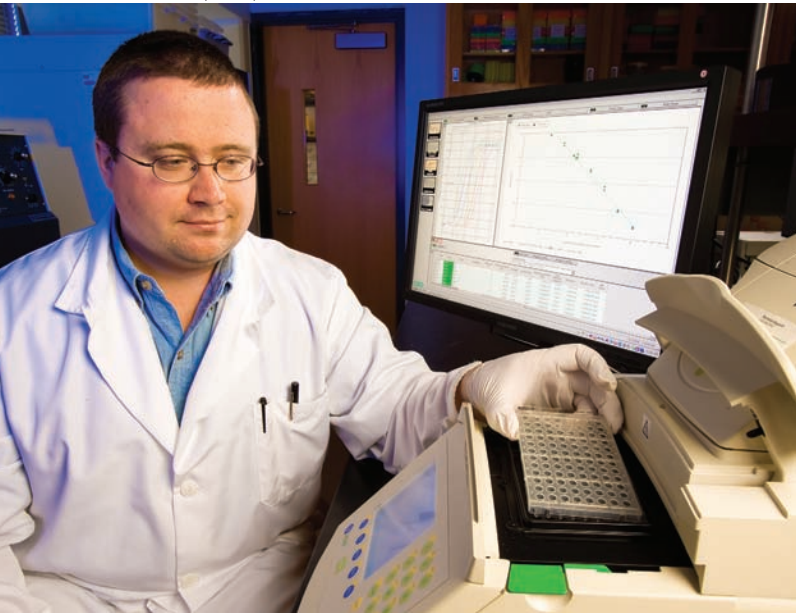
Dozier, meanwhile, conducted three broiler studies. In his first study, young broilers consumed either a control diet with no glycerin supplementation or feed with a 6-percent glycerin content. His results indicated that glycerin provided the 7- to 11-day-old broilers with an AME of 3,621 kcal/kg. Later research resulted in similar findings for older broilers. Glycerin supplements at varying levels provided 21- to 24-day-old broilers with an AME of 3,331 kcal/kg and 42- to 45-day-old broilers with an AME of 3,349 kcal/kg.

Overall, the data indicates that crude glycerin is an excellent source of energy in swine and poultry rations and can be used without harming animal performance, carcass composition, or meat quality.

"This research project has been a success so far," says Dozier. "We will have a total of six peer-reviewed papers from this research, and we've been invited to present the results at national and international nutrition conferences. But we still need additional research on how to handle glycerin as an alternative feedstuff for swine and poultry in integrated feed mills."

He also notes that from a nutritional standpoint, this technology can serve as an alternative dietary energy source that could result in lower feed costs.

STEPHEN AUSMUS (D1340-2)



Loading samples into a real-time PCR instrument, physiologist Thomas Weber measures gene expression in tissues collected from piglets fed diets containing coproducts from the biofuels industry.

scientists have shown that it is possible to supplement pig diets with dried distiller's grains, which remain after ethanol production. Though this can result in equivalent animal productivity, it can also result in increased manure production—and higher levels of volatile organic compounds, which may increase odor emissions," says animal nutritionist Brian Kerr, who works at the ARS Swine Odor and Manure Management Research Unit at Ames, Iowa. "We decided to look at using the coproducts from biodiesel production as feed supplements because no such data was available to the livestock industry."

Kerr partnered with animal scientist William Dozier—formerly in the ARS Poultry Research Unit at Mississippi State and now with Auburn University—and Iowa State University colleague



Animal nutritionist Brian Kerr feeds piglets crude glycerin (the dark liquid), which he has shown to be an excellent source of energy for the animals.

Crude glycerin does contain small amounts of methanol and salt, which could potentially limit its use as a feed supplement. Additional studies might be needed to assess how much methanol livestock can safely ingest in glycerin supplements, which would help regulators refine U.S. standards for using crude glycerin in livestock feed.

But as U.S. biodiesel production continues to boom, crude glycerin supplements could be a win-win situation for biodiesel producers and farmers alike.

“Swine and poultry producers are very interested in supplementing livestock feed with glycerin,” Kerr notes. “This way, crops can be used for both biofuels and for livestock at the same time.”—By **Alfredo Flores** and **Ann Perry**, ARS.

This research is part of Food Animal Production (#101) and Manure and Byproduct Utilization (#206), two ARS national programs described on the World Wide Web at www.nps.ars.usda.gov.

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