

Ethanol

PRODUCER MAGAZINE

The World of Ethanol at Your Fingertips

From the June 2010 Issue

Healthy Living: DDG's New Function

Distillers grains may find a new market for extracted protein and fiber to be used in functional foods.

by Luke Geiver

New research in the \$60 billion functional food industry, coupled with a study from The Boyd Company Inc., a New Jersey-based location consulting firm, points to a promising new role for distillers grains (DDG): improving our health. Though distillers grains today find their way into animal feed, John Boyd Jr., vice president of The Boyd Company, believes the coproduct's potential for improving human health will provide a new function above and beyond what we think the ethanol coproduct can be used for today. Boyd's study, "Functional Food Industry Costs and Ties to Ethanol Coproduct," compares the cost of operating a functional food facility in 35 U.S. and Canadian cities. The study outlines the relationship between DDG and the functional food industry, exploring possible partnerships between the food industry and ethanol producers. "This is a new way for thinking about the ethanol industry," Boyd says, "This is a way to distinguish a market."

A Functional Purpose

The functional food market has existed in countries such as Japan for some time now, according to Boyd. In February 2009, the Functional Food Centre at Oxford Brookes University, in England, began working exclusively with the development, research and promotion of functional foods. "A functional food is a food system that has an advantage to your health, over and beyond the food's normal health contributions," explains center director Jeya Henry. "Take cranberries for example. We didn't always know what amounts of the fruit contributed to our health. We now know the quantity needed for health benefits."

Henry's work utilizes this understanding of the quantities required for a food to aid in health issues such as reducing high cholesterol or in boosting low fiber counts. Henry focuses on using the selective properties of certain foods to make optimal blends with the properties of another, resulting in functional foods—with added protein, extra fiber or extracts, all of which boost the food's contribution towards wellness. Although the use and development of functional foods is not new, the use of DDG is. Henry believes the idea is a good one and worthy of support. "Are there things that we can extract to use for more than just feeding pigs and cattle?" Boyd answers in the affirmative. "This is a cutting edge area at the academic level, but people are living longer and want to be healthier," Boyd says. The need to be healthier, however, is only one aspect driving the use of ethanol coproduct in functional foods forward.

Food science researchers at South Dakota State University, Brookings, the "Cadillac" of universities engaging in end-use applications for agricultural materials, as Boyd says, have begun answering the question already. Padu Krishnan, a professor in the department of nutrition, food science and hospitality at SDSU, is developing a functional flour using DDG. Krishnan explains that as feed markets become saturated, new avenues and markets should be explored for alternative revenue streams. "The use of corn as a food crop is not an alien concept," he says, "However, the use of ethanol residues and byproducts by the food industry has been slow in developing." Krishnan points out the importance of the venture for ethanol producers. "Finding economic value for an underutilized agricultural material will reduce the cost of ethanol production and directly benefit ethanol producers," Krishnan says.

DDG's New Function

Krishnan is working on a higher value use for DDG in a flour blend he's named Alice-DDG. "Alice is a variety of white wheat flour that we produce at SDSU for the Asian noodle market," he says, "but it has tremendous possibilities as a bread wheat also." The promise of Alice-DDG is related directly to the value of important corn components. After the removal of fermentable carbohydrates and the drying process during the ethanol production those components are concentrated, Krishnan says. "The key things in distillers grain are the things that came from the corn to begin with."

The concentration of both protein and fiber in the corn gives the DDG a quality the Boyd study says will be sought after for those producing functional foods, and in the case of the SDSU team, is already being utilized. After grinding the DDG into a fine flour, it is mixed in varying proportions with the wheat flour to create different versions of Alice-DDG. The composition and physical properties of the developed flour were determined through standard laboratory methods. The results showed the product to have very low heavy metal and mycotoxin levels, making the Alice-DDG flour safe for human consumption with its added fiber and protein levels.

Krishnan notes corn is already a food and people should not reject eating a modified food if the added material comes from a pre-existing, food-based substance. "There are many unconventional sources of fiber with various uses in foods like guar gum, xanthan, carrageenan, locust bean gum, etc., but 'corn-based dietary fiber' has a familiar ring to it," Krishnan says. "Our research is intended to strike a balance between ingredient functionality and aesthetic traits that make a food product desirable." Part of the goal for Krishnan and his team is to create a DDG food ingredient that remains flavor neutral, color neutral, and odor neutral to maintain the ingredient's versatility for introduction into multiple products, something he notes, sawdust can't do.

As the research by the SDSU food science "Cadillac" team continues, Krishnan expects good results. "Our ultimate goal is to use

part of the DDG stream in an ethanol plant for the production of wholesome, food-grade DDG that can meet the specifications of a food ingredient."

Boyd expects this goal will be seen sooner than later. He projects a high amount of venture capitalist money to go into the functional food market. "In five years we won't be able to go to a supermarket without seeing other alternatives," he says. "Consumers want it, people want to eat food that promotes healthy living. We project the functional food industry to grow by 25 percent over the next five years."

The growth of the ethanol industry supplying food companies with food grade DDG may, however, be much further off, says Scott Kohl, technical director of research and development at ICM Inc. He recognizes the possible partnership between functional food and ethanol coproducts. Kohl has worked on food production concepts for Lifeline Foods LLC, a joint venture of ICM and AgraMarket Quality Grains, a farmer cooperative. Lifeline utilizes ICM's dry fractionation technology to separate the endosperm, germ and pericarp into usable fractions, with the remaining portion of the endosperm being used for ethanol production. Kohl says there are difficulties with the functional food concept. "It is very unlikely for an ethanol plant to make either a food product or, in this case, a functional product. But, what a plant could do is make raw ingredients that a manufacturer could put into a product." Kohl explains one of the main reasons for the lack of ethanol plants producing food relates directly to regulations in the food industry. "The average ethanol plant can't do any of these things, producing food on site," Kohl says, "because you have to keep the corn in a food grade state. Regulations in the food industry would make this very difficult." He suggests that front-end fractionation may be the best approach to developing functional foods. "Lifeline is a facility that does this," he explains. "The same process could be used to produce DDG for functional food use. Because of sanitation issues and food regulation it would be much easier."

Krishnan explains his approach is to create a food ingredient, and not a food. To produce Alice-DDG, Krishnan addressed the food regulations in the first steps of his process, preparing the DDG by washing it with a variety of food grade solvents and sterilizing the flour in a portion-controlled sealed can in a food-grade steam sterilizer.

As Kohl infers, the idea of an ethanol plant producing food onsite may be unrealistic, but the Boyd study paints a positive outlook for functional foods from DDG. "The massive increase in ethanol production in the U.S. has also resulted in a similar increase in its most valuable coproduct: DDG," the report says, and the future mass production of nutrient rich ingredients from DDG is on the way. Not surprisingly, the Boyd report indicates the best places for food facility operations are located in the highest ethanol-producing Midwestern states with Sioux Falls, S.D., topping the list. The report also lists major food and beverage companies heavily involved in functional food research which include General Mills Inc., ConAgra Inc., PepsiCo, Kraft Foods Inc., and many others. Bioscience firms Syngenta, Monsanto Co., DuPont and others are also involved in researching the concept, according to the report.

Lifeline Foods promotes the idea of "Fueling America, Feeding the World," and Boyd would not disagree. On the future of ethanol plants helping to feed the world and do it in a way that provides added human benefits, Boyd believes that DDG usage and functional food companies are a "perfect marriage." For researchers Henry and Krishnan, using ethanol coproducts for functional foods seems to be a healthy one. EP

Luke Geiver is an associate editor of Ethanol Producer Magazine. Reach him at (701) 738-4944 or lgeiver@bbiinternational.com.

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