Why Are Chickens Getting Too **Fat?**

Obesity is a problem for many American consumers—and now, even our chickens are getting fat!

In all animals, obesity results from an energy imbalance that occurs when more food energy (calories) is consumed than the body actually needs. The excess energy is stored mostly as fat. Over the years, poultry breeders have bred chickens that grow faster and produce more meat in response to a growing worldwide consumer demand. But modern broiler/breeder chickens don't adequately balance their feed consumption to match their energy requirements. When these birds are given unrestricted access to feed, they will overeat and become obese.

An important biochemical pathway was discovered in animals that maintains energy balance in the body. A key component of the pathway is an enzyme called "AMP-activated protein kinase" (AMPK), which helps to regulate both energy use by individual cells and food intake by the animal. This pathway is currently being studied in chickens and turkeys.

Animal scientists Monika Proszkowiec-Weglarz and Mark Richards in the ARS Growth Biology Laboratory at Beltsville, Maryland, along with research leader John McMurtry and Penn State University collaborator Ramesh Ramachandran, recently identified and sequenced the genes responsible for the AMPK pathway in birds and showed that they function in different tissues throughout the body of the broiler chicken.

According to Proszkowiec-Weglarz, AMPK plays a central role in sensing cellular energy levels. It begins a series of events that affect food intake and metabolism of fat, carbohydrate, and protein. "AMPK is really a molecular fuel gauge and a master metabolic regulator in cells," she says. "It responds to fluctuations in the levels of cellular energy and of specific extracellular nutrients and hormones."

Cells obtain energy from conversion of adenosine triphosphate (ATP) to adenosine monophosphate (AMP). "AMPK senses the ratio of AMP to ATP and works to raise the level of ATP within cells" says Proszkowiec-Weglarz. "Our goal is to learn how the AMPK pathway functions in birds to achieve energy balance, so growers can efficiently produce chickens of optimal weight while minimizing excess fat."—By **Sharon Durham,** ARS.

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New Cranberry Hybrid High in Antioxidants

ARS scientists and colleagues are suiting up a wholesome cranberry variety with a newly isolated genetic trait. Using traditional breeding methods, they have created an experimental cranberry line with a high level of absorbable antioxidants.

Plant pathologist James J. Polashock, with the ARS Fruit Laboratory, and Nicholi Vorsa, with the Philip E. Marucci Center for Blueberry and Cranberry Research and Extension at Rutgers University, collaborated on the project. Both scientists are located at the center in Chatsworth, New Jersey.

The cultivated, typical American cranberry, *Vaccinium macrocarpon,* has long been prized for its brilliant red fruit. The deep-colored pigments are made up of anthocyanins, which are a subclass of flavonoids. The many plant chemicals in this large group are widely studied for their purported health benefits, including their role as antioxidants.

The researchers found that a cranberry species from Alaska, *Vaccinium oxycoccus,* is genetically similar enough to the American cranberry to enable interspecies hybridization, producing fertile progeny. The Alaskan species is attractive to the breeders because its fruit anthocyanins are mostly linked to glucose.

Here's why that's good.

In nature, anthocyanins are mostly bound to sugars. Anthocyanins that are bound to the sugar glucose are very high in antioxidant capacity. And flavonoids bound to glucose have been found to be more readily absorbed in the human gut.

But the anthocyanins found in the American cranberry are bound mainly to other, less-absorbable sugars, namely galactose and arabinose. Generally, less than 5 percent of the anthocyanins in the typical cranberry are glucose linked, according to Polashock.

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Cranberries vary in antioxidant bioavailability based on the sugars their anthocyanins are bound to.

By crossing the American and Alaskan species, researchers have created a cranberry with high levels of more bioavailable antioxidants.

"The progeny of these crosses also deliver the proanthocyanidins known for inhibiting *E. coli* from adhering to the lining of the bladder and causing urinary tract infections," says Polashock.

The first-generation hybrids contained up to 50 percent anthocyanin linked to glucose. Through backcrossing, the researchers have now produced progeny that also offer good productivity, vigor, and adaptation. The next step is to produce a horticulturally acceptable cultivar for growers to use.—By **Rosalie Marion Bliss,** ARS.

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