

Soybeans May Help Iron-Deficient Women After All

Iron deficiency affects 30 percent of the world's population, especially women and children living in poverty.

Score another one for soy. ARS-assisted research suggests that ferritin in soybeans is a highly usable source of iron for women who are marginally iron deficient.

The finding, reported in this month's *American Journal of Clinical Nutrition*, can help make a significant gain against iron deficiency, which affects 30 percent of the world's population and is especially prevalent among women and children living in poverty. It decreases cognitive function and worker productivity and can lead to illness and death.

The study refutes the belief that iron in the form of ferritin in soybeans has poor bioavailability, that is, the body does not readily absorb it after it is ingested.

Eighteen female volunteers—most of whom had marginal iron deficiency—consumed soy in the form of muffins and had their iron measured 14 days later. They then repeated the process with soy broth.

Ross Welch, a plant physiologist from ARS' Plant, Soil, and Nutrition Laboratory in Ithaca, New York, assisted in the study. He says the ferritin in the soybeans proved "highly bioavailable—as bioavailable as the iron in meat," even in the presence of phytic acid, an "antinutrient" found in legume seeds and in whole cereal grains that interferes with iron uptake.

Welch says the absorption rate of iron in the broth and muffins averaged 27 percent during the 28-day test period—much higher than the 5 to 10 percent expected from earlier human studies. He explains that use of a high-ferritin soybean variety may be what led to the high iron bioavailability levels observed in this study.

This research began in 1994 with studies of ferritin in soybean seeds and root nodules at North Carolina State University in Raleigh and in the Soybean and Nitrogen Fixation Research Unit on the school's campus.

It was begun by Elizabeth Theil, an ARS-supported biochemistry professor at the university. She collaborated with ARS agronomist Joseph W. Burton in Raleigh and with John Beard, a nutrition professor at Pennsylvania State University at University Park. The research eventually included studies with mice done at Penn State.

The recent work was done at Penn State's General Clinical Research Center by Theil, who is now senior scientist at Children's Hospital Oakland Research Institute in California, along with Beard and graduate student Laura Murra-Kolb.

Welch assisted by growing the Tokyo variety of soybeans with a radioactive isotope of iron, which made it possible to "label" the iron in seed ferritin and make it detectable in red blood cells.

He cautions that the results are not unequivocal, because not all of the iron in the soybeans used in the study was in the ferritin form. Theil says this issue is being addressed by current studies.—By **Luis Pons**, ARS.

This research is part of Plant Biological and Molecular Processes, an ARS National Program (#302) described on the World Wide Web at <http://www.nps.ars.usda.gov>.

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