

News Release



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Hi-maize® Resistant Starch Shown to Help Adults Eat Less Food over 24 Hours

New clinical research finds that Hi-maize resistant starch kept healthy subjects satisfied and helped them consume fewer calories at next meal and over 24 hours

BRIDGEWATER, NJ, November 12, 2009 – A University of Surrey, (Guildford, Surrey, United Kingdom) clinical study found that the addition of Hi-maize resistant starch to breakfast and lunch meals resulted in significantly fewer calories being consumed at the next meal and over 24 hours compared to control meals delivering equal amounts of energy and glycemic carbohydrates.¹ The researchers also found the resistant starch significantly reduced the postprandial insulin response, even though the meals delivered equal amount of glycemic carbohydrate. This latest study adds to the growing body of evidence demonstrating the benefits of Hi-maize resistant starch in hunger, weight and glycemic management.

The randomized, single-blind, balanced crossover study investigated the acute effects of consuming Hi-maize resistant starch on a group of healthy men, ages 19-31 years with a healthy weight. They consumed two equal portions of resistant starch, stirred into a mousse, as part of a standard breakfast and lunch meal. Blood samples and Visual Analogue Scale (VAS) questionnaires were collected every 30 minutes for seven hours followed by an *ad libitum* dinner meal. Diet diaries were used to report snacks consumed in the evening. Consumption of resistant starch resulted in an average of 88 fewer kilocalories (a reduction of 6.6% compared to the control) being consumed at the dinner meal and an average of 321 fewer kilocalories (a reduction of 9.6% compared to the control) over 24 hours. The participants reported no difference in their feelings of hunger, fullness or prospective food consumption during the study.

“Resistant starch appears to impact hunger and food consumption over many hours, coinciding with its fermentation in the large intestine. The main effect occurred at the *ad libitum* dinner and then later in the day after the participants left the controlled environment,” said Dr. Denise Robertson, Lecturer in Nutritional Physiology within the Postgraduate Medical School at the University of Surrey and the principal investigator of the study. “Resistant starch does not act like other viscous fibers and gums, which may delay emptying of the stomach or slow glucose absorption over a few hours. Its effects occur over a longer period of time. This could have beneficial implications for weight management and potentially, weight loss.”

Previous studies support these longer-term satiety benefits. A previous clinical trial found increased satiety and reduced glycemic response to a standardized meal up to thirteen hours after dietary consumption of resistant starch.² Once again, the benefits correlated with fermentation biomarkers. In addition, animal studies have shown that the fermentation of Hi-maize resistant starch in the large intestine turns on the genes that make satiety

hormones glucagon-like peptide-1 (GLP-1) and peptide YY (PYY), and that these hormones remained elevated for 20+ hours.³ Cellulose, a non-fermenting fiber, had no effect in the same studies.

“This study shows that Hi-maize resistant starch impacts satiety differently than other fibers. Because fermentation is a key mechanism and different fibers ferment in different ways, not all fibers will deliver these longer-term benefits,” said Dr. Terry Finocchiaro, director of nutrition research and development at National Starch. “Natural Hi-maize resistant starch continues to demonstrate strong effects on satiety in clinical research”

To keep up with the ever-increasing body of research on the benefits of natural resistant starch, visit www.resistantstarch.com often. For more information about Hi-maize and to request a sample, contact: National Starch Information Center, 181 Herrod Boulevard, Dayton, NJ 08810. Call 1-866-961-NATL (6285). Fax 1-609-655-4402. E-mail nstarch@essentialms.com. Information is also available at www.foodinnovation.com.

About National Starch Food Innovation

National Starch Food Innovation (Bridgewater, NJ) is a leading global supplier of nature-based functional and nutritional ingredient solutions, including Hi-maize natural resistant starch, for the food and beverage industries. The company has a strong focus on delivering innovation to meet market and consumer trends in wholesome and natural, texture, nutrition, wellness, vitality and targeted delivery solutions. This vision combined with an extensive, award-winning product range, market knowledge and technical expertise makes National Starch Food Innovation a partner of choice for the next generation of food producers. For more information, visit www.foodinnovation.com.

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¹ **Acute ingestion of resistant starch reduces food intake in healthy adults.** Authors: Caroline L. Bodinham, Gary S. Frost and M. Denise Robertson. *British Journal of Nutrition*. Epub ahead of print October 27, 2009. doi:10.1017/S0007114509992534. <http://journals.cambridge.org/action/displayIssue?jid=BJN&volumeld=-1&issueld=-1>

² **Including indigestible carbohydrates in the evening meal of healthy subjects improves glucose tolerance, lowers inflammatory markers, and increases satiety after a subsequent standardized breakfast.** Authors: Anne C. Nilsson, Elin M. Östman, Jens J. Holst, Inger M.E. Björck . *The Journal of Nutrition* 2008;138:732-9.

³ **Peptide YY and proglucagon mRNA expression patterns and regulation in the gut.** Authors: June Zhou, Maren Hegsted, Kathleen L. McCutcheon, Michael J. Keenan., Xiaochun Xi., Anne M. Raggio, and Roy J. Martin. *Obesity* 2006;14(4):683-689.

Dietary resistant starch up-regulates total GLP-1 and PYY in a sustained daylong manner through fermentation in rodents. Authors: June Zhou, Roy J. Martin, Richard T. Tulley, Anne M. Raggio, Kathleen L. McCutcheon, Li Shen, Samuel Colby Danna, Sasmita Tripathy, Maren Hegsted, and Michael J. Keenan. *American Journal of Physiology. Endocrinology and Metabolism* 2008. Nov;295(5):E1160-6.