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**Dark Chocolate Lovers Show Higher Tolerance for Bitterness in Chocolate Ice Cream  
Findings Reported in the *Journal of Dairy Science*®**

Philadelphia, PA, July 24, 2013 – To make the inherent bitterness of cocoa in chocolate ice cream more palatable, manufacturers add high levels of fat and sugar. Yet, bitterness is an integral part of the complex flavor of chocolate. In a new study published in the August issue of the *Journal of Dairy Science*®, investigators report that consumers who prefer dark chocolate in solid form tolerate twice the amount of bitter ingredients in chocolate ice cream than those who prefer milk chocolate. Elimination of some added sugar and fats in chocolate ice cream may be acceptable, and perhaps preferable, to some consumers.

“Our primary goal was to determine whether rejection thresholds for added bitterness in chocolate ice cream could be predicted by individual preferences for solid milk or dark chocolate,” says senior author John E. Hayes, Assistant Professor of Food Science and Director of the Sensory Evaluation Center, College of Agricultural Sciences, The Pennsylvania State University, University Park, PA. “Estimating rejection thresholds could be an effective, rapid tool to determine acceptable formulations or quality limits when considering attributes that become objectionable at high intensities.”

The research team produced a control sample of plain chocolate ice cream and samples with varying levels of sucrose octaacetate, a food-safe bitter ingredient used to alter the chocolate ice cream’s bitterness without disturbing other the sensory qualities of the samples, like texture.

These samples were offered in pairs to 96 members of the Penn State community who were non-smokers between the ages of 18 and 45. Forty-six participants preferred milk chocolate. All participants were asked to indicate which of the two blind samples they preferred. They each tasted one spoonful of ten different samples, rinsing with water between pairs.

As expected, the group that preferred solid dark chocolate showed a significantly higher rejection threshold – about twice as high -- for sucrose octaacetate in the chocolate ice cream than the group that preferred milk chocolate.

“These results suggest that this approach could be used to make chocolate ice cream with less added sugar to be marketed for dark chocolate lovers, though this needs to be formally tested,” says Dr. Hayes. “Rejection thresholds can also be applied to other dairy foods in quality control or product optimization applications as a means to determine specific concentration limits associated with preferences.”

Further, the research team has demonstrated that the use of the rejection threshold methodology can be used effectively with solid, and not just liquid, foods.

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#### **NOTES FOR EDITORS**

"Explaining Tolerance for Bitterness in Chocolate Ice Cream Using Solid Chocolate Preferences," by Meriel L. Harwood, Joseph R. Loquasto, Robert F. Roberts, Gregory R. Ziegler, and John E. Hayes. *Journal of Dairy Science*, Volume 96, Issue 8 (August 2013), <http://dx.doi.org/10.3168/jds.2013-6715>, published by Elsevier.

Full text of the article is available to credentialed journalists upon request. Contact Eileen Leahy at +1 732-238-3628 or [jdsmedia@elsevier.com](mailto:jdsmedia@elsevier.com) to obtain copies. Journalists wishing to set up interviews with Dr. Hayes may contact him at [jeh40@psu.edu](mailto:jeh40@psu.edu).

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