

MaryAnne Drake

Department of Food Science
Box 7624
North Carolina State University
Raleigh, NC 27695

a. Professional Preparation

Central Washington University, Ellensburg, WA	Biology	B.S., 1990
Washington State University, Pullman, WA	Food Science	M.S., 1992
Washington State University, Pullman, WA	Food Science	Ph.D. 1996

b. Appointments

2009-Present- Professor of Sensory Analysis and Flavor Chemistry, North Carolina State University
2005-2008- Associate Professor of Sensory Analysis and Flavor Chemistry, North Carolina State University
1997-2000- Assistant Professor of dairy foods and dairy microbiology, Mississippi State University Department of Food Science and Technology

c. Professional Scholarly Activities

2014-present Director, Southeast Dairy Foods Research Center
2013-2015 Senior Editor Journal of Dairy Science
2010-2012 Section Editor, Journal of Dairy Science
2006-2010 FASS Board of Directors
2007 ADSA President
2006 ADSA Vice President
2005 Sensory Evaluation Division, Chair, IFT
2003 Elected to ADSA Board of Directors
2002 Chair, Dairy Foods Division IFT
2002 Vice Chair, ADSA Dairy Foods Division Program Committee
2002 World Cheese Championship Judge
2002-2005 Editorial Board Journal of Food Protection
2000-2003 Editorial Board Journal of Food Science, Microbiology
2000 USDA NRIGCP proposal review committee
1999-2001 Editorial Board Journal of Dairy Science
1998 National Technical Advisory Committee review board, Dairy Management Inc.

d. Honors and Awards

2013 IFT Research and Development Award
2013 Julius Baurman Award IFT Philadelphia Section
2012 ADSA IDF Dairy Processing Award
2012 William Neal Reynolds Professor
2005 IFT Samuel Cate Prescott Award
2005 Invited extern examiner for doctoral student, University College Cork, Ireland
2004 ADSA DSM Food Specialties Award
2003 ADSA Foundation Scholar Dairy Foods Award
2000 AOCS Phospholipid division paper of the year
1999 Central Soya, Inc. Research Award
1999 Grantsmanship Award Mississippi Agricultural and Forestry Experiment Station
1998 Grantsmanship Award Mississippi Agricultural and Forestry Experiment Station
1995 National Dairy Promotion Board M.E. Franks Fellowship
1995 First Place IFT Graduate Paper Competition Dairy Technology Division
1995 IFT Kraft Fellowship
1994 Pfizer Lite Foods IFT Fellowship
1994 First place IFT Graduate Paper Competition Sensory Division

f. Publications

Oltman, A.E., Jervis, S.M., and Drake, M.A. 2014. Consumer attitudes and preferences for fresh market tomatoes. J. Food Sci. 79: S2091-S2097.

- Jervis, M.J., Jervis, S.M., Guthrie, B. and Drake, M.A. 2014. Determining children's perceptions, opinions, and attitudes for sliced sandwich breads. *J. Sensory Stud.* 29: 351-36.
- Frqankowski, K.M., Miracle, R.E. and Drake, M.A. 2014. The role of sodium in the salty taste of permeate. *J. Dairy Sci.* 97:5356-5370.
- Jervis, M.J. and Drake, M.A. 2014. The use of qualitative research methods in quantitative science: a review. *J. Sensory Stud.* 29: 234-247.
- Park, C.W., Bastian, E., Farkas, B.E., and Drake, M.A. 2014. The effect of acidification of liquid whey protein concentrate on the flavor of spray dried powder. *J. Dairy Sci.* 97:4043-4051.
- Li, X., Lopetcharat, K., and Drake, M.A. 2014. Extrinsic attributes that influence parents' purchase of chocolate milk for their children. *J. Food Sci.* 79: S1407-S1415.
- Jervis, S.M., Gerard, P.D., Drake, S., Lopetcharat, K., and Drake, M.A. 2014. The perception of creaminess in sour cream. *J. Sensory Stud.* 29: 248-257.
- Campbell, R.E and Drake, M.A. 2014. Enzymatic bleaching in commercial colored Cheddar whey retentate. *Int. Dairy J.* 38:148-153.
- Smith, T.J. Li. X.E., Drake, M.A. 2014. Norbixin and bixin partitioning in Cheddar cheese and whey. *J. Dairy Sci.* 97:332-3327.
- Park, C.W. and Drake, M.A. 2014. The distribution of fat in dried dairy particles determines flavor release and flavor stability. *J. Food Sci.* 79:R452-459.
- Jervis, S.M., Jervis, M., Guthrie, B. and Drake, M.A. 2014. The efficacy of using photographs to represent attributes of sliced sandwich bread in an adaptive choice based conjoint. *J. Sensory Stud.* 29:64-73.
- Campbell, R.E., Boogers, I., Drake, M.A. 2014. Development of a novel method for the extraction of norbixin from whey and its subsequent quantification via high performance liquid chromatography. *J. Dairy Sci.* 97: 1313-1318.
- Campbell, R.E., Gerard, P.D., Drake, M.A. 2014. Characterizing endogenous and exogenous peroxidase activity for bleaching of fluid whey and retentate *J. Dairy Sci.* 97:1225-1232.
- Park, C.W., Bastian, E., Farkas, B., Drake, M.A. 2014. The Effect of Feed Solids Concentration and Inlet Temperature on the Flavor of Spray Dried Whey Protein Concentrate. *J. Food Sci.* 79:C19-C24.
- Campbell, R.E. and Drake, M.A. 2013. Cold enzymatic bleaching of fluid whey. *J. Dairy Sci.* 96:7404-7413.
- Desai, N., Shepherd, L. and Drake, M.A. 2013. Sensory properties and drivers of liking for Greek yogurts. *J. Dairy Sci.* 96:7454-7466.
- Fox, A.J., Smith, T.J., Gerard, P.D., Drake, M.A. 2013. The influence of bleaching agent and temperature on bleaching efficacy and volatile components of fluid whey and whey retentate. *J. Food Sci.* 78:C1535-C1542.
- Amelia, I., Drake, M.A., Nelson, B., Barbano, D.M. 2013. A new method for the production of lowfat Cheddar cheeses. *J. Dairy Sci.* 96: 4870-4884.
- Campbell, R.E. and Drake, M.A. 2013. The impact of native and non-native enzymes on the flavor of dried dairy ingredients. *J. Dairy Sci.* 96:4773-4783.
- Shepherd, L., Miracle, R.E., Leksrisompong, P., and Drake, M.A. 2013. Relating sensory and chemical properties of sour cream to consumer acceptance. *J. Dairy Sci.* 96:5435-5454.

- Kim, M.K., Lopetcharat, K., and Drake, M.A. 2013. Influence of packaging information on consumer liking of chocolate milk. *J. Dairy Sci.* 96:4843-4856.
- Jervis, S.M. and Drake, M.A. 2013. The impact of iron on the bleaching efficacy of hydrogen peroxide in liquid whey systems. *J. Food Sci.* 78:R129-R137.
- Campbell, R.E., Adams, S., Drake, M.A., and Barbano, D.M. 2013. Effect of bleaching permeate from microfiltered skim milk on 80% serum protein concentrate. *J. Dairy Sci.* 96: 1387-1400.
- White, S.S., Fox, K.M., Jervis, S.M., and Drake, M.A. 2013. Influence of heating and acidification on the flavor of whey protein isolate. *J. Dairy Sci.* 96: 1366-1379.
- Leksrisompong, P.P., Lopetcharat, K., Guthrie, B., and Drake, M.A. 2013. Preference mapping of carbonated lemon lime beverages with regular and diet beverage consumers. *J. Food Sci.* 78:S320-S328.
- Jervis, S.M., Ennis, J., and Drake, M.A. 2012. A Comparison of Adaptive Choice-Based Conjoint and Choice-Based Conjoint to Determine Key Choice Attributes of Sour Cream with Limited Sample Size. *J. Sensory Stud.* 451-462.
- Kang, E.J., Smith, T.J., and Drake, M.A. 2012. Alternative bleaching methods for Cheddar cheese whey. *J. Food Sci.* 77:C818-C823.
- Barden, L.M., Drake, M.A., and Foegeding, E.A. 2012. Impact of sample thickness on descriptive texture analysis of Cheddar cheese. *J. Sensory Studies.* 27: 286-293.
- Kim, M.K., Lopetcharat, K., Gerard, P.D. and Drake, M.A. 2012. Consumer awareness of salt and sodium and sodium reduction labeling. *J. Food Sci.* 77:S307-S313.
- Li, X., Campbell, R.E., Fox, A., Gerard, P.D., and Drake, M.A. 2012. Influence of Storage, Heat Treatment and Solids Composition on the Bleaching of Whey with Hydrogen Peroxide. *J. Food Sci.* 77:C798-C804.
- Leksrisompong, P.P., Gerard, P.D., Lopetcharat, K., and Drake, M.A. 2012. Bitter taste inhibiting agents for whey protein hydrolysate and whey protein hydrolysate beverages. *J. Food Sci.* 77: S282-S287.
- Leksrisompong, P.P., Lopetcharat, K., Guthrie, B., and Drake, M.A. 2012. Descriptive analysis of carbonated regular and diet lemon lime beverages. *J. Sensory Studies.* 27:247-263.
- Campbell, R.E., Kang, E.J., Bastian, E., and Drake, M.A. 2012. The use of lactoperoxidase for the bleaching of fluid whey. *J. Dairy Sci.* 95:2882-2890.
- Jervis, S.M., Campbell, R.E., Wojciechowski, K., Drake, M.A., and Barbano, D.M. 2012. Impact of bleaching whey on sensory and functional properties of 80% whey protein concentrate. *J. Dairy Sci.* 95: 2828-2862.
- Leksrisompong, P.P., Whitson, M.E., Truong, V.D. and Drake, M.A. 2012. Sensory attributes and consumer acceptance of sweet potato cultivars with varying flesh colors. *J. Sensory Stud.* 27:59-69.
- Jervis, S.M., Lopetcharat, K., Drake, M.A. 2012. Application of ethnography and conjoint analysis to determine key consumer attributes for latte-style coffee beverages. *J. Sensory Stud.* 27:48-58.
- Listiyani, M.A.D., Campbell, R.E., Miracle, R.E., Barbano, D.M., Gerard, P.D., Drake, M.A. 2012. Effect of temperature and bleaching agent on bleaching of liquid Cheddar whey. *J. Dairy Sci.* 95:36-49.
- Liaw, I., Miracle, R.E., Jervis, S.M., Listiyani, M., Miracle, R.E. and Drake, M.A. 2011. Comparison of the Flavor Chemistry and Flavor Stability of Mozzarella and Cheddar whey. *J. Food Sci.* 76:C1188-C1194.

- Kim, M., Drake, S.L., and Drake, M.A. 2011. Evaluation of key flavor compounds in reduced and full fat Cheddar cheeses using sensory studies on model systems. *J. Sensory Stud.* 26:278-290.
- Whitson, M.E., Miracle, R.E., Bastian, E., and Drake, M.A. 2011. Effect of liquid retentate storage on flavor of spray dried whey protein concentrate and isolate. *J. Dairy Sci.* 94:3747-3760.
- Listiyani, M., Campbell, R.E., Miracle, R.E., Dean, L., and Drake, M.A. 2011. Influence of bleaching on flavor of 34% whey protein concentrate and residual benzoic acid concentration in dried whey proteins. *J. Dairy Sci.* 94: 4347-4359.
- Campbell, R.E., Miracle, R.E., Gerard, P.D., and Drake, M.A. 2011. Effects of starter culture and storage on the flavor of liquid whey. *J. Food Sci.* 76:S354-361.
- Campbell, R.E., Miracle, R.E., and Drake, M.A. 2011. The effect of starter culture and annatto on the flavor and functionality of whey protein concentrate. *J. Dairy Sci.* 94:1185-1193.
- Drake, S.L., Lopetcharat, K. and Drake, M.A. 2011. Salty taste in dairy foods. Can we reduce the salt? *J. Dairy Science.* 94:636-645.
- Drake, S.L. and Drake, M.A. 2011. Comparison of salty taste and time intensity of sea and land salts from around the world. *J. Sensory Studies.* 26:13-24.
- Drake, S.L. and Drake, M.A. 2011. Application of Sensory Methods to Development of Probiotic and Prebiotic Foods. Ch 6 In *Probiotic and Prebiotic Foods. Technology, Stability and Benefits to Human Health.* Nov Science Publishers, New York, NY pp 113-130.
- Palacios, O.M., Joseph Badran, Lisa Spence, Mary Anne Drake, Michele Reisner and Howard R. Moskowitz. 2010. Measuring acceptance of milk and milk substitutes among younger and older children. *J. Food Sci.* 75:S522-S526.
- Drake, M.A., Miracle, R.E., and McMahon, D.J. 2010. Impact of fat reduction on flavor and flavor chemistry of cheddar cheeses. *J. Dairy Sci.* 93:5069-5081.
- Drake, M.A., Miracle, R.E., and McMahon, D.J. 2010. Influence of fat on flavour and flavour development of Cheddar cheese. *Australian J. Dairy Technol.* 65(3):644-650.
- Kelly, M., Vardhanabhuti, B., Luck, P., Drake, M.A., Osborne, J., Foegeding, E.A. 2010. Role of protein concentration and saliva interactions in the astringency of whey proteins at low pH. *J Dairy Sci* 93:1900-1909.
- Kelly M, Vardhanabhuti B, Luck P, Drake MA, Osborne J, and Foegeding EA. 2010. Role of charge interactions in the astringency of whey proteins at low pH. *J Dairy Sci* 93:1890-1899.
- Kang, E.J., Campbell, R.E., Bastian, E., and Drake, M.A. 2010. Annatto and bleaching in dairy foods. Invited review. *J. Dairy Sci.* 93:3891-3901.
- Drake, S.L., Yates, M.D., and Drake, M.A. 2010. Development of a sensory lexicon for processed and imitation cheeses. *J. Sensory Stud.* 25:720-739.
- Childs, J.L. and Drake, M.A. 2010. Consumer perception of astringency in acidic whey protein beverages. *J. Food Sci.* 75:S513-S521.
- Liaw, I., Eshpari, H., Tong, P.S., and Drake, M.A. 2010. The impact of antioxidant addition on flavor of Cheddar and Mozzarella whey and Cheddar whey protein concentrate. *J. Food Sci.* 75:C559-C569.
- Leksrisonpong, P.P., Miracle, R.E., and Drake, M.A. 2010. Characterization of flavor of whey protein hydrolysates. *J. Agric. Food Chem.* 58:6318-6327.

- Melo, L., Childs, J.L., Drake, M.A., Bolini, H., and Efraim, P. 2010. Expectations and acceptability of diabetic and reduced calorie milk chocolates among non-diabetics and diabetics in the USA. *J. Sensory Stud.* 25 (s1): 133-152
- Whitson, M.E., Miracle, R.E., Drake, M.A. 2010. Sensory characterization of chemical components responsible for cardboard flavor in whey protein. *J. Sensory Stud.* 25:616-636.
- Evans, J.P., Zulewska, J., Newbold, M., Drake, M.A., Barbano, D.M. 2010. Comparison of Composition and Sensory Properties of 80% Whey Protein and Milk Serum Protein Concentrates. *J. Dairy Sci.* 1824-1843.
- Leksrisompong, P., Barbano, D.M., Foegeding, E.A., Gerard, P.D., Drake, M.A. 2010. The Roles of Fat and pH on the Detection Thresholds and Partition Coefficients of Three Compounds: Diacetyl, δ -Decalactone, and Furaneol. *J. Sensory Stud.* 25: 347-370
- Drake, S.L., Drake, M.A., Sanderson, R., Daniels, H.V. and Yates, M.D. 2010. Influence of purging time on the sensory properties of aquacultured Southern Founder (*Paralichthys Legostigma*). *J. Sensory Stud.* 25:246-259.
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- Barden, L., Cakir, E., Leksrisompong, P.N., Ryan, K.N., Foegeding, E.A., Drake, M.A. 2009. Effect of flavor on perceived texture of whey protein isolate gels. *J. Sensory Stud.* 25:447-462.
- Rogers, N.R., M. A. Drake, C. R. Daubert, D. J. McMahon, T. K. Bletsch, and E. A. Foegeding. 2009. The effect of aging on low-fat, reduced-fat, and full-fat Cheddar cheese texture. *J. Dairy Sci.* 92: 4756-4772.
- Croissant, A.E., Kang, E.J., Campbell, R.E., Bastian, E., and Drake, M.A. 2009. Impact of bleaching agent on the flavor and flavor chemistry of whey proteins. *J. Dairy Sci.* 92:5917-5927.
- Drake, S.L., Lopetcharat, K., and Drake, M.A. 2009. Comparison of two different methods to explore consumer preferences for cottage cheese. *J. Dairy Sci.* 92:5883-5897.
- Evans, J., Zulewska, J., Newbold, M., Drake, M.A., and Barbano, D.M. 2009. Comparison of Composition, Sensory and Volatile Components of 34% Whey Protein and Milk Serum Protein Concentrates. *J. Dairy Sci.* 92:4773-4791.
- Drake, S.L., Lee, S.L., Clark, S., Lopetcharat, K., and Drake, M.A. 2009. Mapping regional differences in consumer liking for sharp Cheddar cheeses. *J. Food Sci.* 74:S276-285.
- Lloyd, M.A., Drake, M.A., Gerard, P.D. 2009. Flavor Variability and Flavor Stability of US-Produced Whole Milk Powder. *J. Food Sci.* 74:S334-S343.
- Childs, J.L. and Drake, M.A. 2009. Consumer perception of low fat cheese. *J. Sensory Studies.* 24:902-921.
- Lloyd, M.A., Hess, S., and Drake, M.A. 2009. Effect of package and storage temperature on flavor and flavor stability of whole milk powder. *J. Dairy Sci.* 92:2409-2422.
- Childs, J.L., Yates, M.D., and Drake, M.A. 2009. Preference mapping of cheese sauces. *J Food Sci.* 74:S205-S218
- Bansal, N., Drake, M.A., Piraino, P., Broe, M.L., Harboe, M., Fox, P.F., and McSweeney, P.L.H. 2009. Suitability of recombinant camel (*Camelus dromedaries*) chymosin as a coagulant for Cheddar cheese. *Int. Dairy J.* 19:510-517.
- Sheehan, J.J., Patel, A.D., Drake, M.A., and McSweeney, P.L.H. 2009. Effect of partial or total substitution of bovine for caprine milk on the compositional, volatile, non-volatile, and sensory characteristics of semi-hard cheeses. *Int. Dairy J.* 19:498-509.

- Wright, B.J., Zevchak, S.E., Wright, J.M., and Drake, M.A. 2009. Impact of agglomeration on flavor and flavor stability of whey proteins. *J. Food Sci.* 74:S17-S29.
- Kim, M., Bang, W., Drake, M.A., Hanson, D., and Jaykus, L. 2009. Survival of *L. monocytogenes* on sous-vide. *J. Food Prot.* 72: 637-643.
- MaryAnne Drake, Joy Wright, Megan Whitson, and Michelle Lloyd. 2009. Impact of dairy ingredients on the flavour profiles of foods. M Corredig. Woodhead Publishing. Great Abington, Cambridge UK. Ch 17 In Dairy-derived ingredients: food and nutraceutical uses. 675 pages Pp 442-466
- Drake, M.A., Miracle, R.E., and Wright, J.M. 2009. Sensory properties of dairy proteins. Ch 15 In Milk Proteins: From Expression to Food. Thompson, A., Boland, M., Singh, H. (Eds). Elsevier, Amsterdam, The Netherlands. Pp 429-448.
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- Childs, J.L., Thompson, J.L., Lillard, S.L., Berry, T.K., and Drake, M.A. 2008. Consumer perception of whey and soy protein in meal replacement products. *J. Sensory Stud.* 23:330-339.
- Bang, W., Hanson, D. and Drake, M.A. 2008. Effect of salt and sodium nitrite on growth and enterotoxin production of *Staphylococcus aureus* during the production of air dried fresh pork sausage. *J. Food Protection.* 71:191-195.

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- Thompson, J.L., Gerard, P.D., and Drake, M.A. 2007. Chocolate milk and the Hispanic consumer. *J. Food Sci.* 72:S666-S675.
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- Krause, A.J., Lopetcharat, K., Drake, M.A. 2007. Identification of the characteristics that drive consumer liking of butter flavor. *J. Dairy Sci.* 90:2091-2102.
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- Azizoglu, R. and Drake, M.A. 2007. Impact of Antibiotic Stress on Acid and Heat Tolerance and Virulence Factor Production of *Escherichia coli* O157:H7. *J. Food Protection*, 70:194-199.

Drake, M.A. 2007. Defining Cheese Flavour. Ch 17 In Improving the Flavour of Cheese, B. Weimer, Ed., CRC Press. New York, NY pp 370-395.

Carunchia Whetstine, M.E., and M.A. Drake. 2007. The flavor and flavor stability of skim and whole milk powders. Ch 13 In Flavor Chemistry of Dairy Products. K.R. Cadwallader, M.A. Drake, R. McGorin, Eds. ACS Publishing, Washington, DC. Pp 217-252.

Drake, M.A., Cadwallader, K.R., and Carunchia Whetstine, M.E. 2007. Establishing Links Between Sensory and Instrumental Analysis of Dairy Flavors: Example Cheddar cheese. Ch 3 Flavor of Dairy Products. K.R. Cadwallader, M.A. Drake, R. McGorin, Eds. ACS Publishing, Washington, DC. Pp 51-78.

Singh, T.K., Cadwallader, K.R., Drake, M.A. 2007. Biochemical processes in the production of flavor in milk and milk products. Ch. 78 In Handbook of Food Products Manufacturing. Hui, Y.H. Editor. John Wiley and Sons, Inc. Hoboken, NJ pp 715-748.

g. external funding

Drake, M.A. 2014-2016. The role of protein, protein ratio and fat content on consumer perception of fluid milk. Dairy Management, Inc. \$144,000.

Drake, M.A. 2014-2016. The role of fat and heat treatment on consumer perception of fluid milk. Dairy Management, Inc. \$121,000.

Drake, M.A. 2014-2015. Preference mapping of Gouda cheeses. \$16,000.

Drake, M.A. 2014-2015. Sensory Applications Lab, Dairy Management, Inc. \$159,000.

Drake, M.A. 2014-2016. Exploring Consumer Perception of Permeate-Based Sodium Reduction with Different Permeate Sources. Dairy Management Inc. \$110,000.

Foegeding, E.A., Daubert., C.R., Drake, M.A. 2014-2018. A Comprehensive Understanding of the Role of Flavor and Texture in the Eating Experience and Satiety. USDA \$499,000.

Drake, M.A. 2013-2014. Sensory Applications Lab, Dairy Management, Inc. \$159,000.

Drake, M.A. 2013-2014. Reducing Allergenicity of Protein Beverages Enabled by Novel Heat-stable Ingredients. Univ Tenn (USDA subcontract). \$50,000.

Drake, M.A., Foegeding, E.A. 2012-2015. The Influence of Processing Parameters on SMP Quality . Dairy Management, Inc. \$199,000.

Drake, M.A. 2012-2014. Effect of Bleaching Methods on Properties of Whey Protein,. Agropur, Inc. \$49,000.

Drake, M.A. 2012-2013. Sensory Applications Lab, Dairy Management, Inc. \$159,000.

Drake, M.A. 2011-2014. Influence of Spray Drying Parameters and the Lactoperoxidase System to Minimize Flavor Formation in Spray Dried Whey Protein. \$233,000.

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