

MIDWEST DAIRY FOODS RESEARCH CENTER

University of Minnesota (St. Paul)
www.midwestdairy.umn.edu

South Dakota State University (Brookings)

Iowa State University (Ames)



CENTER DIRECTOR

Lloyd Metzger, PH.D.
Center Director
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OVERVIEW

The Midwest Dairy Foods Research Center has resources within the University of Minnesota (St. Paul), South Dakota State University (Brookings) and Iowa State University (Ames). The dairy center was formed to conduct research and provide support needed to increase the viability of the U.S. dairy industry and ensure its future competitiveness. The center offers expertise in dairy foods research for both traditional dairy products and dairy products used as an ingredient.

RESEARCH FOCUS

- Improving and controlling flavor development and functionality in cheese
- Improving the performance of cheese starter cultures through genetics
- Adding value to milk-based products with probiotics and nutraceuticals
- Improving shelf life of flavored milks
- Reducing undesirable taste attributes of milk
- Improving functionality and controlling flavor attributes of milk fractionation components
- Developing methods for effective and profitable uses of whey

FACILITIES AND EQUIPMENT

UNIVERSITY OF MINNESOTA

CONTACT: RAY MILLER
Plant Manager
612-624-7776
rmiller@umn.edu

FACILITIES

- Sensory Center
- Joseph J. Warthesen Food Processing Center
- Brining and sporulation room

FACILITIES AND EQUIPMENT

- EQUIPMENT:**
- Agglomerator: Glatt 3-lb. cap.
 - Blue cheese needler
 - Buhler extruder
 - Butter churn: Vane, 300 lbs.
 - CEM microwave (rapid moisture oven)
 - Cheese presses: vertical and horizontal with various hoop styles
 - Cheese vat: Damrow 5,000 lbs.
 - Cheese vats: Kusel 2,000 lbs.
 - Cheese vats: Nu-Vat, 800 lbs. (2)
 - Tetra-Hoyer SF600 Continuous ice cream freezer: 120 gal./hr.
 - Coating drum: Spray Dynamics
 - Curdmill: Damrow
 - Decanter: Sharples 1 gal./min.
 - Desludging centrifuge: Westfalia, 3 to 5 L/min.
 - Drum dryer: Buffalovac 6-in. drums
 - Dryer: Coulter, 90 lbs./hr.
 - Dryer: Niro, 20 lbs./hr.
 - Evaporator: CE Rogers, 200 lbs./min.
 - Food chopper and cutter: Hobart 10 lbs.
 - Fruit/nut feeder
 - Hammermill: Fitzpatrick, 5-lb. hopper
 - Homogenizers: Gaulin 30 and 125 gal./hr.
 - HTST and homogenizer: APV 30 gal./hr.
 - Microthermics: 1 to 3 l./min.
 - Mix process unit (vat pasteurizer, homogenizer and plate cooler): 50 to 100 gal.
 - Pasteurizer: Cherry-Burrell 4,000 lbs./hr.
 - Process cheese cooker: Blentech 10 lbs.
 - Process cheese cooker: Damrow 40 lbs.
 - PTI RO/UF system multitube
 - Storage tank: Cherry-Burrell 200 gal.
 - Ribbon blender
 - Scherping cheddaring belt: 200 to 300 lbs./hr.
 - Scherping cheese system: 2,500-lb. cap.
 - Separator: Westfalia 2,000 lbs./hr.
 - UF system: DDS-20, Plate and Frame, 10-l.
 - UF system: Osmonics 5m2, spiral-wound
 - Univats: Cherry-Burrell, 50 gal.
 - Vacuum pan evaporator: Rogers, 100 lbs.
 - Water activity testing

FACILITIES AND EQUIPMENT

SOUTH DAKOTA STATE UNIVERSITY

CONTACT: HOWARD BONNEMAN
Dairy Plant Manager
612-688-5480
howard.bonnemann@sdstate.edu

FACILITIES

- Dairy Research and Training Facility
- Dairy Pilot Plant

FACILITIES AND EQUIPMENT

- EQUIPMENT:**
- Batch freezer: 40-qt. Emery Thompson
 - Butter churns: 15 to 450 lbs.
 - Centrifugal pumps
 - Cheddar mill
 - Cheese block cutter (pneumatic)
 - Cheese press (pneumatic)
 - Cheese sealer: Sipromac
 - Cheese shredder: Hobart
 - Cheese vat: 2,500 lb. HCV
 - Cheese vat: 2x Kusel Double-O, 500 lbs.
 - Cheese vat: 1,000 lbs. fully enclosed, double-O on load cells with pre-draw and final drain
 - Drain table for HCV and 100 lb. Double-O
 - Cold bowl cream separator: DeLaval 5,000 lbs./hr. and 7500 lb./hr. cold bowl
 - Crystallization tank: 3,000 lb.
 - Dryer: two-stage with vibrating fluid bed, custom built, Dahmes Equipment
 - Evaporator: two-stage, falling film, custom built, Dahmes Equipment
 - Evaporator: vacuum-thermal, Blaw-Knox
 - Filler: Bag-n-Box, Scholle
 - Fruit feeder
 - Homogenizer: Gaulin 5,000 lbs./hr., 4,000 PSI
 - Homogenizer: 7,500 lb./hr. at 3,500 psi
 - HTST systems: 5,000 lbs./hr. and 7500 lb./hr.
 - Ice cream freezer: APV K110 150 gal./hr.
 - Sawvel cup filler for 6 to 64 oz. container
 - Rotary bottle filler for 8 oz. through gallon
 - Likwifier: 100 gal.
 - Microfiltration system: 1.7m², ceramic membranes
 - Niro spray dryer: rotary atomizer
 - Platform scales: 75 lbs. and 400 lbs.
 - Positive pump for revel in ice cream
 - Process cheese cooker: single-screw, 30-lb. culinary steam generator
 - Process vats: 20, 50, 200, 300, 500 and 600 gal.; steam and cool
 - Raw milk storage: 2 x 8,500 gal. silos
 - Refrigerated and frozen storage facilities, includes -40°F blast freezer
 - Steam culture chest
 - Ultrafiltration pilot lab, spiral-wound with 3.8-in. elements
 - Ultrafiltration, 4-stage, spiral-wound with 6-in. elements
 - Nano/reverse osmosis filtration, pilot lab, spiral wound with 3.8-in. elements

NOTE: A majority of systems will be control wired through “wonder ware” touch screens. Systems will have recoverable, downloadable data of VFDs, flow rates, pressure and temperature sensors.

FACILITIES AND EQUIPMENT

IOWA STATE UNIVERSITY

CONTACT: HUI WANG
 Pilot Plant Manager
 515-294-3572
 huiwang@mail.adp.iastate.edu

FACILITIES

- Dry processing pilot plant
- Fermentation facility
- Food microbiology lab
- High hydrostatic pressure processing facility
- Nutrition and wellness research center
 - Fitness and metabolism unit
 - Meeting rooms
 - Sensory evaluation unit
- Process development lab
- Product development capabilities
- Technology transfer pilot plant and theater
- Test kitchen and sensory lab
- Wet processing pilot plant

FACILITIES AND EQUIPMENT

A fee for use may be associated with some of the listed equipment. Please contact Stephanie Clark or Hui Wang if you are interested in more information about equipment or services provided at Iowa State University.

- EQUIPMENT:**
- Acid digester: Labconco
 - Aroma scan
 - Autoclave
 - Brookfields HBYR1
 - CEM Microwave Ashing System 300
 - Centrifuge: Autocrit Ultra 3
 - Centrifuge: Beckman J2-21
 - Centrifuge: Beckman J2-2M/E, refrigerated
 - Centrifuge: Beckman J2-HC, high-speed
 - Centrifuge: Cepa Z41, continuous
 - Centrifuge: Clinical
 - Centrifuge: Damon/IEC, tabletop
 - Centrifuge: IEC, explosion-proof, low-speed
 - Centrifuge: International Model HN
 - Centrifuge: Sorvall RC3B Plus
 - Centrifuge: Swing Bucket, 4-L
 - Centrivap concentrator: Labconco
 - Cheese press
 - Cheese vats: jacketed stainless steel w/agitation
 - Cold and dry storage lockers
 - Compression and injection molding machines
 - Consistometer: Adams
 - Consistometer: Bostwick
 - Extrusion systems for grain processing
 - Fermentors: Benchtop, 1-, 2-, 5-, 10-L
 - Fermentors: sterilizable-in-place, 15-, 50-, 100-L
 - Filters
 - Filtration unit: Amicaon hollow-fiber
 - Food extrusion
 - Freeze drying
 - Freezer: Ultralow (-70°C)
 - Refrigerator/Freezer: explosion-proof, isotemp
 - Gamma counter

FACILITIES AND EQUIPMENT

- EQUIPMENT:**
- Gas chromatography: Varian
 - Gas chromatography-mass spectrometry: Agilent
 - Glue depositing
 - High-Performance Liquid Chromatograph
 - High-Temperature Short Time Pasteurizer (Microthermics)
 - Homogenizer: Brinkman
 - Hunter Labscan XE
 - Incubator shaker: New Brunswick Sci
 - Instron 1122
 - Kettle: electric-heated with agitation, 10 gal.
 - Kjeldahl: Labconco
 - Membrane filter system
 - Microplate reader
 - Microscopes
 - Milestone M/S Meba Micro Digest Units
 - Oven: Fisher Isotemp
 - Oven: Lindberg Blue M
 - PCR Cycler: Biorad
 - Penetrometers
 - Photochem (oxidation potential system)
 - Plastic film and sheet extruder
 - Rapid Visco Analyzer
 - Refractometer
 - Retorts
 - Rotary evaporator and vacuum pump
 - Screens and mixing tanks
 - SLM French Pressure Cell Press
 - Spectronics XL-1500 UV Crosslinker
 - Spectrophotometer: Beckman DU 640
 - Spectrophotometer: Genesys 20
 - Spectrophotometer: HP PDA 8452
 - Spectrophotometer: Spectronic 21D
 - Spinning disc colorimeters
 - Spiral filter/pump
 - Stomachers
 - Texture analyzer (TAXT2)
 - Toxic diet prep room and pelletor and mixer
 - Ultracentrifuge: Beckman L8M
 - UV illuminator: Fisher Biotech
 - Vacuum oven: food-grade
 - Viscometers: Digital Brookfield (YR-1; HDB, RV)
 - Rotary evaporator: food-grade
 - Water activity meter: AquaLab
 - Wet grinders
 - Wire cheese block cutter

COURSES, SYMPOSIA AND EVENTS

University of Minnesota

- Food Entrepreneur Seminar
- Microbiology and Engineering of Sterilization Process
- Milk Pasteurization and Ultrafiltration Workshops

RESEARCHERS AND STAFF

Researchers and nutritionists work within the dairy research program and are closely aligned with the University of Minnesota Food Science Department, the South Dakota State University Dairy Science Department, and the Iowa State University Food Science and Human Nutrition Department, addressing new product development and processes for dairy products and ingredients.

RESEARCHERS AND STAFF

SANJEEV ANAND, PH.D.

**Associate Professor of Dairy Microbiology,
Food Safety**

South Dakota State University

sanjeev.anand@sdsstate.edu

Public health microbiology of milk and food products, predictive microbiology, quality systems implementation, biofilms, nutraceuticals and molecular methods in microbiology. Bioluminescent markers and signal molecules.

ROBERT BAER, PH.D.

Professor of Dairy Science

South Dakota State University

robert.baer@sdsstate.edu

Dairy products with beneficial fatty acids, emulsifiers in low-fat and nonfat ice cream, analysis of dairy products.

LANCE BAUMGARD, PH.D.

Associate Professor; Norman Jacobson

Endowed Professor, Animal Science

Iowa State University

baumgard@iastate.edu

Environmental and nutritional physiology; post-absorptive carbohydrate and lipid metabolism; bioenergetics; dairy science and nutrition.

DONALD BEITZ, PH.D.

**Distinguished Professor in Agriculture and Professor of
Animal Science and Biochemistry**

Iowa State University

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Lipid metabolism; cholesterol; nutritional and genetic control of animal food.

TERRY BOYLSTON, PH.D.

Associate Professor of Food Science and Human Nutrition

Iowa State University

tboylsto@iastate.edu

Lipid and flavor composition of foods; conjugated linoleic acid formation in dairy products.

BYRON BREHM-STECHER, PH.D.

**Assistant Professor of Food Science and
Human Nutrition**

Iowa State University

byron@iastate.edu

Food safety and biosecurity; rapid molecular detection of food-borne pathogens and spoilage organisms; flow cytometry; biomimetics; multicomponent antimicrobial systems.

STEPHANIE CLARK, PH.D.

**Associate Professor of Food Science and Human
Nutrition; Associate Director of the Midwest Dairy Foods
Research Center**

Iowa State University

milkmade@iastate.edu

Applies food microbiology and chemistry approaches to bridge the gap between dairy product sensory quality and human health.

SAARI CSALLANY, PH.D.

Professor of Food Science

University of Minnesota

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Lipids, vitamin E, oxidative enzyme systems, edible fats and oil nutritional biochemistry, free radicals.

RESEARCHERS AND STAFF

FRANCISCO DIEZ-GONZALEZ, PH.D.

Associate Professor of Food Science
University of Minnesota

fdiez@umn.edu

Food safety microbiology, food-borne pathogens, preharvest control of pathogenic E. coli, bioterrorism.

CARRIE EARTHMAN, PH.D.

Assistant Professor of Nutrition
University of Minnesota

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Clinical nutrition, medical nutrition therapy, body cell mass, nutrition support and assessment for patients at risk for wasting and gastric bypass surgery.

ASHRAF HASSAN, PH.D.

Associate Professor of Dairy Science
South Dakota State University

ashraf.hassan@sdsstate.edu

Lactic acid bacteria, fermented milks, low-fat cheeses and exopolysaccharides.

BARAEM ISMAIL, PH.D.

Assistant Professor of Food Science
University of Minnesota

bismailm@umn.edu

Phytochemicals, protein and enzyme chemistry; improving the functionality and bioactivity of food constituents; soy isoflavones (chemical structure, protein association, extractability, stability and bioavailability).

STEPHANIE JUNG, PH.D.

Associate Professor of Food Science and Human Nutrition
Iowa State University

jung@iastate.edu

High-pressure treatment of foods; effects of processing on food components (proteins and enzymes); use of enzymes to modify protein characteristics (extractability and functional properties).

THEODORE LABUZA, PH.D.

Morse Alumni Distinguished Teaching Professor of Food Science
University of Minnesota

tplabuza@umn.edu

Water activity, food stability and safety, food law, shelf-life testing, glass transition phenomena, bioterrorism, contaminants in food, time-temperature integrator tags.

BUDDHI LAMSAL, PH.D.

Assistant Professor of Food Science and Human Nutrition
Iowa State University

lamsal@iastate.edu

Food processing and engineering; crops utilization and industrial value-addition through enzyme application, fermentations and bio-based products; engineering properties of food; structure-functional properties of proteins, polysaccharides and food rheology.

PEGGY LEHTOLA

Assistant Director of Midwest Dairy Foods Research Center

University of Minnesota

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Assistant to the director.

RUTH MACDONALD, PH.D.

Professor and Food Science and Human Nutrition Department Head

Iowa State University

ruthmacd@iastate.edu

Identifying factors in foods that reduce the incidence of progression of cancer.

LARRY MCKAY, PH.D.

Professor Emeritus of Food Science

University of Minnesota

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Microbiology, gene transfer systems, plasmids, bacteriophages of cheese starter cultures, microbiology of food fermentations.

RESEARCHERS AND STAFF

AUBREY MENDONCA, PH.D.

Associate Professor of Food Science and Human Nutrition
Iowa State University

amendon@iastate.edu

Rapid detection of human pathogens in dairy foods;
development and application of natural antimicrobials to
enhance the safety and quality of dairy foods.

LLOYD METZGER, PH.D.

Associate Professor and Alfred Chair in Dairy Education,
Director of Dairy Center

South Dakota State University

lloyd.metzger@sdstate.edu

Structure and functional roles of cheese components
and modification of manufacturing parameters; cheese
technology; dairy products processing.

VIKRAM MISTRY, PH.D.

Professor and Department Head of Dairy Science

South Dakota State University

vikram.mistry@sdstate.edu

Reduced-fat dairy products; membrane processing;
process cheese manufacture; salt whey in cheesemaking;
cheesemaking characteristics of milks from Holstein and
Brown Swiss cows.

**KASIVISWANATH
MUTHUKUMARAPPAN, PH.D.**

Professor of Agricultural and
Biosystems Engineering

South Dakota State University

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Dairy rheology and microstructure; physical and functional
properties of dairy products.

DANIEL O'SULLIVAN, PH.D.

Professor of Food Science

University of Minnesota

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Bacteriophage resistance and bacteriocin production
in lactococci, genetic regulatory circuits, genetic
fingerprinting, probiotic cultures.

DEVIN PETERSON, PH.D.

Associate Professor of Food Science

University of Minnesota

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Flavor generation, characterization of flavor compounds and
flavor delivery in foodstuff.

GARY REINECCIUS, PH.D.

Professor and Department Head of Food Science

University of Minnesota

greinecc@umn.edu

Flavor chemistry, off-flavors and flavor processing.

R. ROGER RUAN, PH.D.

Professor of Biosystems and Agricultural Engineering

University of Minnesota

ruanx001@umn.edu

Imaging and spectroscopy technology, shelf-life testing,
structure-function relationships of biological materials.

DAVID SCHINGOETHE, PH.D.

Distinguished Professor of Dairy Science

South Dakota State University

david.schingoethe@iastate.edu

Distillers grains, fiber-digesting enzymes in dairy rations,
bovine somatotropin (bST), rumen bypass proteins and
dietary fat in lactating cows.

RESEARCHERS AND STAFF

TONYA SCHOENFUSS, PH.D.

Assistant Professor of Food Science
University of Minnesota

tschoenf@umn.edu

How formula and manufacturing processes affect natural and process cheeses, fermented milks and other dairy ingredients.

LESTER A. WILSON, PH.D.

University Professor
Iowa State University

lawilson@iastate.edu

Food quality determination (instrumental and sensory methods: color, flavor, aroma, taste, texture, viscosity and pungency); influence of radiation on rennet activity (NASA); food safety and quality training; influence of processing and storage on food acceptance.

ZATA VICKERS, PH.D.

Professor of Food Science
University of Minnesota

zvickers@umn.edu

Food aromas and acceptability; sensory evaluation of food; improved sensory and flavor techniques for fermented dairy products.

TONG WANG, PH.D.

Professor of Food Science and Human Nutrition
Iowa State University

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Lipid chemistry and analysis; value-added processing and utilization of soybeans and other oilseeds; vegetable oil refining.

