ABOUT NDC

National Dairy Council (NDC), the non-profit organization founded by dairy farmers and funded by the national dairy checkoff program, has been committed to research-based nutrition education and communications since its start in 1915. NDC is dedicated to bringing to life the dairy community’s shared vision of a healthy, happy, sustainable world - with science as its foundation.

NDC’s staff of registered dietitians, researchers, and nutrition experts educate on dairy’s role as part of balanced eating plans, as well as inform people about the farm-to-table, table-to-farm connection. NDC has helped launch programs to benefit the health and wellness of children and adults, including Fuel Up to Play 60, which encourages youth to consume nutrient-rich foods and achieve 60 minutes of physical activity each day. NDC also helped launch the Future of Food Partnership and The Great American Milk Drive, which both address food insecurity in America. For more information, visit www.NationalDairyCouncil.org and www.DairyGood.org and follow NDC on Facebook and Twitter (@NtlDairyCouncil).

ABOUT NDC RESEARCH

For the past century, National Dairy Council (NDC) has spearheaded research to provide a credible science base for educational outreach on behalf of dairy farmers and the dairy community. In that time, we have supported groundbreaking scientific research, including that of Dr. E.V. McCollum, who was the first to scientifically link dairy foods and good health in 1917. And it was Dr. McCollum who suggested milk be fortified with vitamin D.

Today, our registered dietitians, nutrition research, product research, environmental science and communication experts across the country carry on the traditions of discovery and scientific collaboration to help safeguard public health.
# TABLE OF CONTENTS

MESSAGE FROM CHIEF SCIENCE OFFICER ......................................................... 2  
**CREATING KNOWLEDGE** ................................................................. 3  
  OUR GUIDING PRINCIPLES ............................................................... 3  
  NUTRITION RESEARCH ............................................................... 4  
  PRODUCT RESEARCH ............................................................... 5  
  SUSTAINABILITY ............................................................... 12  

EDUCATION AND OUTREACH ............................................................... 14  
  NUTRITION RESEARCH ............................................................... 14  
  PRODUCT RESEARCH ............................................................... 15  
  SUSTAINABILITY ............................................................... 16  

SERVICE TO THE DAIRY INDUSTRY ......................................................... 17  
  NUTRITION RESEARCH ............................................................... 17  
  PRODUCT RESEARCH ............................................................... 17  
  SUSTAINABILITY ............................................................... 18  

SCIENTIFIC & REGULATORY AFFAIRS ..................................................... 19  

STRATEGIC PARTNERSHIPS ............................................................... 21  

GLOBAL LEADERSHIP ............................................................... 22  

OUR TEAM ............................................................... 24
MESSAGE FROM THE CHIEF SCIENCE OFFICER

Bringing to life the dairy community’s shared vision of a healthy, happy, sustainable world – with science as our foundation: that is the mission of National Dairy Council. Whatever our role here, it’s a purpose that we live every day – from the scientific staff working on nutrition, product and sustainability research to the experts in Scientific and Regulatory Affairs and the collaborators behind Nutrition Science Partnerships.

Together, we work on behalf of dairy farmers to create knowledge, disseminate that knowledge through education and outreach initiatives, and work in service to the dairy community, providing guidance on a range of scientific topics. We are pleased to report another productive year.

From the very beginning of 2016, nutrition science and policy topics were front and center with the release of the latest version of Dietary Guidelines for Americans (DGAs). The Guidelines reinforced dairy’s role in healthy eating patterns, which reflected the scientific evidence produced by NDC and others.

Our 2016 nutrition research highlights included a landmark investigation of the DASH eating plan (Dietary Approaches to Stop Hypertension), published in the American Journal of Clinical Nutrition.

Historically, the DASH diet has been limited to low-fat and fat-free dairy foods. But the new study showed that whole-milk dairy foods (i.e., milk, cheese and yogurt) can be part of DASH, while providing the same benefits associated with improved blood pressure. It was yet another positive finding on the role of dairy fat and full-fat dairy foods, and we welcomed the news.

In addition to new research publications and presentations, our scientific outreach efforts claimed the spotlight in a presentation with our scientists and a key strategic partner in type 2 diabetes research: the Joslin Diabetes Research Center.

Dr. Osama Hamdy and Melinda Maryniuk, MEd, RD, CDE, from Joslin, presented “Diabetes & Dairy: Discoveries and Meal Planning for Optimal Management” at the Academy of Nutrition and Dietetics annual meeting. The Nutrition Science and Partnerships team worked with NDC’s Nutrition Affairs team to make this significant event happen. It was a valuable opportunity for NDC to reach nutrition professionals.

We are particularly proud of the work our Product Research scientists are doing in cheese and dairy ingredient research. NDC investment in cheese research, application, and training efforts related to cheese varieties, flavors, and textures are driving innovation and improving the quality of U.S. cheese. Award-winning, high quality U.S. cheeses have gained consumer recognition – and are driving sales.

In 2016, the Dairy Ingredient Research program made notable contributions to dairy ingredients, delivering tools and processing technologies that help to reduce spores in milk powders. By addressing key quality and food safety issues, our technology innovations are creating market opportunities.

We are also proud to report that the new Environmental Stewardship Module of Farmers Assuring Responsible Management Environmental Stewardship (FARM ES) was launched by the National Milk Producers Federation. The module provides a tool for voluntary on-farm assessment and communications of greenhouse gas emissions and energy use. Its adoption is an important team milestone because it uses the life-cycle assessment methodology and calculations we developed for the Farm Smart™ tool.

These are just a few highlights drawn from many science and research team achievements in 2016, and I invite you to learn more in this report. We are proud of the work that we do on behalf of dairy farmers, and we look forward to creating new science-based information in 2017 in service to NDC’s mission.
OUR GUIDING PRINCIPLES

SCIENTIFIC INTEGRITY
• Pursue research on behalf of the dairy sector to ensure quality and safety of dairy products, stimulate new product and ingredient innovation, and better understand the role of dairy foods in healthy, sustainable eating patterns.
• Adhere rigorously to accepted scientific principles, methods and conduct to guide study design, execution, data analysis, interpretation, and presentation of results. Furthermore, the National Dairy Council commits to the research principles outlined by International Life Sciences Institute (ILSI) in “Funding Food Science and Nutrition Research: Financial Conflicts and Scientific Integrity”.^1^ • Research will be conducted in accordance with applicable laws and regulations for proper treatment of research subjects, animals, and materials, including review and approval of human and animal study protocols by accredited and appropriate institutional review boards.

TRANSPARENCY
• Disclose freely the National Dairy Council as a funding source or sponsor of research in all types of publications.
• Results from National Dairy Council funded research conducted at public institutions will be made publicly available through publication in reputable peer-reviewed scientific journals, abstracts at scientific meetings, and presentations to professionals. Once the research is published, results will also be communicated in ways that are truthful and not misleading to non-scientist audiences. Communication in these ways is encouraged for all research findings.
• Subject all National Dairy Council scientific research to USDA review and oversight as described in The Dairy Promotion Stabilization Act of 1983, 7 U.S.C.S. § 4501 et seq.

PUBLIC-PRIVATE PARTNERSHIPS
• The National Dairy Council recognizes the value of public-private partnerships for advancing scientific research. The National Dairy Council also commits to the ILSI guiding principles for public-private partnerships outlined in “Principals for building public-private partnerships to benefit food safety, nutrition and health research,”^2^ and were further emphasized by the Interagency Committee on Human Nutrition Research,^3^ which emphasize honest communication, unbiased project selection, transparency, accountability, mutual trust and cooperation.

NDC reviews these guiding principles on an annual basis to ensure they remain relevant, appropriate and useful.

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NUTRITION RESEARCH

The Nutrition Research program focuses on two main areas of study: public health and consumer-focused benefits.

The Public Health research program studies differences in dairy consumption among different populations, how dairy contributes to overall health, growth, and development, and how dairy as a component of diet can reduce risk for chronic, non-communicable diseases. Primary areas of interest in public health are: cardiovascular disease, metabolic health, bone health, childhood nutrition, and sustainable nutrition.

The program’s research on Consumer-Focused Benefits studies areas that may directly affect consumers’ daily lives. These topics may include dairy protein for maintenance of muscle mass and prevention of muscle loss with aging (i.e., sarcopenia), protein quality, and dairy consumption and cognitive function through all life stages.

NUTRITION RESEARCH PLATFORMS

CARDIOVASCULAR HEALTH
Cardiovascular disease continues to be among the leading causes of death in the U.S. and worldwide. Despite multiple studies with findings to the contrary, many still believe that consuming any saturated fat, including that found in milk fat, elevates LDL-cholesterol and increases the risk of cardiovascular disease. The Cardiovascular Health program shares evidence-based data that demonstrates how dairy foods, regardless of fat content, can help improve vascular function. When dairy foods are included in a healthy dietary plan, such as DASH, they are associated with reduced risk for cardiovascular disease.

METABOLIC HEALTH
Over 29 million people in the U.S. have type 2 diabetes, with direct medical costs of approximately $116 billion. Another 79 million people with prediabetes are at high risk of developing type 2 diabetes. Observational research indicates that consumption of milk and other dairy foods like cheese, yogurt, and fermented milks are associated with a lower risk of developing type 2 diabetes. In this program, we focus on communicating clinical evidence that demonstrates routine consumption of dairy foods improves insulin and glucose metabolism and facilitates metabolic health, helping to reduce risk for type 2 diabetes.
**BONE HEALTH**
Many health authorities recommend dairy foods to improve bone health, particularly for growing children. The Dietary Guidelines for Americans, American Academy of Pediatrics, and National Osteoporosis Foundation all agree that calcium, vitamin D, and dairy foods are critical for bone health. Recently, a joint position statement by the National Osteoporosis Foundation and the American Society for Nutrition rated calcium, physical activity, dairy foods, and vitamin D as the most important contributors to peak bone development. NDC’s current research program examines dairy consumption and bone health. The program strives to fill important research gaps in this area, addressing the importance of dairy foods for bone health during aging, as well as determining the interactive effects of nutrients such as calcium, vitamin D, and protein on bone health.

**CHILDHOOD NUTRITION AND HEALTH**
Childhood obesity is a growing concern – with serious long-term health and socio-economic consequences. To gain a real-world perspective on the problem, NDC has invested in a study cohort of moms and babies – a group we will follow for a “cells-to-society” perspective. This initiative will improve our understanding of the role of dairy nutrition, and the many variables that contribute to early childhood weight gain.

**SUSTAINABLE NUTRITION**
People today want to know more about the food they eat: what’s in it, where it comes from, and how it’s produced. They are also concerned about their food’s environmental impact and resource use including the role of dairy production. Our sustainable nutrition program is focused on standardizing and quantifying food production and consumption impacts on the environment and people. We are also working to determine dairy’s per-unit nutrient and health benefits relative to environmental impact and other foods.

**MUSCLE MASS AND FUNCTION**
Sarcopenia – the loss of skeletal muscle mass, quality and strength associated with aging is a major cause of disability in older adults, reducing mobility and increasing the risk of falls and bone fractures. But consuming protein, specifically dairy proteins, has been shown to help build and maintain muscle in people of all ages. The aim of this program is to understand how the protein in dairy foods and dairy protein ingredients can contribute to the maintenance of muscle mass, strength and functional performance across the adult lifespan.

**ENERGY AND COGNITION**
Many consumers are looking for products designed to increase their energy and endurance. At the same time, more research studies are showing links between mental alertness and higher cognitive scores. The energy and cognition program is following up on these trends by examining the contributions of dairy to brain health and mental acuity in all ages. It is also exploring the ways in which milk helps maintain stable blood glucose levels, sustaining energy and contributing to cognitive performance.
NUTRITION RESEARCH HIGHLIGHTS

33 ongoing research projects
9 new research projects funded, and
1 co-funded with dairy community partners

107 new research pre-proposals received

26 published scientific papers,
7 co-authored by NDC Scientists

75 NDC abstract presented at scientific meetings

120 NDC research papers cited*
in peer reviewed journals

*This refers to the number of citations from 2015 publications, since such analysis can only be performed on papers that have been in publication for at least 12 months. This statistic indicates relevancy and reach of our research.
Dairy industry innovation and quality leaders turn to NDC’s research team as a source of knowledge and technology insights. This team helps dairy, food, and beverage companies bring new, innovative dairy products and dairy ingredients to the U.S. market as well as drive exports.

Research drives product innovation – and product innovation drives sales. That’s why dairy, food, and beverage manufacturers depend on the latest science and technologies to help their products thrive in the marketplace.

Through Product Research, NDC provides the industry with the latest developments in dairy product and ingredient, along with technical resources for product development. The National Dairy Foods Research Center Network, a network research centers program coordinated through NDC, includes food/dairy science departments and applications/technology labs at the nation’s universities. They advance dairy science and help the industry innovate to address unmet consumer demand.

Product Research advances knowledge in the fields of dairy science and technology. The applications program provides technical support to manufacturers, users, and marketers of dairy products and ingredients. We work to catalyze industry innovation by providing resources, tools, and expertise. Our program communications keep the industry informed of dairy research outcomes through literature, trade publications, and e-communications.

Making Milk the Obvious Choice

The total beverage category is experiencing phenomenal growth, buoyed by new product options that reflect consumer demand for minimal processing and more protein. To bolster demand for fluid milk and milk-based beverages, NDC research sponsorship is working to deliver tools to enable the highest quality milk that is differentiated from other products within a competitive market category. The program is spurring innovations in milk-based beverages while touting milk’s quality and freshness.

In 2016, completed projects yielded these industry insights:

• **LED retail lighting improves milk’s quality.** Light is detrimental to milk’s freshness, but our research shows that LED lighting in retail cases is less damaging than traditional fluorescent lighting.

• **Consumers respond to different levels of casein.** Milk becomes whiter and thicker as casein content is increased; consumers perceived increased mouth coating with increased casein content.

• **Milk pasteurization methods affects consumer preference.** Most consumers preferred regular pasteurized milk, but would accept ultra-pasteurized milk: an insight which will drive improvements for longer shelf-life products.
PRODUCT RESEARCH CATEGORIES

The Product Research team works closely with industry partners and experts to determine focus areas for new research. We keep dairy relevant to consumers through knowledge development in four categories:

DAIRY INGREDIENTS RESEARCH
is behind many compelling new product formulations, such as whey protein concentrates in fortified foods. This impactful research builds on current market success stories, introducing new applications, enhanced quality, and technologies that unlock new ingredient functions.

CHEESE & CULTURED PRODUCTS RESEARCH
focuses on technologies and applications that deliver new and improved flavors, textures, and procedures to meet global needs.

FLUID MILK & DAIRY BEVERAGE RESEARCH
focuses on finding creative ways to maintain dairy demand, while ensuring delivery of great tasting milk in different formats.

FOOD SAFETY RESEARCH
builds trust in dairy by mitigating the risk of food safety incidents. We are working to discover new and better control technologies for dairy pathogens.

Improving Milk Powder, Driving Exports
The National Dairy Council partners with U.S. Dairy Export Council (USDEC) to grow dairy markets. The milk powder improvement initiative focuses on developing the knowledge base for U.S. dairy powder manufacturers to be more competitive in the global marketplace. NDC continues funding research to gain insights into powder production that consistently meet customer specifications. NDC-funded research projects span a range of topics, from technologies to reduce spore counts in milk powders to novel ways to enhance powder processing capabilities.

Key insights identified in 2016 include:

- **Novel spore-busting technologies** leveraging processing technologies, such as cavitation and novel surface coating that will enable higher quality and more consistent dairy products (i.e. low spore powders).
- **Improved powder consistency**, resulting from insights on the effect of processing parameters during evaporation and drying of milk on milk powder taste and functionality.

FOUR CATEGORIES OF RESEARCH ARE DESIGNED TO INCREASE DAIRY INNOVATION AND TRUST

- **Dairy Ingredients & Co-Products**
  - Add value
  - Use every drop (sustainability)

- **Cheese / Cultured Products**
  - Global expansion
  - Consumer choices

- **Fluid Milk & Beverages**
  - Quality
  - New consumption experiences

- **Food Safety**
  - Training/Best Practices
  - Listeria Consortium
Building Knowledge for Dairy Products

The Product Research team works closely with its partners to build dairy industry knowledge. The team leverages the expertise of dairy research centers and partners with major universities, government agencies, and other leading scientific, health, and nongovernmental organizations. This allows the Product Research team to provide a comprehensive and industrywide approach to technical research for U.S. dairy.

Some of our key industry collaborations include the Dairy Center Network, U.S. Dairy Export Council, Global Innovation Partnerships, the Innovation Center for U.S. Dairy, and the State and Regional Check-Off teams. With these valuable and mutually beneficial partnerships, we amplify farmer investment and apply our knowledge and research insights to the benefit of the entire dairy industry.

Delivering High-Value Ingredients From Milk and Whey

We work to increase utilization of dairy proteins and fractions through milk and whey ingredient programs. Our research has focused on improving quality and performance of milk, whey, and co-product ingredients. Our efforts have led to new, higher-protein foods and beverages that benefit from the improved flavor, aroma, and performance of milk and whey proteins and co-products.

Product and nutrition research has helped the dairy industry improve the quality and performance of dairy ingredients used in foods and beverages, positioning these products for the growing health and wellness market.

In 2016, our milk and whey research yielded several important innovations, including:

- Interventions that increase solubility of Milk Protein Concentrate/Skim Milk Powder by changing their mineral content;
- More functional whey proteins with improved solubility in highly concentrated beverage applications; and
- Promising formulations for potential weight-loss and satiety using whey protein isolates complexed with cocoa.
THE IMPACT OF THE DAIRY RESEARCH CENTER NETWORK

The Product Research team funds application and technology development labs to turn prototypes into products. These labs assist with prototype and concept development, product and process troubleshooting, scale-up and sensory evaluation.

As part of the National Dairy Foods Program, these labs leverage dairy pilot plants and other facilities for research in dairy products, ingredients, processing, and packaging. By collaborating with industry partners throughout the research and development process, the product research program supports the industry to reduce time-to-market for new dairy and dairy-based products, responding more quickly to consumers’ unmet needs.

Notable Publications


PRODUCT RESEARCH HIGHLIGHTS

50 ongoing research projects, 14 new research projects, 94 new research pre-proposals received

7 co-funded with dairy community partners 4 co-funded with dairy community partners

82 published scientific papers 13 NDC abstracts presented at scientific meetings 1 patent

2 book chapters 8 theses 110 NDC product research papers cited* in peer reviewed journals

*This refers to the number of citations from 2015 publications, since such analysis can only be performed on papers that have been in publication for at least 12 months. This statistic indicates relevancy and reach of our research.
Every day, people who work in the U.S. dairy industry are finding new ways to reduce dairy's environmental footprint, from increasing milk production to four times that of the global average – while generating the fewest greenhouse gas emissions per gallon – to recycling farm animal waste with anaerobic digesters or using recyclable packaging for their products.

The Sustainability team captures their progress, conducting primary research and aggregating secondary research in support of dairy's socially responsible, economically viable, and environmentally sound practices.

We use open-source, peer-reviewed scientific findings to communicate dairy’s environmental stewardship from production to consumption, including data on greenhouse gas (GHG) emissions, energy use, water quality and quantity, and land use. We also focus on environmental stewardship that supports air quality, soil health, resource recovery, and biodiversity.

By communicating dairy’s environmental progress – from farm to table – we inspire others in the dairy community to adopt similar practices, while publicly demonstrating industry commitment to being good stewards of the land.

**SUSTAINABILITY RESEARCH HIGHLIGHTS**

- 5 published articles
- 2 abstracts presented at scientific meetings
- 1 report developed
- 957 views on ResearchGate.net*
- 18 research papers cited* in peer review journals

*Research Gate is a professional network for scientists to connect, share and collaborate with specialists around the world. Views are counted each time someone reads the summary or full text, or downloads a publication.

*This refers to the number of citations from 2015 publications, since such analysis can only be performed on papers that have been in publication for at least 12 months. This statistic indicates relevancy and reach of our research.
Benchmarking Dairy Sustainability

Our completed life-cycle assessments for fluid milk (2013), cheese (2013), and yogurt (2016), provide accurate baselines for environmental impact and identify areas for improvement across the entire dairy supply chain. The studies showed:

- U.S. dairy’s greenhouse gas footprint is ~2% of total U.S. emissions
- Dairy’s water withdrawal is ~5% of total U.S. water withdrawal
- Dairy’s land occupation is ~8.4% of total U.S. crop land area

Another analysis completed through the Cow of the Future® project shows that dairy cows make a net positive contribution to the U.S. food supply by converting human-inedible feed ingredients into nutritious milk and dairy foods. Because dairy feed is primarily forage (53%) and agricultural byproducts (19%), competition between dairy feed and human food is negligible (20% by composition and 2.2% by U.S. food industry demand).

Sustainable Dairy is a Coordinated Agricultural Project (CAP) funded by the United States Department of Agriculture (USDA) - National Institute for Food and Agriculture (NIFA) in which NDC partners - through the Innovation Center for U.S. Dairy - with eight universities and four federal research laboratories in a significant five-year research, extension, and education effort.

With support from the Innovation Center for U.S. Dairy, multidisciplinary, teams are conducting targeted research, education, and outreach on climate change adaptation and mitigation efforts in dairy production systems of the Great Lakes region. Project leads are based at the University of Wisconsin-Madison, with collaborators at several other institutions, primarily The Pennsylvania State University and Cornell University.

Research and modeling results from the Sustainable Dairy project will help the dairy industry meet its GHG reduction goals. The project will be complete in 2018.

More information on Sustainable Dairy CAP is available at: http://www.sustainabledairy.org/Pages/home.aspx

Dairy CAP project
31 conference abstracts
20 presentations
7 journal publications
5 accepted submissions
3 technical fact sheets
**Joslin Diabetes Center Collaboration**
Ten percent of the population has diabetes. And an additional 86 million people are at risk for developing type 2 diabetes: a condition that can be prevented and treated with healthy lifestyle changes, including adding dairy.

NDC is collaborating with the Joslin Diabetes Center, a world-renowned research and clinical institute, to advance the science on dairy and diabetes risk. We are also creating a network – including physicians, registered dietitians, diabetes educators, and consumers – to spark public conversations about dairy’s positive role in the diet.

In 2016, we had a chance to showcase our collaboration with Joslin at the annual Academy of Nutrition and Dietetics (AND) Food & Nutrition Conference & Expo.

Our presentation, “Diabetes and Dairy: Discoveries and Meal Planning for Optimal Management,” featured both a clinician and a certified diabetes educator from Joslin. Presenters highlighted emerging research from several different countries, showing consistent beneficial results when people with diabetes incorporate low-fat or full-fat dairy into their diets.

NDC research staff also worked with the New England Dairy Promotion Board to bring Joslin representatives on a farm tour. The tour gave Joslin staff the chance to learn about cow management directly from farmers, giving them a firsthand perspective on the values of dairy farming – and dairy foods.

**NUTRITION RESEARCH EDUCATION AND OUTREACH HIGHLIGHTS**

| 28 | Invited professional presentations, international |
| 17 | Educational blogposts written by NDC scientists |
| 3  | Media interviews given by NDC scientists |

| 11 | Scientific conferences attended by NDC scientists |
| 3  | Educational webinars |
| 28 | Memberships in professional organizations, leadership roles |
PRODUCT RESEARCH

In 2016, the Product Research team found many ways to share its innovative research with the industry, including technical documents, workshops, activation meetings, and invited lectures. From findings on controlling listeria to guidance on consumer labeling, our technical documents are a valuable industry resource, providing timely insights on technical topics.

Product Research is also a frequent contributor to industry conferences, participating in meetings and invited lectures that reach and teach others in the dairy industry.

Our best practice workshops on food safety are another vital contact point for our team: We tap our own experts and our network of partners to protect the goodness of dairy through education and outreach.

PRODUCT RESEARCH EDUCATION AND OUTREACH HIGHLIGHTS

OUR OUTREACH EFFORTS ENGAGED OVER 1000 INDUSTRY PROFESSIONALS:

300 Professionals trained at food safety workshops

26 memberships in professional organizations, 9 leadership roles

4 Technical reports for product and process improvements

15 Industry activation meetings

11 Invited lectures, 887 industry attendees
SUSTAINABILITY

The Sustainability team educates and engages the industry on the environmental and health effects of dairy foods. We use scientific evidence and subject-matter expertise to inform the development of common metrics by the industry that measure, analyze, and report on dairy’s sustainability impacts – from production to consumption.

The dairy industry has a long tradition of caring for the land and nourishing generations of Americans. By committing to continuous improvement in dairy production methods – and to meeting the needs of a growing population – it is extending its legacy of stewardship. Our work empowers individuals in the industry to promote the health and well-being of people, businesses, dairy animals – and our planet, today and tomorrow.

In 2016, we partnered with the National Milk Producers Federation (NMPF) to develop a new Environmental Stewardship module for their Farmers Assuring Responsible Management (FARM) Program. This module gives dairy producers, cooperatives, and companies a tool for assessing and communicating greenhouse gas emissions and energy use on dairy farms. The Environmental Stewardship module is based on life-cycle assessment methodology and calculations we developed for the Farm Smart™ tool, used to measure a dairy farm’s carbon footprints.

Recently, the Sustainability team also provided scientific support for the updated Stewardship and Sustainability Framework for U.S. Dairy. The framework offers credible industrywide guidance for the voluntary measuring and communication of environmental stewardship, social responsibility, and our commitment to continuous improvement with dairy customers and consumers.

SUSTAINABILITY EDUCATION AND OUTREACH HIGHLIGHTS

- 9 Memberships in professional organizations,
- 6 Scientific presentations,
- 1 Scientific symposium,
- 6 leadership roles,
- 16 committee roles,
- 2 Sponsored scientific meetings,
- 16 Industry presentations
NUTRITION RESEARCH

Nutrition Research scientists are scientific consultants across the dairy industry who provide presentations on the latest nutrition science related to dairy foods. Our partnerships with state and regional dairy organizations enable crucial continuing education for staff, and keep thought leaders current on the latest science.

In addition, Nutrition Research scientists regularly present to scientists from other dairy companies - for example, through partnerships with the U.S. Dairy Export Council or Innovation Center for U.S. Dairy members. We keep a broad range of industry representatives informed on the latest science and health benefits of dairy foods - catalyzing innovation for the benefit of all.

Educational Site Visits
In 2016, Nutrition Research staff conducted 7 visits to dairy industries and state regionals. We provided education and updates on the latest evidence of nutritional benefits of dairy foods/ingredients.

Childhood Nutrition Research Conference
NDC co-hosted the Childhood Health & Nutrition Research Conference & Roundtable in partnership with the USDA Arkansas Children’s Nutrition Center. We convened cross-disciplinary experts on childhood health and nutrition to examine the current state of nutrition science – from benchtop to application.

Among those in attendance were:
• Over 80 scientific researchers, extension specialists, school nutrition experts, and health and wellness professionals
• Local Arkansas dairy farmers, and two youth ambassadors from Fuel Up to Play 60 program
• 18 researchers, who presented their emerging scientific data
• 8 speakers and two panels, who also presented their work

For over a century, childhood health and wellness has been a cornerstone for NDC nutrition research and education - but the field needs more basic and applied research. The work presented and discussed at the conference will help guide NDC in future research and outreach, showing how dairy foods can play an integral role in childhood health and wellness.

PRODUCT RESEARCH

The Product Research team are scientific consultants working across the dairy industry to provide information on the latest innovation and technology related to dairy foods. They leverage the expertise of six National Dairy Foods Research Centers. By supporting and enhancing the Dairy Centers’ research, applications, outreach and training programs, we are preparing the industry to innovate and address unmet consumer demands for dairy.

While we work broadly to accelerate core research and education objectives, the Product Research team also takes on specific initiatives. For example, we developed a knowledge base, in partnership with USDEC, to help the U.S. milk powder industry consistently meet global customer specifications.

The Product Research program has also helped artisan/specialty cheese companies develop domestically produced high-quality cheese for the growing specialty cheese market.

Dairy Center/Application Labs Highlights
2,000 Industry professionals trained/educated
110 Industry contacts benefited from our support
150 Industry contacts tapped our technical support
200+ Industry inquiries answered

Dairy Centers build future workforce for dairy processors
Students entering the workforce:
>30 Graduate students
>275 Undergraduate students
SUSTAINABILITY

The Sustainability team convenes the scientific community to shape and align agricultural and food sustainability research priorities related to dairy production and consumption. We also monitor scientific dialogue and analyze its potential implications for the U.S. dairy community. Our work helps us anticipate potential challenges and needs in the dairy industry.

Our staff serve as members or advisors to many leading scientific, governmental, and nongovernmental organizations focused on agricultural sustainability, including:

- USDA Natural Resources Conservation Service (NRCS) Agricultural Air Quality Task Force, which provides recommendations to the Secretary of Agriculture on agricultural air quality issues;
- Food and Agriculture Organization of the United Nations, Livestock Environmental Assessment and Performance Partnership, which provides guidance on global environmental benchmarking of livestock supply chains;
- Council for Agricultural Science and Technology, which assembles and interprets credible, balanced, science-based information, communicating to policymakers, the media, the private sector, and the public;
- Council on Dairy Cattle Breeding, which conducts and manages the National Dairy Genetic Evaluation Program; and
- Field to Market, which develops environmental metrics for sustainable crop production.

SUSTAINABILITY SERVICE HIGHLIGHTS

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<th>18</th>
<th>25</th>
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<tr>
<td>organizational comments</td>
<td>manuscripts reviewed for high-impact scientific journals</td>
<td>recommendations contributed through the Agricultural Air Quality Task Force (AAQTF)</td>
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Sharing Sustainability Expertise

In 2016, the Sustainability staff participated on expert panels, reviewing competitive grant proposals for the USDA National Institutes of Food and Agriculture (NIFA) Foundational Program on nitrogen and phosphorus cycling and the Small Business Innovation Research (SBIR) program.
Scientific & Regulatory Affairs serves the dairy industry by monitoring the food and nutrition environment and educating stakeholders about the potential implications of scientific, policy, and regulatory activities for dairy. Our team helps build NDC’s reputation as the leading authority on dairy foods in health and wellness with the health professional, nutrition, and broader scientific communities.

To engage and educate food and nutrition scientists in academia, government, and industry, our team hosts national symposia on priority dairy nutrition topics, developing educational materials about dairy foods in health and sustainability that advance the greater body of scientific knowledge.

Our team also provides insights and expertise that support dairy community communications about dairy consumption. We source food intake data from the Centers for Disease Control and Prevention’s (CDC) National Health and Nutrition Examination Survey to provide key insights on the average amount of dairy foods consumed, and the nutrients dairy foods contribute to the diet. These messages are used throughout the dairy community to illustrate the important role of dairy foods and their nutrients in healthy eating patterns.

Sharing Scientific and Regulatory Expertise

  Created by the Nutrition Translation Research Interest Section within the American Society for Nutrition, this symposium gave NDC an opportunity to sponsor a session on effective communication methods for scientists. Our panel of experienced scientists shared tips on interacting with the media.

- 7 Science Summaries
  These two-page documents give readers with diverse interests and training a current summary of the science on particular dairy and health-related topics.
  Topics include: bone mass, cardiovascular disease, blood pressure, lactose intolerance, type 2 diabetes, nutrient contributions of dairy foods to the diet, and milk and beverage trends in the U.S. These seven summaries are posted on nationaldairycouncil.org and are available to the public.
• Milk, Cheese, and Yogurt infographics: Translating FDA Final Rule on Food Labeling: Revision of the Nutrition and Supplement Facts Labels

In May 2016, FDA issued the final rules on revisions to the Nutrition and Supplement Facts labels, serving sizes (Reference Amounts Customarily Consumed), and other updates. The final rule includes significant changes to current regulations, updated nutrition information on the label, and how the nutrition information must be presented to consumers.

These final rules will impact dairy product labels and some claims. To translate the impact of the rules on dairy products, NDC developed three infographics (milk, cheese, and yogurt), and shared the materials with our strategic partners.

Public comments by Scientific and Regulatory Affairs

• NASEM “Finding a Path to Safety in Food Allergy” - NDC submitted comments to the NASEM consensus committee evaluating the literature on food allergy, while they developed recommendations to inform practice and policy on food allergy.

Comments summarized the current state of the science on how best to meet nutrient needs in children with cow milk allergy (CMA), the need for research to reduce the risk or prevent the development of CMA, and information clarifying that CMA and lactose intolerance are two different conditions which are often confused. The final report was released on November 30, 2016.

• NASEM “Review of WIC Food Packages: Improving Balance and Choice” - NDC submitted comments to the NASEM consensus committee reviewing the nutritional status and food and nutritional needs of the population eligible for the WIC program (the Special Supplemental Nutrition Program for Women, Infants and Children) to provide recommendations to the USDA to revise the WIC food package.

NDC’s comments included information about the nutrient contribution of dairy foods to the diet and how more flexibility within the food package (allowing yogurt and cheese substitutions, and 2% milk) could help close nutrient gaps. The final review document was released on January 5, 2017.

• Use of the Term “Natural” in the Labeling of Human Food Products - In November 2015, FDA requested comments on the use of the term “natural” in the labeling of human food products. NDC submitted comments to FDA with information about “natural cheese” and the historical use of this term to distinguish between processed cheeses and cheeses made through traditional processes.

NDC’s comments described critical processes for ensuring the safety of milk and milk products, and maintaining characterizing properties of dairy products, such as pasteurization and fermentation, which are consistent with the term “natural.” These comments also addressed required vitamin additions in some dairy products to maintain nutritional equivalence.

• Voluntary Sodium Reduction Goals: Target Mean and Upper Bound Concentrations for Sodium in Commercially Processed, Packaged, and Prepared Foods - In June 2016, FDA issued a draft voluntary guidance to the food industry for reducing sodium in processed and commercially prepared food. The guidance supports voluntary, coordinated, and gradual reduction of sodium across the food supply.

In December 2016, NDC submitted comments to FDA on the critical role of salt for safety, quality, and taste profile of cheese. Due to the technical challenges of sodium reduction in cheese, achievement of the short-term proposed sodium-reduction goals for cheese would be challenging. NDC’s comments also provided scientific data that demonstrate a neutral or beneficial effect of cheese on blood pressure.
STRATEGIC PARTNERSHIPS

The National Dairy Council recognizes the value of public-private partnerships. In our many partnerships with public and private organizations, we continually strive for honest communication, unbiased project selection, transparency, accountability, and mutual trust and cooperation. We abide by the principles of the Interagency Committee on Human Nutrition.

RESEARCH

To expand and strengthen our NDC Research programs, we routinely partner or co-invest in research with private industry, not-for-profit groups, research foundations, other check-off and dairy organizations, government research labs, and clinical research organizations. In August 2016, NDC and USDA Science & Research teams gathered for a meeting in Washington, D.C. which included all collaborators identified in the Memorandum of Understanding (MOU). The meeting included NDC, ARS, and NIFA leaders, as well as national program leaders for USDA agencies. Also attending were leadership of National Milk Producers Federation (NMPF), International Dairy Foods Association (IDFA), USDA Economic Research Services (ERS), and the USDA Foundation for Food and Agriculture Research (FFAR).

After agencies presented their overviews, NDC staff led breakout sessions on food safety, product research, sustainability and nutrition. Our conference proceedings summarized mutual areas of research interest and aligned topics with a dairy research roadmap. We formed four working research groups to foster ongoing collaboration, and will continue working to align research priorities and identify potential resources. We also established a collaboration with the Joslin Diabetes Center. Our partnership on education, research, and outreach projects now underway at Joslin is committed to increase recognition among health care practitioners of the importance of three daily servings of dairy in reducing type 2 diabetes risk.

These collaborative ventures have helped us reinforce important dairy farmer research priorities, such as dietary guidance, sustainable nutrition, health effects of saturated fat, and functional benefits of dairy ingredients and co-products.

GLOBAL INNOVATION PARTNERS (GIP)

GIP is a cross-functional team of experts. Our role encompasses direct consultancy with partners as it relates to product development, menu innovation, and translation of nutrition science to address consumer demand and preferences.

We partner with major foodservice companies as well as a collaborative of major fluid milk processors. Our efforts also include professional education and marketing for the goodness of dairy products and ingredients supported by nutrition science. Together, our team navigates the evolving nutrition environment by translating dairy category insights into business opportunities, protecting the industry’s reputation and promoting its products in the marketplace.
GLOBAL LEADERSHIP

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

In 2016, Chief Scientific Officer, Gregory D. Miller, PhD, was selected to represent the U.S. as an expert member of FAO’s High Level Panel of Experts (HLPE) on Food Security and Nutrition whose purpose is to advise the Committee on World Food Security. The key functions of the HLPE are to:

a. Assess and analyze the current state of food security and nutrition and its underlying causes;
b. Provide scientific and knowledge-based analysis and advice on specific policy-relevant issues, utilizing existing high quality research, data and technical studies; and
c. Identify emerging issues, and help members prioritize future actions and attentions on key focal areas.

In addition, Dr. Miller delivered two presentations to the United Nations:

• The Importance of the dairy sector to nutritional security: Fuel Up to Play 60 project in the U.S.
• The Importance of the dairy sector to food security

Also in 2016, Dr. Ying Wang, director of Sustainability Research, served as a co-chair of the Technical Advisory Group that led the development of the FAO’s Livestock Environmental Assessment and Performance (LEAP)* Large Ruminant Environmental Assessment Guide, and as a Technical Advisory Group member to develop the Nutrient Cycling Accounting Guide.

*LEAP is a multi-stakeholder initiative focused on improving the environmental performance of livestock supply chains while ensuring their economic and social viability.
GLOBAL DAIRY PLATFORM (GDP)
Global Dairy Platform (GDP) is a member organization in the dairy sector that works to promote dairy’s role and contribution to sustainable diets and food systems.

GDP is focused on engaging a number of United Nations organizations – including the Economic and Social Council, FAO, Global Agenda for Sustainable Livestock, and the Committee on World Food Security – to understand how dairy can be a part of the solution to world nutrition and health issues.

These organizations seek partners who can help them deliver on the Sustainable Development Goals (SDG). These 17 goals include areas such as climate change, economic inequality, innovation, and sustainable consumption. One of the GDP’s areas of focus is SDG 2, or “zero hunger,” which aims to end hunger, achieve security, improve nutrition, and promote sustainable agriculture.


INTERNATIONAL DAIRY FEDERATION (IDF)
Our scientists work closely with the IDF, the leading source of scientific and technical expertise for the global dairy chain. IDF engages all stakeholders in productive activities and research projects to further current knowledge and science on a wide range of issues. Through its working bodies, events, and work program, IDF provides a common platform, systems, and processes for the global dairy sector to build consensus.

Two NDC experts serve on IDF committees:

- Dr. Ying Wang is chair of the Standing Committee for Environment.
- Dr. Mickey Rubin is co-chair of the Standing Committee for Nutrition and Health.
Our team is a diverse group of scientists and health professionals with advanced degrees in nutrition, exercise physiology, public health, and animal, environmental and soil science. Collectively, we have published over 100 scientific works. Our combined food industry experience exceeds 60 years, spanning dairy production, product development, nutrition research, sports nutrition, food regulations, and labeling.

We also hold leadership positions in many different professional societies. The diverse expertise and experience of our team spurs advanced research and informs outreach programs that invest dairy farmer dollars toward the long-term viability of the dairy industry.
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