



**COUNCIL ON DAIRY
CATTLE BREEDING
ACTIVITY REPORT**

OCT2021/SEP2022



COUNCIL ON DAIRY CATTLE BREEDING

USDCDB.COM



ACTIVITY REPORT OCT 2021/SEP 2022

TABLE OF CONTENTS

ABOUT CDCB	2
WORD FROM THE CHAIR	3
CEO COLUMN	4
CDCB BOARD OF DIRECTORS	5
CDCB WORKING GROUPS	6-7
CDCB PERSONNEL	8
CDCB DATA PROVIDERS	9
CDCB IN NUMBERS	10
YEAR IN REVIEW	11-12
GENETIC EVALUATIONS	13
WEBCONNECT	13
COLLABORATION, RESEARCH AND DEVELOPMENT	14-17
INTERN REPORTS	18
OUTREACH	19-22
FINANCIAL REPORT	23

ABOUT CDCB

The Council on Dairy Cattle Breeding (CDCB) provides premier dairy genetic information services through industry collaboration centered around a mission to help optimize cow health and productivity in herds worldwide. This non-profit organization is responsible for calculating and distributing the genetic evaluations and genomic predictions, for managing the national cooperator database, and for analyzing and distributing dairy cattle data in the United States. The CDCB drives continuous improvement and maintains the integrity of the world's largest animal database, building on a quality foundation with more than eight decades of recorded U.S. dairy animal performance. The CDCB is a collaboration between four sectors of the U.S. dairy industry: Dairy Records Providers (DRP), Dairy Records Processing Centers (DRPC), National Association of Animal Breeders (NAAB) and Purebred Dairy Cattle Association (PDCA).

This report was prepared for the 2022 CDCB Industry Meeting held October 5, 2022, in Madison, Wisconsin.

CDCB MISSION

**TO DRIVE GLOBAL DAIRY CATTLE IMPROVEMENT
BY USING A COLLABORATIVE DATABASE TO DELIVER
STATE-OF-THE-ART GENETIC MERIT AND PERFORMANCE
ASSESSMENTS FOR THE HERD DECISION MAKING.**

CDCB BOARD CHAIR ACTIVITY REPORT



IF YOU ARE NOT DIRECTLY INVOLVED WITH THE DAY-TO-DAY ACTIVITIES OF CDCB, IT MAY FEEL LIKE A QUIET YEAR. Instead of major changes to evaluations or index updates, CDCB efforts were strategically invested behind-the-scenes in developing new traits and collecting new and

more data. Most new traits don't have clean data readily available, so a significant focus has been laying the foundation for data collection pipelines and exploring data sources to develop other economically-important tools for producers. While this process lengthens the time, it is essential to plan and build for the future.

Two major areas of emphasis have centered around the collection of lameness data and the development of an evaluation for milking speed based on quantitative data versus subjective surveys. Continued research with Cattle Eye should produce solid analytical data with high correlations to lameness to identify animals that exhibit signs of lameness, help detect emerging issues and also so producers can be preventative in hoof care.

Dairy producers have adopted changes in reproductive management practices that may affect genetic evaluations. The calculation of fertility evaluations are complicated by the rapid adoption of beef semen on dairy cows, synchronization programs, sexed semen and embryos in repro programs. Fertility traits should be reviewed to account for these changes and to make sure fertility evaluations are robust.

CDCB is committed to funding innovative research in areas such as milk yield calibrations, feed efficiency trials, methane emissions and more described within this report. These are longer term research projects that put the financial reserves of CDCB to good use and benefit all producers.

The Dairy Breed Improvement Collaboration shows the commitment of the CDCB Board to make genomics more affordable for Ayrshire, Brown Swiss, Guernsey, and in the future, Milking Shorthorn bulls. Another side benefit was clarifying which bulls are used for A.I. and creating better awareness of differences between use of evaluations for selection purposes and use of a bull's genomic evaluation to commercially market semen as an A.I. sire. Although the CDCB fee schedule is available to the public, robust discussions have increased understanding of the fee structure and conditions when A.I. Service fees apply.

A year ago, I reported that Residual Feed Intake (RFI) was included in the updated Net Merit \$ index in August 2021. The industry has been monitoring this trait and will continue to study what RFI is telling us and if there should be further adjustments. The challenge continues to be the addition of new good quality data to increase the reliability. International data has been considered but adding those phenotypes doesn't necessarily improve the trait results. CDCB is committing some financial reserves to the collection of additional phenotypic data to increase reliabilities and have data on animals more closely related to the current population.

CDCB is in a sound financial position and is investing a portion of the reserve funds for data and process improvements. The CDCB Board of Directors appreciates the dedication of the entire CDCB staff to produce high-quality results and thanks the entire industry for their ongoing support.



Photo provided by GENEX

CEO COLUMN

IT IS STILL A GREAT TIME TO WORK FOR THE DAIRY INDUSTRY!

Despite the recent challenging times, the dairy sector keeps reinventing itself to consistently fulfill its vocation of feeding the world.

We are humbled that CDCB has contributed to this process by maintaining a world-class

genetic evaluation system based on

the national cooperator database. This requires constant investments in human resources, infrastructure, system optimization, and most importantly in research.

In this past year, CDCB added new talents to the team, enhanced its data processing capacity and launched a completely new web user interface called WebConnect.

For R&D, CDCB invested considerable resources in projects around feed efficiency, cow mobility and lameness, single-step genomic methodologies, milking speed, Johne's disease, milk yield and components projection factors, and enteric methane mitigation – all while continuing to incorporate cutting-edge research from the USDA Animal Genomics and Improvement Laboratory (AGIL). More details on all these activities can be found within this annual report, as well as an overview of activities by the board, working groups, and our talented staff.

I dedicate the rest of this column to look ahead and share our vision for the future. Selection goals for dairy breeds should address the needs of the dairy cow, the dairy producer, the processing industry and the consumer. If we examine the history of our modern selection indices, selection was initially focused on production traits and gradually incorporated the

so-called “functional traits” designed for healthier cows that stay longer in production. Selection indices also reflect the milk pricing systems, which are based on consumer behavior and historically targeted milk composition and milk quality. Today's consumers are increasingly concerned with social and environmental impacts of food production, to the point that animal welfare and carbon footprint have gained a tangible value. Global warming has become an intercontinental priority, and cattle have been positioned as a significant contributor to greenhouse gas emissions. Despite our opinion on how much cows should be blamed for climate change, consumers expect the dairy industry to minimize methane emissions and revert the perception that cows are “bad for the environment.”

Mitigating emissions involves a series of new herd management practices, and genetics certainly plays a major role. That's why CDCB is a founding member of the Greener Cattle Initiative, an industry-oriented research consortium that will award approximately \$5 million over the next 5 years to support research to mitigate enteric methane emissions.

The 2022 CDCB Industry Meeting at the World Dairy Expo will explore the question, “How do genetics impact sustainability goals?” Through perspectives of dairy buyers, dairy producers and geneticists, the meeting will highlight how much we already have done – and can do in the future – to breed more sustainable cows.

Finally, CDCB is committed to support a proposal presented to the Greener Cattle Initiative by a consortium of universities that will collect methane emission data on a comprehensive number of genotyped, lactating cows and eventually allow the development of national genomic evaluations for methane emissions.

All these projects guarantee another exciting year ahead of us to serve the dairy community!



Photo provided by ABS Global

BOARD OF DIRECTORS

The CDCB Board of Directors guides the development and continuous improvement of U.S. dairy genetics and CDCB services.

Jonathan Lamb, dairy producer from Oakfield, New York, joined the CDCB Board of Directors in July 2022 following his election as President of Holstein Association USA. Lamb assumes the board seat held the past three years by Corey Geiger.

John Clay, Jay Mattison, Katie Olson and Lindsey Worden were re-elected to new three-year terms.

OFFICER TEAM

CDCB officers were elected in April 2021 and will continue in these roles through April 2023.

- **Jay Weiker**, *Chair*
- **Dan Sheldon**, *Treasurer*
- **John Clay**, *Vice Chair*
- **Lindsey Worden**, *Secretary*

THANK YOU

to these individuals who dedicate their time, energy and expertise to genetic improvement benefiting dairy herds worldwide.

2022-2023 BOARD OF DIRECTORS

Dairy Records Providers

- **Susan Lee**, *Idaho DHIA, Jerome, Idaho*
- **Jay Mattison**, *National DHIA, Verona, Wis.*
- **Dan Sheldon**, *Treasurer, Woody Hill Farms, Salem, NY*

Dairy Records Processing Centers

- **John Clay, Ph.D.**, *Vice Chair, Dairy Records Management Systems, Raleigh, NC*
- **Eddie Ormonde**, *VAS, Tulare, Calif.*
- **Mark Rodgers**, *MKVT Polled Holsteins, Glover, Vt.*

National Association of Animal Breeders

- **Paul Hunt**, *URUS Group, Madison, Wis.*
- **Katie Olson, Ph.D.**, *ABS Global, DeForest, Wis.*
- **Jay Weiker**, *Chair, NAAB, Madison, Wis.*

Purebred Dairy Cattle Association

- **Jonathan Lamb**, *Oakfield Corners Dairy, Oakfield, NY*
- **Neal Smith**, *American Jersey Cattle Association, Reynoldsburg, Ohio*
- **Lindsey Worden**, *Secretary, Holstein Association USA, Inc., Brattleboro, Vt.*

Non-Members Supporting the CDCB Board

- **Paul VanRaden, Ph.D.**, *USDA AGIL Industry Liaison*
- **João Dürr, Ph.D.**, *CDCB Chief Executive Officer*

USDA AGIL = United States Department of Agriculture, Animal Genomics and Improvement Laboratory



Jay Weiker
Chair



John Clay
Vice Chair



Dan Sheldon
Treasurer



Lindsey Worden
Secretary



Susan Lee



Jay Mattison



Eddie Ormonde



Mark Rodgers



Paul Hunt



Katie Olson



Jonathan Lamb



Neal Smith



Thank you **Corey GEIGER**

FOR SERVICE ON CDCB BOARD FROM 2019 TO 2022

Your wisdom and tireless dedication to CDCB as a member of the Board of Directors will be greatly missed.

CDCB WORKING GROUPS

Producers, industry leaders and researchers provide valuable input and ongoing collaboration in the spirit of continuous improvement.

PRODUCER ADVISORY COMMITTEE (PAC)

PURPOSE

Provide grassroots input for development of strategy, policy and activity, including future priorities and opportunities to be pursued by the CDCB.

GROUP MEMBERS

Bill Peck, *Chair, Welcome Stock Farm, Schuylerville, NY*
Lloyd Holterman, *Past Chair, Rosy Lane Holsteins, Watertown, Wis.*
Kent Butters, *Butter Dell Dairy, Lewiston, Utah*
Spencer Hackett, *Melarry Farms, Rice, Minn.*
Tom Kestell, *Ever-Green-View Farm, Waldo, Wis.*
Sean Tollenaar, *Tollcrest Dairy, Wheatland, Calif.*

Thank you Mike Santos of Terra Linda Dairy, Tulare, Calif., for his previous service to the Producer Advisory Committee.

DAIRY EVALUATION REVIEW TEAM (DERT)

PURPOSE

Provide independent, objective and confidential reviews of the CDCB triannual dairy genetic evaluation results prior to the public (official) release in April, August and December. This has enabled identification of issues and improved evaluation-day data release.

GROUP MEMBERS

Mehdi Sargolzaei, *Select Sires Inc.*
Sam Comstock, *Holstein Association USA*
Tom Lawlor, *Holstein Association USA*
Ryan Starkenburg, *ABS Global, Inc.*
Bob Welper, *PEAK Genetics*

GENETIC EVALUATION METHODS (GEM)

PURPOSE

Provide independent, objective and impartial advice and strategic guidance to AGIL and CDCB staff throughout the development of dairy genetic evaluations.

GROUP MEMBERS

Christian Maltecca, *North Carolina State University, Chair*
Chad Dechow, *Penn State University*
Tom Lawlor, *Holstein Association USA*
Daniela Lourenco, *University of Georgia*
Ezequiel Nicolazzi, *CDCB*
Ryan Starkenburg, *ABS Global*
Robert Tempelman, *Michagan State University*
Paul VanRaden, *USDA AGIL*
Kent Weigel, *University of Wisconsin-Madison*

EVALUATION FREQUENCY TASK FORCE

PURPOSE

Prepare a cost-benefit analysis of increasing the frequency of full genetic evaluations and an implementation strategy (if current frequency is modified).

TASK FORCE MEMBERS

Chuck Sattler (Chair) and Andy Stiefel, *representing National Association of Animal Breeders*
Lee Day and John Clay, *representing Dairy Records Processing Centers*
Steven Sievert, *representing Dairy Records Providers*
Tom Lawlor, *representing Purebred Dairy Cattle Association*
Paul VanRaden, *USDA AGIL*
João Dürr, *CDCB*
Ezequiel Nicolazzi, *CDCB*

Based on an extensive review of the publication and distribution business rules prepared by the CDCB staff, the Evaluation Frequency Task Force will be restructured following the August 2022 Board of Director meeting to recommend an updated policy that may impact the frequency of evaluations.

COLORED BREEDS AI SERVICE FEE TASK FORCE

PURPOSE

Review existing AI fees for smaller populations (Brown Swiss, Ayrshire and Guernsey, and Milking Shorthorn) and recommend strategies to stimulate larger enrollment of bulls in the NAAB cross-reference program

TASK FORCE MEMBERS

Susan Lee, representing Dairy Records Providers

Neal Smith, representing Purebred Dairy Cattle Association

Katie Olson, representing National Association of Animal Breeders

Mark Rodgers, representing Dairy Records Processing Centers

João Dürr, CDCB

See page 19 for details on the Dairy Breed Improvement Collaboration.

MILKING SPEED EVALUATION TASK FORCE

PURPOSE

Review the potential to implement genetic evaluations for milking speed in all dairy breeds and make recommendations to ensure data flow, data quality and publication standards.

TASK FORCE MEMBERS

Asha Miles, USDA Animal Genomics Improvement Laboratory, Chair

Jeffrey Bewley, Holstein Association USA

João Dürr, CDCB

Sophie Eaglen, National Association of Animal Breeders

Robert Fourdraine, Dairy Records Management Systems

Kristen Gaddis, CDCB

Steven Sievert, National Dairy Herd Improvement Association

See page 16 for outcomes of the task force work.

thank you **Cari**
WOLFE



Cari Wolfe retired from the American Jersey Cattle Association in June 2022, after serving the USJersey organizations for 40 years. Her contributions and leadership toward Jersey breed progress are well documented. For countless years, Cari served on two very important CDCB committees: Dairy Evaluation Review Team (DERT) and Genetic Evaluation Methods (GEM). She was also active on the Evaluation Frequency Task Force at the time of her retirement. Cari was a driving force in data collection for the Jersey health evaluations and a key advisor during implementation of the CDCB genomic evaluations for crossbred animals.

BEST WISHES, CARI

CDCB PERSONNEL

The CDCB team is dedicated to deliver value to dairy producers and industry stakeholders, with work centered around three pillars.

CDCB support functions – office management, human resources, information technology, public relations, accounting and legal – are performed in-house or by external collaborators to ensure that CDCB operates as efficiently as possible.

NATIONAL COOPERATOR

DATABASE Maintaining efficient data flow protocols, ensuring data safety, optimizing data management procedures, and abiding by high data quality standards

GENETIC SERVICES Offering benchmark references, adopting advanced genomic tools, carrying out genetic evaluations, and ensuring the dairy industry receives the information they need in an efficient, timely manner.

RESEARCH & INNOVATION

Developing data pipelines using novel recording technologies and assessing unexplored data pools, developing new products and methods that benefit service users, and facilitating data access requests from the scientific community.

Lillian Bacheller, *Senior Applications Developer*
 Javier Burchard, Ph.D., *Chief Innovation Officer*
 José Carrillo, Ph.D., *Chief Data Officer*
 João Dürr, Ph.D., *CEO*
 Cindy Ferrier, *Office Manager*
 Heather Adams Enzenauer, *Applied Geneticist*
 Kristen Parker Gaddis, Ph.D., *Geneticist*
 Gerald Jansen, *Technical Advisor*
 Jay Megonigal, *IT Manager*
 Rodrigo Mota, Ph.D., *Applied Geneticist*

Jhamal McKee, Jr. *Systems Administrator*
 Ezequiel Nicolazzi, Ph.D., *Chief Operation Officer*
 Kendra Randall, *Project Manager*
 Frank Ross, *System Administrator*
 Duane Norman, Ph.D., *Technical Advisor & Industry Liaison*
 Marius Temzem, *Database Administrator*
 Lauren Thomas, *Data Specialist*
 Kaori Tokuhisa, MSC, *Genomic Data Analyst*
 George Wiggans, Ph.D., *Technical Advisor*
 Xiao-Lin (Nick) Wu, Ph.D., *Product Development Manager*



CDCB team gathers outside the office in Bowie, Maryland



Heather Adams Enzenauer



Kristen Parker Gaddis



Gerald Jansen



Jhamal McKee



Ezequiel Nicolazzi



Duane Norman



Marius Temzem



Kaori Tokuhisa



George Wiggans



Nick Wu

Front (L-R): Rodrigo Mota, Lauren Thomas, Lillian Bacheller, Kendra Randall and Cindy Ferrier.
Back (L-R): João Dürr, Frank Ross, Jay Megonigal, José Carrillo and Javier Burchard.

CDCB DATA PROVIDERS

DAIRY RECORDS PROVIDERS

Aguiar Milk Testing, Inc.	DHIA West	Lancaster DHIA	Tennessee DHIA
AgSource	Gallenberger Dairy Records	Mid-South Dairy Records	Texas DHIA
Arizona DHIA	Heart of America DHIA	Minnesota DHIA	Tulare DHIA
Central Counties DHIA	Idaho DHIA	Puerto Rico DHIA	United Federation of DHIA's
Dairy Lab Services	Indiana State Dairy Association	Rocky Mountain DHIA	Washington State DHIA
Dairy One Cooperative Inc.	Integrated Milk Testing Services	San Joaquin DHIA	
DHIA Cooperative, Inc.	Jim Sousa Testing	Southern DHIA Affiliates	

CDCB-CERTIFIED GENOMIC NOMINATORS

ABS Global, Inc.	Genetic Visions-ST LLC	Neogen Corporation dba Geneseek	Sexing Technologies
American Jersey Cattle Association	Holstein Association USA, Inc.	PEAK Genetics	Synergy (Unione per i Servizi alla selezione e biodiversita)
Bio-Genesys Ltd.	Holstein Canada	SEENERGI	Weatherbys Scientific
CRV	Labogena DNA	Select Sires Inc.	Zoetis
Czech Moravian Breeders' Corporation, INC (CMBC)	National Association of Animal Breeders, Inc.	Semex Alliance	

PUREBRED DAIRY CATTLE ASSOCIATION

American Guernsey Association	Holstein Association USA, Inc.
American Jersey Cattle Association	Red and White Dairy Cattle Association
American Milking Shorthorn Society	U.S. Ayrshire Breeders' Association
Brown Swiss Cattle Breeders' Association	

DAIRY RECORDS PROCESSING CENTERS

AgriTech Analytics
AgSource
Amelicor
Dairy Records Management Systems

CDCB-CERTIFIED GENOTYPING LABORATORIES

Bio-Genesys Ltd.	Czech Moravian Breeders' Corporation, Inc. (CMBC)
Genetic Visions-ST LLC	Eurofins Genomics Europe Genotyping A/S (EFEG A/S)
Labogena DNA	Weatherbys Scientific
Neogen Corporation dba Geneseek	Zoetis

INTERNATIONAL COOPERATORS

Agriculture and Horticulture Development Board (GBR)	National Livestock Breeding Center (NLBC) (JPN)
ANAFI (ITA)	Nordic Cattle Genetic Evaluation (DNK, FIN, SWE)
BSW Intergenomics (8 countries)	Interbull Centre (35 countries)
CRV B.V. (NLD)	SYNERGY (Unione per i Servizi alla Selezione e Biodiversita) (ITA)
Eleveo ASBL (BEL)	Qualitas (CHE) vit (DEU)
Lactanet (CAN)	

thank you **Suzanne HUBBARD** FOR COMMITMENT TO EXCELLENCE



Suzanne Hubbard retired after 41 years of service at U.S. Department of Agriculture, first in the Animal Improvements Programs Laboratory, later known as Animal Genomics and Improvement Laboratory (AGIL).

Suzanne's professional dedication was extremely helpful in communicating the relevance of the research conducted by dozens of scientists in these labs. Her role as a USDA Animal Scientist included a broad range of

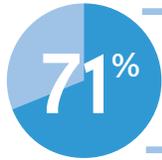
responsibilities – from editing manuscripts, to distributing scientific current events and relevant literature, and assisting in website design.

Suzanne delivered remarkable attention to detail, ensuring that details were correct and text was clear, which usually shortened the review process substantially. She compiled research results that transformed annual reports and five-year plans into documents with high scientific appeal, and her fellow scientists cite her improvements to hundreds of presentations.

Suzanne, we thank you for your commitment to dairy cattle improvement and wish you many happy years in retirement!

CDCB IN NUMBERS

Young genomic sires account for



all A.I. breedings in U.S. (2021)



>6.5 million genotypes in world's largest animal database. (August 2022)

GENOTYPES



12% Jersey

86% Holstein



8%

of genotyped animals are male



92%

of genotyped animals are female



81 Countries

with animal genotypes in CDCB database

6

annual DHI summaries produced

3.99M

cows in 10,887 herds enrolled in DHI test plans (2022)



50 traits calculated by CDCB

◦ 4 selection indexes

◦ 5 production traits

◦ 21 health, fertility & calving traits

◦ 22 conformation traits

◦ 25 official genetic conditions & haplotypes

Weekly genomic predictions for new genotyped animals

7.7M

DHI records in CDCB health evaluations Holstein

Monthly genomic evaluations

1.2M

DHI records in CDCB health evaluations Jersey

Triannual evaluations conventional, genomic & Interbull (in APR, AUG & DEC)

28k

DHI records in CDCB health evaluations Brown Swiss

Dairy Cows by Breed

AMONG 3,660,278 COWS WITH RECORDED BREED IN DHI HERDS (2021)

Ayrshire 5,410

Jersey 419,581

Brown Swiss 17,238

Milking Shorthorn 1,340

Guernsey 4,928

Crossbred Dairy 300,933

Holstein 2,910,848

YEAR IN REVIEW OCT 2021 / SEPT 2022

OCTOBER 2021

- CDCB published two summary reports based on U.S. cows on DHI (Dairy Herd Information), summarizing reproductive status and reasons cows exit the milking herd.
- “Improving Cow Mobility through Genetics:” Nearly 335 individuals from 26 countries registered for the 7th annual CDCB Industry Meeting.



JANUARY 2022

- Jhamal McKee joined CDCB as Junior Systems Administrator.
- Sajjad Toghiani assumed a new role as Research Geneticist at USDA AGIL*.

FEBRUARY 2022

- The 6 millionth genotype was recorded in the national cooperator database on February 19, 2022.
- CDCB transitioned accounting in-house and moved to a more paperless, electronic system.

NOVEMBER 2021

- CDCB is a founding participant of the Greener Cattle Initiative, a collaboration to accelerate solutions that reduce enteric methane emissions.

DECEMBER 2021

- With the December 7 triannual evaluations, CDCB delivered updated values – 50 individual traits and 4 selection indexes – for 75 million animals. *See page 13.*
- Residual Feed Intake (RFI) was improved with a significant number of new records, variance adjustments and higher estimated heritability, resulting in increased reliability of PTAs.
- A task force was established to explore U.S. genetic evaluations for milking speed and recommend steps to ensure data flow, data quality and publication standards. *See page 16.*
- CDCB’s Board-approved 2022 budget includes notable R&D investment in feed efficiency, hoof health and cow mobility, lactation predictions and projection factors, methane emissions and single-step GBLUP methods.

MARCH 2022

- CDCB posted new summaries of Dairy Herd Information (DHI) records, for DHI participation, state and national lactation averages, herd average summary, and milk somatic cell count.



Photo provided by Amelcor

Thank you
**Vickie
WHITE**

of the American Jersey Cattle Association (AJCA) for meticulous management of CDCB accounting over several years. João Dürr recognized Vickie’s service to CDCB during the 2022 AJCA Annual Meeting in Portland, Oregon.

*United States Department of Agriculture Animal Genomics and Improvement Laboratory

MAY 2022

- CDCB launched WebConnect on May 23 – an “overhaul” of the platform that provides the animal data, queries, statistics, trends and files used by dairy producers and industry cooperators.
- At the 2022 ICAR–Interbull meeting, CDCB research was featured in 5 presentations during the Interbull Scientific Programme.
- João Dürr was elected Board Vice President for ICAR, the International Committee for Animal Recording.

JUNE 2022

- Graduate students Tori Iqbal and Larissa Novo join CDCB as interns. *Details on page 18*
- As President of Holstein Association USA, Jonathan Lamb of Oakfield, New York, assumed the CDCB Board seat held by Corey Geiger.
- Sixteen papers presented at the American Dairy Science Association (ADSA) meeting were authored by CDCB and USDA AGIL scientists.
- George Liu of USDA AGIL received the 2022 J. L. Lush Award in Animal Breeding, sponsored annually by CDCB.

APRIL 2022

- A significant number of edits were implemented in the April 2022 U.S. evaluations, to apply the most current available data and trait definitions. *Details on page 13*
- The CDCB Board and Producer Advisory Committee (PAC) met in Saratoga Springs, New York, and toured the farms of CDCB Board member Dan Sheldon and PAC member Bill Peck.
- The PAC increased from 5 to 6 producers, enabling additional grassroots input. Spencer Hackett and Tom Kestell were appointed to the PAC.
- The CDCB Board reviewed the unusual challenges of the April evaluations and recommended further study around the phenotypic data of crossbred animals and impacts of a large number of daughters from the same herd. Moving forward, the Dairy Evaluation Review Team (DERT) will receive more results prior to publication date, to identify inconsistencies earlier.
- CDCB sponsored the ADSA® Discover Conference on genetic diversity.

JULY 2022

- CDCB hosted a virtual training on Application Programming Interface, its functionality and value.

AUGUST 2022

- Javier Burchard and Kristen Parker Gaddis presented initial hoof health project findings at the 21st International Symposium on Lameness in Ruminants.
- Evaluations for 6 health traits were expanded to Brown Swiss animals, effective with the August 9 triannual run.
- The new position of CDCB Outreach Specialist was posted to expand programs with collaborators and producers.
- The CDCB Board approved the Dairy Breed Improvement Collaboration policy to support genetic progress in the Ayrshire, Brown Swiss, Guernsey, and Milking Shorthorn breeds. *Details on page 17.*
- Rosy–Lane Holsteins, the University of Wisconsin–Madison's Arlington Dairy Farm and ABS Global production center were toured during a joint session of the CDCB Board and Producer Advisory Committee.



SEPTEMBER 2022

- Dr. Heather Adams Enzenauer joined CDCB as Applied Geneticist.
- Fifty participants attended the 5th annual workshop for genomic nominators and labs, with virtual and in-person options.

GENETIC EVALUATION CHANGES

DECEMBER 2021

- Genetic evaluations for Residual Feed Intake (RFI) improved using variance adjustments, higher estimated heritability and additional RFI records
- Evaluations discontinued for subset of ~37,000 animals genotyped exclusively with the Illumina Bovine3K BeadC and do not have genotyped progeny
- Exclusion of animals with conflicting pedigree vs. genomic breed composition
- Haplotype calls for Ayrshire Curly Calf syndrome
- New processing of verified Interbull pedigrees

APRIL 2022

- Milk-only records included in multi-trait evaluation of yield traits (versus previous requirement that fat yield was recorded)
- For non-Holstein breeds, definitions for Body Weight, Udder and Feet and Legs composites were updated to match those of breed associations
- New phenotypic editing on fertility evaluations to reduce potential bias of unreported ET events
- International evaluation processing changes in policy for Heifer Conception Rate, Cow Conception Rate and Daughter Pregnancy Rate

AUGUST 2022

- CDCB health traits extended to Brown Swiss animals, for milk fever, displaced abomasum, ketosis, mastitis, metritis and retained placenta
- In Guernseys, genomic evaluations available for Rear Leg Rear View
- In Holsteins, Feet and Legs and Udder composites updated to precisely match HAUSA's formula
- Exclusion of 900 series IDs from female domestic percentile calculation

December 6 is the final 2022 triannual evaluation

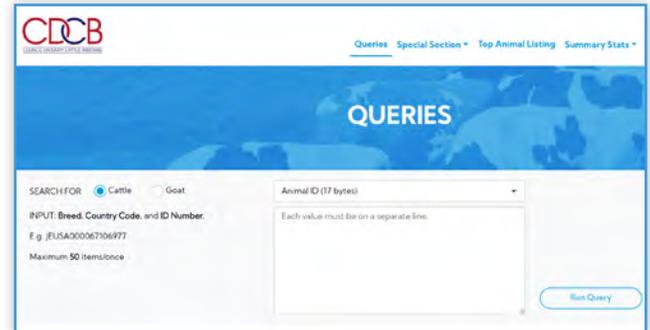


2023 TRIANNUAL EVALUATION DATES:

April 4, August 8 and December 5, 2023

WEBCONNECT TRANSITION

CDCB launched the new WebConnect platform on May 23 as an overhaul of the platform that provides the animal data, queries, statistics, trends and files used by dairy producers and industry cooperators. Developed for the modern environment, WebConnect provides more data, more customization and user-friendly formats.



A transition plan was implemented for a seamless experience to all users, with both systems running in parallel to minimize disruptions and provide users time to learn and provide input to WebConnect functionality.

In fall 2022, WebConnect completely replaces the legacy query system developed by USDA.

HOW IS WEBCONNECT ACCESSED?

Public access is available at www.uscdcb.com for all reports and statistics, animal pedigree information and evaluation results (for animals in the CDCB database). More robust users, such as genomic nominators and data providers, have log-in access to specific data.

HOW IS WEBCONNECT DIFFERENT?

CDCB objectives in creating WebConnect included:

1. Provide an up-to-date system
2. Provide easy navigation and usage of web tools
3. Enhance the user experience
4. Improve customer service
5. Provide more opportunities for data transfer and integration

Most users will notice revised query formats that are more structured and better organized, so information is easier to locate and digest. Other major improvements are easier and faster data transfer, better web access and more flexibility to download information.

WebConnect also enables more individualized reports. For years, CDCB has produced reports that document changes in U.S. dairy based on information collected through Dairy Herd Improvement (DHI) – referred to as the DHI annual reports. With WebConnect, users can calculate and view additional information not previously provided. For example, users can run breed summaries where previous summaries were across all breeds.

COLLABORATION, RESEARCH AND DEVELOPMENT

CDCB leads and supports research in dairy genetics through a multi-faceted approach:

- World-class research at USDA Animal Genomics and Improvement Laboratory
- Expanded in-house research capacity and expertise
- Partnership with experts at universities and research institutions
- Support of independent research for aligned interests

CURRENT CDCB RESEARCH COLLABORATIONS

PROJECT	DELIVERABLES	INSTITUTIONS	START DATE	END DATE
Mobility and hoof health data pipeline	Data pipeline that captures mobility and hoof health phenotypes Mobility and hoof health genetic evaluation(s) Hoof health management tools for dairy farms	CDCB University of Minnesota USDA Animal Genomics and Improvement Laboratory (AGIL)	Oct. 1, 2020	Dec. 1, 2023
Improved feed efficiency, sustainability and profitability through genetic selection	Genomic evaluation for feed efficiency in U.S. Holsteins Dairy management tools	Iowa State University Michigan State University University of Florida University of Wisconsin-Madison USDA AGIL	April 1, 2019	March 31, 2024
Genomic prediction for Johne's disease resistance via data pipeline for milk ELISA tests	Genetic evaluation for resistance to Johne's disease in U.S. Holsteins	CDCB USDA AGIL	May 1, 2019	Dec 31, 2023
Framework for predicting milk, fat and protein yields from heterogeneous data sources	Updated milk yield and component trait predictions Comparison of current milk yield and component prediction methodologies	CDCB USDA AGIL National Dairy Herd Improvement Association	Oct. 10, 2020	Dec. 31, 2024
Adoption of single-step genomic methodology	CDCB genetic and genomic selection evaluations via Single Step GBLUP methodology	CDCB USDA AGIL University of Georgia	May 23, 2022	Sept 2, 2024

MOBILITY AND HOOF HEALTH DATA PIPELINE

CDCB and University of Minnesota (UMN) College of Veterinary Medicine initiated a project in July 2021 with the end goal to develop herd management tools and a hoof health genetic evaluation.

To identify and measure a relevant genetic trait, a data pipeline is necessary to capture phenotypic information (mainly collected by hoof trimmers and relevant digital technologies), genomic data, and general production and management information.

One on-farm data source being piloted in the CDCB-UMN project is a Video Analytic Platform (VAP) by CattleEye. This system has been operational since July 2021 on the first pilot farm of 3000 cows in northwest Iowa. A comparison of CattleEye observations with hoof health data collected by trained hoof trimmers and farm managers has demonstrated the ability to differentiate between cows with and without lesions.



Locomotion scoring with Video Analytics Platform (CattleEye), Camera view.

Genomic prediction for resistance to Johne's disease:
See page 16 for the investigation into Johne's resistance by 2022 CDCB intern Larissa Novo.

Preliminary results indicate that:

1. Locomotion scores collected by the VAP are associated with hoof lesions, and are significantly higher in cows reported as having a hoof lesion.
2. There are challenges to collecting and combining data obtained from multiple different sources such as CattleEye, on-farm management software, genotypes, and hoof trimming records.
3. Further work is needed to understand the relationship between locomotion scores from the VAP and specific hoof lesion records.
4. There is an increase in the number of hoof trimmers with enhanced knowledge regarding standard trimming procedures and hoof lesions.
5. Dairy farmers, veterinarians, and hoof trimmers are gaining awareness about the CDCB-UMN hoof health project.

University of Minnesota and CDCB are actively recruiting dairy producers, veterinarians, and hoof trimmers for project participation.



Cattle Eye camera (2D)

IMPROVED FEED EFFICIENCY, SUSTAINABILITY AND PROFITABILITY THROUGH GENETIC SELECTION

CDCB's Feed Saved evaluation debuted in December 2020 to enable dairy producers to breed for more feed-efficient cows, save on feed costs and reduce dairy's environmental footprint. In one year, there was a 40% gain in records used to compute the evaluations, from 6,200 records in December 2020 to almost 8,600 records in December 2021.



Feed intake data continues to be collected at U.S. research herds and added to the CDCB database as available. CDCB and Foundation for Food and Agriculture Research (FFAR) are funding collection of genotypes and phenotypes at Michigan State University, University of Wisconsin-Madison, Iowa State University, University of Florida, and USDA Animal Genomics and Improvement Laboratory.

In April 2021, feed intake

records from more than 650 lactations in three Canadian herds were added to the reference population.

With these new data, we have been able to conduct additional analyses and determine appropriate adjustments. Similar adjustments are applied in most other traits and recommended especially when combining domestic and foreign data. This larger dataset was also used to re-estimate the heritability. This higher heritability reflects the whole dataset, including the records most recently collected, and will result in more accurate genetic (reliable) predictions. With these learnings, the Residual Feed Intake Trait was improved in the December 7, 2021, evaluations.

Continuing flow of new data is another priority, and this challenge is being approached through continued international collaboration, continuing data collection at the current research herds, and recruitment of additional research herds. Another strategy being investigated is the identification of proxy variables that could be used in addition to the intensive data currently collected at the research herds.

FRAMEWORK FOR PREDICTING MILK, FAT AND PROTEIN YIELDS FROM HETEROGENEOUS DATA SOURCES

In 2021, CDCB, USDA AGIL and NDHIA (National Dairy Herd Information Association) embarked on a project to update or develop new milk yield projection factors and develop reliable tools for on-farm management. This project will update work of more than 20 years ago to provide more accurate lactation information for the modern cow in current dairy environments.

This project involves analyzing, updating and reviewing predictions for milk, fat, protein and somatic cell count in cooperation with Dairy Records Processing Centers and Dairy Record Providers. This comprehensive approach evaluates how current production systems with new milking

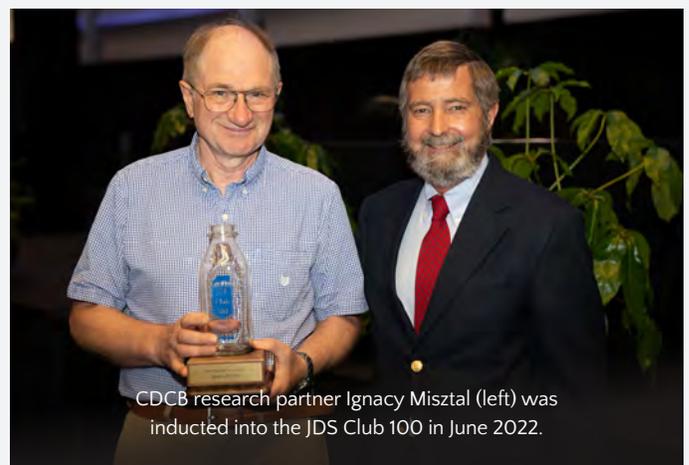
and recording procedures, as well as modern genetics, may affect methods of predicting future production.

- The first work to evaluate performance of existing statistical models that estimate daily milk yields was published August 10, 2022, by *Frontiers in Genetics: Statistical Methods Revisited for Estimating Daily Milk Yields: How Well do They Work?* Authors include Nick Wu, George Wiggans, Duane Norman, Asha Miles, Curtis Van Tassel, Randy Baldwin, Javier Burchard and João Dürr.
- Dr. Asha Miles of USDA AGIL authored "Getting Milk Yield Right," published in the June 14, 2022, *Progressive Dairy*.

ADOPTION OF SINGLE-STEP

CDCB, USDA AGIL and the University of Georgia (UGA) have collaborated since January 2019 on developing genetic and genomic evaluation methodologies, mainly focusing on single-step genomic methods.

One of the main goals of the cooperation is to assess the advantages and feasibility of implementing single-step methods in the U.S. genetic official evaluations, considering both the theoretical improvements and the scalability needed.



CDCB research partner Ignacy Misztal (left) was inducted into the JDS Club 100 in June 2022.

CDCB HEALTH TRAITS EXTEND TO BROWN SWISS

Genetic evaluations to strengthen resistance to six health disorders became available for Brown Swiss animals on August 9, 2022.

Official evaluations for these six traits have been available from CDCB for Holsteins since April 2018 and Jerseys since April 2020. After a recent feasibility analysis, the same pipelines and processes used for Holstein and Jersey health traits were extended to include Brown Swiss.

The resulting Predicted Transmitting Abilities (PTAs) are presented as percentage points above or below the breed's average resistance for that disorder, with more positive values being favorable. The larger the positive values, the more favorable the genetic resistance to the disorder.

In Net Merit, the six health traits are combined with a total weight ranging from 1.7 to 2.1%, depending on the breed.



CDCB Disease Resistance Traits

Displaced absomasum (DA)	Ketosis (KETO)
Hypocalcemia, or milk fever (MFEV)	Mastitis (MAST)
	Metritis (METR)
	Retained placenta (RETP)

EVALUATIONS FOR MILKING SPEED: NEXT R&D STEPS

Dairy producers actively use milking speed (MS) metrics to guide their management and make economic decisions; however, the U.S. does not currently have genetic evaluations for milking speed.

The Milking Speed Evaluations Task Force was appointed in October 2021 to review the possibility of implementing U.S. genetic evaluations for milking speed in all dairy breeds and recommend the necessary steps to make this happen.

The long-term goal is to provide accurate, low-cost genomic evaluations for MS that can be predicted at birth. Following analysis of preliminary data, the task force concluded that considerable research is required to develop a clear phenotype definition and identify the relevant data types and quality control/assurance measures required to standardize and integrate these data into the existing national evaluation system.



In August 2022, the CDCB Board decided to support the task force's research proposal with the following objectives:

- Assemble a high-resolution dataset pertinent to MS representing different dairy breeds, equipment manufacturers, parlor types, and milking management strategies
- Characterize MS for herds grouped by equipment manufacturer and parlor type and assess the impact of additional system effects on the phenotype
- Characterize any biological effects that impact MS, especially concerning udder health
- Standardize MS trait definition and estimate heritability to determine its suitability for selection

GREENER CATTLE INITIATIVE TO MITIGATE METHANE

CDCB is a founding participant of the Greener Cattle Initiative, a collaboration to accelerate solutions that reduce enteric methane emissions – the largest source of direct greenhouse gas emissions in the beef and dairy sectors. This initiative was announced in November 2021 by the Foundation for Food & Agriculture Research (FFAR) and the Innovation Center for U.S. Dairy.

The Greener Cattle Initiative has pledged to award approximately \$5 million over the next 5 years for research in the following areas:

- Genetic selection of cattle that emit less methane
- Feed additives and supplements that inhibit enteric methane emissions
- Feed ingredients that alter metabolic pathways to reduce enter methane emissions
- Increased understanding of microbiome composition and activity in cattle
- Technologies such as sensors, robots and artificial intelligence to monitor enteric methane emissions or related physiological indicators
- Socioeconomic analysis of enteric methane mitigation practices and technologies

Founding Participants include ADM, CDCB, Elanco, Genus PLC, the National Dairy Herd Information Association, Nestlé and the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC).

Learn more at <https://foundationfar.org/consortia/greener-cattle-initiative/>

COLLABORATION FOR DAIRY BREED IMPROVEMENT

The Dairy Breed Improvement Collaboration was created to benefit breeders and support genetic progress in the Ayrshire, Brown Swiss, Guernsey, and Milking Shorthorn breeds.

This new program has been led by CDCB with collaboration across all its member sectors – Purebred Dairy Cattle Association, National Association of Animal Breeders (NAAB), Dairy Records Providers and Dairy Records Processing Centers.

There are more tools than ever to accelerate genetic progress with the evolution of genotyping, genomic evaluations and advanced reproductive techniques. However, larger data streams and a higher number of records are key to maximize accuracy and genetic progress.

“We recognize it is more challenging for breeds with smaller populations to take full advantage of these tools,” stated Jay Weiker, President of NAAB and Chair of the CDCB Board of Directors. “We want to do our part to support all dairy breeds, provide value-driven access and increase participation in the programs that support breed improvement.”

Key objectives

The new Dairy Breed Improvement Collaboration has these main objectives:

- Greater participation in programs that support breed improvement – identification, registration, type classification, DHI, genomic testing, NAAB cross reference
- Value-driven access to CDCB genomic evaluations for bulls of smaller-population breeds
- Technical support in genetic improvement strategies

An important element for genetic progress is to increase the number of bulls that are genotyped and receive genomic evaluations. To support this, CDCB provides a credit of \$400 on the A.I. service fees (from the standard of \$800 per domestic bull) for Ayrshire, Brown Swiss, and Guernsey bulls declared active for A.I. service. Milking Shorthorns would become eligible when the breed starts genomic evaluations. With this program, bulls will be enrolled in the NAAB cross-reference database and obtain an NAAB code, which is necessary for phenotypic data (performance records) to flow through the DHI system and into the CDCB database for genetic evaluations. The increased quantity of records result in improved accuracy of both male and female genomic evaluations.



Photo provided by Brown Swiss Cattle Breeders Association

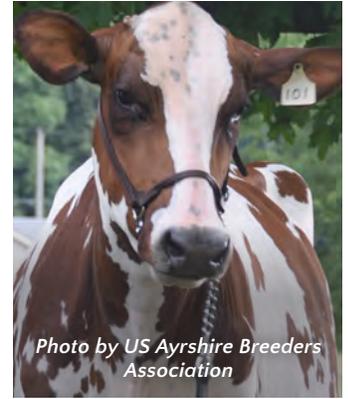


Photo by US Ayrshire Breeders Association

Additionally, CDCB will offer technical assistance to the breed associations as they determine genetic improvement strategies, develop breed-specific indices and implement genetic selection programs that support goals set by the breeders.

Expectations for breeders

The four breed associations demonstrated their commitment, through adoption of these requirements intended to increase genomic testing and participation in the industry programs that advance breed improvement.

- A.I. bulls must be genotyped to be registered
- Progeny of A.I. bulls can only be registered if the sire is enrolled in the NAAB cross reference program
- Bull's dam and sire must be registered



Jay Weiker of NAAB and João Dürr of CDCB met with Milking Shorthorn breeders during their June 24 annual meeting to provide a genetic update and describe the new collaboration to support genetic improvement.

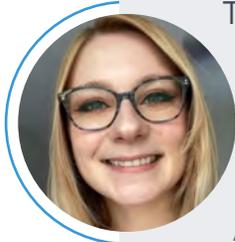
Strategic, collaborative approach

This effort began in 2021 through a task force appointed by the CDCB Board of Directors (see page 7). The Dairy Breed Improvement Collaboration policy was approved by the CDCB Board in August 2022.

This initiative brings together all sectors committed to dairy cattle improvement to reinforce the fundamentals of genetic progress and offer a special hand to those breeds that are not yet optimizing the modern breeding and genetic technologies.

CDCB INTERN PROGRAM: SUPPORTING NEXT GENERATION SCIENTISTS

For the sixth year, CDCB offered internships in 2022 to two aspiring geneticists. CDCB interns have a unique opportunity to work directly with leading scientists at CDCB and USDA AGIL and conduct research in their area of interest. It's rewarding and inspiring to support this talented younger generation!



TERMINATION CODE FREQUENCIES

VICTORIA IQBAL

*PhD student in Animal and
Avian Sciences*

University of Maryland

ADVISOR: Dr. Li Ma

During the CDCB internship in summer 2022, I analyzed the termination codes (the reason why cattle left the herd) and made connections to common health traits as to why they left the herd.

The first part of my analysis included finding the termination code frequencies for 2021. As for the heifers, only 400 were coded for why they left the herd. More termination codes were added in 2020, as well as a secondary termination code to further specify reasons animals exited the herds. Unfortunately, these new codes have not been utilized. Throughout all lactations, the top reason why cattle left the herd was unspecified, followed by low production. In lactation four, death is the top reason why the cattle exit the herd. As for differences between breeds, there were not significant breed differences recorded in 2021.

With the help of Kristen Gaddis, Duane Norman, Nick Wu, Javier Burchard and João Dürr, I will continue my work with this project to create a model that indicates the largest influences of why cattle leave the herd. I hope this data will encourage producers to more consistently code the reason(s) their cattle left the herd and perhaps help reduce the exits due to involuntary reasons.

Working at the CDCB has enabled me to work with a real-world dairy management topic and taught me more skills on data interpretation. I look forward to continuing this project for my thesis at the University of Maryland and applying my knowledge as a future researcher and geneticist.



INVESTIGATION INTO JOHNE'S DISEASE

LARISSA NOVO

*PhD student in Animal Breeding
and Genetics*

University of Wisconsin-Madison

ADVISOR: Dr. Francisco Peñagaricano

During this summer at CDCB, I conducted a project to investigate the incidence of Johne's disease in U.S. dairy cattle. Johne's disease is a chronic, contagious condition caused by a bacterium and can evolve to extreme symptoms and death. Using the large CDCB database allowed us to investigate possible factors that influence the incidence of Johne's disease, such as age, milk production, stage of lactation and breed. An in-depth phenotypic analysis was also performed to explore three different types of statistical models with the inclusion of different traits to be used in the future

Ultimately, we explored alternatives for variance components estimation for Holstein, Jersey and Brown Swiss cows, with or without the use of genomic information. Our preliminary results suggest that a single-step approach is feasible in Jersey and Holstein, but not for Brown Swiss cows due to limited animals with information collected. The database shows almost 402,000 Holstein and 12,000 Jersey cows tested for Johne's disease. Initial results seem to show that there is room for U.S. Jersey cows to be genetically selected with preliminary heritabilities of 0.07 to 0.14. We also had an updated estimation of heritability for Holstein cows, around 0.04. For both Holsteins and Jerseys, we were able to incorporate genomic information to pedigree for a better estimation of heritabilities that can be used in the future for official evaluations with minor adjustments. Next steps are to obtain reliabilities for the estimations for Johne's disease incidence

Outside this work with CDCB, I plan to keep studying new traits and possible ways to improve genetic selection against metabolic diseases.

MEETING ON COW MOBILITY ATTRACTS INTEREST FROM 26 COUNTRIES

Nearly 335 individuals from 26 countries registered in this 7th annual CDCB Industry Meeting, held virtually on October 20, with the theme “Improving Cow Mobility through Genetics.”

The agenda included:

- **Hoof Health:** Using data to make decisions and document change, Dr. Gerard Cramer, University of Minnesota [Recording](#)
- **Lameness:** Data collection and genetics, Dr. Kristen Parker Gaddis, CDCB [Recording](#)
- **Academically verified autonomous livestock monitoring,** Terry Canning, CattleEye [Recording](#)
- **Roundtable: Selection for improved hoof health in dairy cattle,** with dairy producer Josh Vander Well, Terry Canning, Gerard Cramer and Kristen Parker Gaddis, and moderated by Javier Burchard [Recording](#)
- **USDA AGIL research updates,** Dr. Asha Miles, [Recording](#)



Dr. Gerard Cramer



Dr. Kristen Parker



Terry Canning,



Josh Vander Well



Javier Burchard



Dr. Asha Miles

Review post-event news articles

Hoard's Dairyman. Data that Digs into the Root of Lameness. By Katelyn Allen

No dairy farmer wants lame cows in their barn. No consumer wants to see cows struggling with lameness, either. Both of those concerns are at the center of the Council on Dairy Cattle Breeding's (CDCB) effort to reduce hoof issues through genetic selection. [Read the complete article](#)

Hoard's Dairyman. Lameness: It's Time to Take Action. By João Dürr, CDCB

“It's time for the dairy industry to take action,” emphasized Gerard Cramer, D.V.M., of the University of Minnesota.

Cramer was describing a new initiative to address lameness – a condition that affects about 50% of dairy cows during their productive life and results in economic losses, health concerns, and suboptimal animal welfare.

[Read the complete article](#)

Review CDCB-UMN lameness project update on page 14



Workshop organizers Kaori Tokuhisa (at podium) and José Carrillo (standing, right) share recent metrics through the CDCB quality certification program for genomic nominators and genotyping laboratories.

50 ATTENDEES JOIN HYBRID NOMINATOR, LAB WORKSHOP

CDCB hosted its 5th annual workshop for genomic nominators and labs on September 7 and 8, 2022. Of the 51 participants, 33 joined virtually and 18 attended in-person near Baltimore, Maryland. The participants represented breed associations, artificial insemination companies, genotyping laboratories and National Association of Animal Breeders (NAAB).

“Our system is unique with robust standards and expectations to maintain integrity of the CDCB database and evaluations,” said José Carrillo, CDCB Chief Data Officer. “We are continually working to improve our services and communication, and this workshop allows us to interact with and learn from the CDCB collaborators that are vital to delivering quality U.S. genomic evaluations.”



VIEW MEETING RECORDINGS ON CDCB YOUTUBE

Diverse topics, presenters headline the program

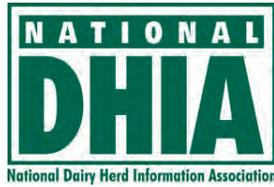
The agenda included several topics important to maintain data quality, evaluation accuracy and streamlined information flow, with frequent discussion periods.

- CDCB Quality Certification program
- Web Connect implementation
- Evaluation updates
- Future developments
- NAAB Dairy Cross Reference Database
- CDCB and A.I. service fees
- Dairy Breed Improvement Collaboration



NDHIA ANNUAL MEETING

The National Dairy Herd Information Association (NDHIA) annual convention was held February 21–24, 2022, in San Antonio, Texas, with about 100 producers, DHI officials and industry personnel in person and 90 others online. The event included the NDHIA business meeting and the DHI Leadership System sessions focused on data, identification technology and innovation. CDCB presenters included:



- JOÃO DÜRR summarized recent updates including CDCB computing power, Net Merit revision and the new Dairy Breed Improvement Collaboration.
- FIONA GUINAN (previous CDCB intern and PhD candidate) presented the new CDCB WebConnect.
- DUANE NORMAN, described the foundation of the U.S. system, “Dairy Data History for Production and Genetics.”

ADSA DISCOVER: GENETIC DIVERSITY

CDCB was a sponsor of “Managing Genetic Diversity for Future Dairy and Livestock Breeding,” hosted by American Dairy Science Association® on April 19–21, 2022. The conference attracted 100 registrants (In-person and virtual live access) representing 9 countries, 24 U.S. states and 20 universities. “Changes in genetic trends and inbreeding in US dairy cattle since the implementation of genomic selection,” was one of 5 posters accepted for review at the event, authored by a team from CDCB, USDA AGIL and University of Georgia.



PUBLISHED REVIEW: GENOMIC SELECTION IN U.S. DAIRY CATTLE

Frontiers in Genetics published a review by George Wiggans and José Carrillo on September 9, 2022: [Genomic Selection in U.S. Dairy Cattle](#). This review describes the specific impacts and future opportunities around genomic selection, providing historical context, current statistics and trends, explanation of benefits and methods to increase evaluation accuracy.



ICAR-INTERBULL

U.S. dairy was well-represented at the 2022 ICAR-INTERBULL meeting in Montreal, Canada, from May 30 through June 3. CDCB research was featured in 6 presentations during the Interbull Scientific Programme.

- JOÃO DÜRR: Considerations in using quantitative measurements of milking speed for genetic evaluations for all dairy breeds in the USA, summarizing findings of the CDCB Milking Speed Task Force (João Dürr, Robert Fourdraine, Steven Sievert, Kristen Gaddis, Jeffrey Bewley, Sophie Eaglen, Jay Weiker, Jana Hutchison, and Asha Miles).
- JOÃO DÜRR: Genetic gains in lifetime merit indexes during the use of three genetic evaluation methods, work in collaboration with H. Duane Norman of CDCB and Fiona Guinan of University of Wisconsin-Madison.
- JOSÉ CARRILLO: Adding and reporting genomically discovered ancestors in U.S. evaluations on behalf of collaborators Rodrigo Mota, George Wiggans and Lillian Bacheller of CDCB and Gary Fok, Dan Null, Emmanuella Ogwo and Paul VanRaden of USDA AGIL.
- GEORGE WIGGANS: Detecting relationships among genotypes in a rapidly growing collection, collaborative work with Gerald Jansen, Lillian Bacheller, and José Carrillo image if space allows: 2022 Interbull George Wiggans.
- XIAOLIN “NICK” WU: An exponential regression model to estimate daily milk yields in dairy cows, work with George Wiggans, H. Duane Norman, Javier Burchard and João Dürr of CDCB, and Asha Miles, Curtis Van Tassell, and Ransom Baldwin of USDA AGIL.
- IGNACY MISZTAL, University of Georgia: Single-step genetic evaluation using the CDCB data, on behalf of D. Lourenco, S. Tsuruta and, M. Bermann at UGA, A. Cesarani at University of Sassari, A. Legarra at INRA, Ezequiel Nicolazzi of CDCB and Paul VanRaden of USDA AGIL.



João Dürr of CDCB was elected Vice President of the 11-person Board of ICAR.



Robert Fourdraine of Dairy Records Management System received the 2022 ICAR Presidents Award.



Ezequiel Nicolazzi of CDCB continues a second year representing the U.S. on the Interbull Steering Committee.

2022 ADSA ANNUAL MEETING

Several scientists from CDCB and USDA AGIL* were among the presenters at the 2022 Annual Meeting of the American Dairy Science Association® (ADSA®), in June 2022, in Kansas City, Missouri.



PRESENTER

PRESENTATION

<p>Fiona Guinan, <i>previous CDCB intern and PhD candidate</i></p>	<p>Genetic trends, generation interval, and inbreeding changes since the implementation of genomic selection in US dairy cattle</p>
<p>Sydney Jewell, <i>previous CDCB intern</i></p>	<p>Indicators of udder health as predictors of subsequent lactation performance</p>
<p>Rodrigo Mota, <i>CDCB Applied Geneticist</i></p>	<p>Accuracy of genomic predictions including or excluding foreign data in reference populations</p>
<p>H. Duane Norman, <i>CDCB Technical Advisor and Industry Liaison</i></p>	<p>Genetic gains for milk traits from various genetic evaluation methods</p>

WCGALP

The premier international genetic conference covering livestock species, World Congress on Genetics Applied to Livestock Production, was held July 3–8 in Rotterdam, The Netherlands. Sessions included plenary speakers, species-orientated sessions, and papers on animal breeding challenges like large-scale phenotyping and use of whole genome sequence data, and discussions on the contribution that genetics can make to societal challenges, like animal welfare, climate change, biodiversity or control of infectious diseases.

CDCB AND AGIL SCIENTISTS PRESENTED 7 TOPICS:

- [Changes in genetic trends for dairy cattle in the U.S. since the implementation of genomic selection](#) Guinan, F.L.; Wiggans, G.R.; Dürr, J.W.; Norman, H.D.; Cole, J.B.; Van Tassell, C.P.; Misztal, I.; Lourenco, D.
- [Comparison of single-step and multi-step evaluations for U.S. milk, fat, and protein](#) Mota, R.R.; Cesarani, A.; Vanraden, P.M.
- [Options for evaluating multiple breeds in a single-step GBLUP for US dairy population](#) Cesarani, A.; Lourenco, D.; Vanraden, P.M.; Nicolazzi, E.L.; Legarra, A.; Tsuruta, S.; Misztal, I.
- [Estimates of genetic parameters for feeding behavior traits and its association with feed efficiency in Holstein cows](#) Cavani, L.; Brown, W.E.; Parker Gaddis, K.L.; Tempelman, R.J.; VandeHaar, M.J.; White, H.M.; Peñaricano, F.; Weigel, K.A.
- [Patterns of inbreeding and selection using runs of homozygosity in North American dairy cattle](#) Lozada-Soto, E.A.; Tiezzi, F.; Cole, J.B.; Vanraden, P.M.; Maltecca, C.
- [Recent advances and future needs in genotype imputation](#) Vanraden, P.M.; Null, D.J.; Al-Khudhair, A.S.
- [The rising popularity of embryo transfer in U.S. dairy cattle and implications for national fertility evaluations](#) Miles, A.M.; Hutchison, J.L.; Vanraden, P.M.

PROJECTS BY CDCB AND AGIL RESULTING IN PUBLICATION

- [Mastering Mastitis: How genetics can help and where we go from here](#). 61st National Mastitis Council, San Diego, CA. February 2022. A.M. Miles and K.L. Parker Gaddis.
- [Multibreed genomic evaluation for production traits of dairy cattle in the U.S. using single-step genomic best linear unbiased predictor](#). Journal of Dairy Science, March 10, 2022. Cesarani A, Lourenco D, Tsuruta S, Legarra A, Nicolazzi EL, VanRaden PM, Misztal I.
- [Genetic evaluations of stillbirth for five US dairy breeds: A data-resource feasibility study](#). Frontiers in Genetics – Livestock Genomics. April 11, 2022. A. Sigdel, X.L. Wu, K.L. Parker Gaddis, H.D. Norman, J.A. Carrillo, J.F. Burchard, F. Peñaricano, and J.W. Dürr
- [Sustainable dairy breeding: working within the US National Evaluation System](#). Journal of Dairy Science abstract. June 6, 2022. A.M. Miles
- [Multiple-trait random regression modeling of feed efficiency in US Holsteins](#). Journal of Dairy Science. July 1, 2022. P. Khanal, K.L. Parker Gaddis, M. Vandehaar, K.A. Weigel, H.M. White, F. Peñaricano, J. Koltes, J. Santos, R. Baldwin, J.F. Burchard, J.W. Dürr, R. Tempelman
- [Preliminary evaluations and progress in the incorporation of camera-based locomotion scores and hoof lesions into a national database](#). Lameness in Ruminants Conference, Bloomington, MN, August 2022. K.L. Parker Gaddis, J.F. Burchard, E. Shepley, R. McMillan, and G. Cramer
- [Statistical methods revisited for estimating daily milk yields: How well do they work?](#) Frontiers in Genetics, August 10, 2022. X.L. Wu, G.R. Wiggans, H.D. Norman, A.M. Miles, C.P. Van Tassell, R.L. Baldwin, J.F. Burchard, J.W. Dürr
- [Estimates of genetic parameters for feeding behavior traits and their associations with feed efficiency in Holstein cows](#). Journal of Dairy Science, September 2022. Cavani, L., W.E. Brown, K.L. Parker Gaddis, R.J. Tempelman, M.J. VandeHaar, H.M. White, F. Peñaricano, and K.A. Weigel
- [Changes in genetic trends in US dairy cattle since the implementation of genomic selection](#). Journal of Dairy Science. September 6, 2022. F.L. Guinan, G.R. Wiggans, H.D. Norman, J.W. Dürr, J.B. Cole, C.P. Van Tassell, I. Misztal, and D. Lourenco
- [Genomic selection in U.S. dairy cattle](#). Frontiers in Genetics. September 9, 2022. G.R. Wiggans and J.A. Carrillo.

2022 AMERICAN DAIRY SCIENCE ASSOCIATION

- [Genetic trends, generation interval, and inbreeding changes since the implementation of genomic selection in US dairy cattle](#), F.L. Guinan, G.R. Wiggans, H.D. Norman, J.W. Dürr, J.B. Cole, C.P. Van Tassell, I. Misztal, A. Cesarani, and D. Lourenco
- [Genetic gains for milk traits from various genetic evaluation methods](#), H.D. Norman, F.L. Guinan, and J.W. Dürr
- [Mixed-model GWAS on milk production traits of 1.16M genotyped Holstein cattle](#), J. Jiang, J. Cheng, C. Maltecca, L. Ma, P.M. VanRaden, and J.R. O'Connell
- [SLEMM: Million-scale genomic best linear unbiased predictions with window-based SNP weighting](#), J. Cheng, C. Maltecca, P. Vanraden, J. O'Connell, L. Ma, and J. Jiang
- [Single-step genomic evaluation of crossbreed dairy cattle in the US](#), A. Cesarani, D. Lourenco, S. Tsuruta, A. Legarra, E.L. Nicolazzi, P.M. VanRaden, and I. Misztal
- [Evidence of selection against recessive defects](#), H.D. Norman, D.J. Null, and P.M. VanRaden
- [Changes in herd statistics for dairy cattle in the US](#), F.L. Guinan, G.R. Wiggans, H.D. Norman, J.B. Cole, T.M. McWhorter, J.W. Dürr, and D. Lourenco
- [Indicators of udder health as predictors of subsequent lactation performance](#), S. Jewell, H.D. Norman, and K.L. Parker Gaddis
- [Accuracy of genomic predictions including or excluding foreign data in reference populations](#), R.R. Mota and P.M. VanRaden
- [Estimates of genetic parameters for feeding behavior traits and its association with feed efficiency in Holstein cows](#), L. Cavani, W.E. Brown, K.L. Parker Gaddis, R.J. Tempelman, M.J. VandeHaar, H.M. White, F. Peñaricano, and K.A. Weigel
- [Improved, expanded, and automated ancestor discovery](#), D.J. Null, G.R. Wiggans, E.O.O. Ogwo, and P.M. VanRaden
- [Current state of inbreeding, genetic diversity, and selection history in all major breeds of US dairy cattle](#), E.A. Lozada-Soto, C. Maltecca, J.B. Cole, P.M. VanRaden, and F. Tiezzi
- [Functional annotation of regulatory elements in cattle genome during rumen development](#), G. Liu
- [Flexible testing and use of milk-only records](#), P.M. VanRaden, G.C. Fok, L.R. Bacheller, G.B. Jansen, and J.A. Carrillo
- [Phenotypic and genotypic impact of milk components and bodyweight composite on dry matter intake](#), S. Toghiani, P.M. VanRaden, K.L. Gaddis, M. J. VandeHaar, and R. J. Tempelman
- [The increasing popularity of embryo transfer has implications for US dairy cattle fertility evaluations](#), A.M. Miles, J.L. Hutchison, and P.M. VanRaden

OUTREACH

JOÃO DÜRR presented “New phenotypes in dairy cattle genetic evaluation and possible applications in countries importing genetics” for the Brazilian Society of Animal Breeding. [October 19, 2021](#)

RODRIGO MOTA presented “Adding genomically discovered maternal grandsires and maternal great grandsires” at a visionary global conference hosted by Iowa State University. [November 3-4, 2021](#)

EZEQUIEL NICOLAZZI spoke on U.S. genetics at his alma mater, Università Cattolica del Sacro Cuore in Italy. [November 19, 2021](#)

KRISTEN PARKER GADDIS was a guest on BoviNews podcast, “Managing Lameness in Your Herd.” [December 7, 2021](#)



JOÃO DÜRR presented during a training by the Brazilian Ministry of Agriculture for technical staff involved in animal health and import trade regulations. [February 2022](#)

JOÃO DÜRR spoke on the impact of public-funded research on dairy production, invited by the National Institute of Food and Agriculture, a U.S. government body with oversight of federally-funded agricultural research. [March 8, 2022](#)

JOSÉ CARRILLO presented during the Animal Breeding and Genetics Seminar at North Carolina State University. [March 23, 2022](#)

EZEQUIEL NICOLAZZI, along with Jay Weiker of NAAB and Tom Lawlor of Holstein Association USA, were guests on the BoviNews podcast “April 2022 Genetic Evaluation Recap.” [April 22, 2022](#)

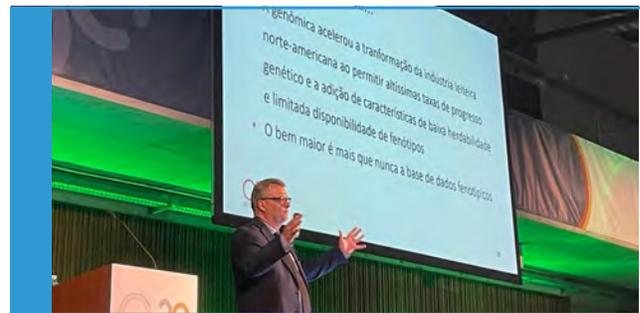
KRISTEN PARKER GADDIS was the invited lecturer on genomics for the Training Center for Agro Zootechnical Development in Italy. [April 27, 2022](#)

JOÃO DÜRR was one of 5 industry representatives invited to an Animal Breeding and Genetics (ABG) curriculum review at Iowa State University. [June 2022](#)

JOÃO DÜRR and Jay Weiker updated Milking Shorthorn breeders on genetic trends and opportunities, during their annual meeting. [June 24, 2022](#)

JOÃO DÜRR spoke at the 30th anniversary celebration of ABLN in Portugal, describing “Prospects for the genetic evaluation of dairy cattle from the U.S. point of view.” [July 2022](#)

KRISTEN PARKER GADDIS presented an update on the metabolic health traits and feed efficiency evaluations at a nutrition conference in Merida, Mexico. [September 29, 2022](#)



CDCB PUBLICATIONS: POPULAR PRESS

[Can we find genetic solutions to lameness?](#) By Javier Burchard. *Hoard's Dairyman*. [Sept. 16, 2021](#)

[Lameness: It's Time to Take Action.](#) By João Dürr. *Hoard's Dairyman*. [October 28, 2021](#)

[We're making strides on improving Feed Saved.](#) By Kristen Parker Gaddis. *Hoard's Dairyman*. [December 6, 2021](#)

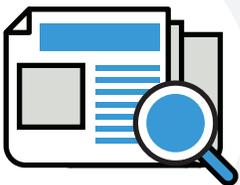
[More breeds need genetic evaluations for stillbirth.](#) By H. Duane Norman. *Progressive Dairy*. [January 20, 2022](#)

[What's new in April's genetic evaluations?](#) By Ezequiel Nicolazzi. *Hoard's Intel*. [April 4, 2022](#)

[How can genetics reduce lameness?](#) By Javier Burchard, *Hoard's Dairyman*, [June 13, 2022](#)

[Leverage genetic tools to breed healthier cows.](#) By Kristen Parker Gaddis. *Hoard's Dairyman*. [August 8, 2022](#)

[How do genetics impact sustainability goals?](#) By João Dürr and H. Duane Norman. *Hoard's Dairyman*,



FINANCIAL REPORT

Below is a summary of the Council on Dairy Cattle Breeding (CDCB) audited financial statements for fiscal year 2021 and 2020.

During 2019, CDCB entered into an agreement with DataGene Limited for computer programming/software development, which continued into 2021. The cost of the software is included in Property and Equipment. depreciation expense will not be recognized until the software is placed into service. Research/Grant agreements continued in 2021 with Michigan State University and included new projects with University of Minnesota, the Greener Cattle Initiative, and the review of the milk projection factors.

Financial statements are prepared monthly and reviewed by the CDCB Board of Directors. In addition, Tidwell Group, LLC performed an audit for the year ended December 31, 2021 and 2020. The audit report documents the financial statements are presented fairly, in all material respects, the financial position of Council on Dairy Cattle Breeding as of December 31, 2021 and 2020, and the changes in its net assets for the years then ended in accordance with accounting principles generally accepted in the United States of America.

2021 OPERATING REVENUE

2021 operating revenue increased 18% compared to 2020. CDCB implemented a fee structure change in June 2019, with full impact in 2020.

2021 EXPENSES

Total expenses increased 13% during 2021 due to additional staffing and contract programmers, as well as an increase in data records access, public relations and website development and research and development expenditures. However, due to COVID-19 travel expense for both board and staff were greatly reduced compared to prior years.

INVESTMENTS

CDCB investment portfolio managed by Morgan Stanley reported market gains, as well as unrealized gain on investments.

2021 AND 2020 AUDITED FINANCIAL STATEMENTS

ASSETS	2021	2020
Cash	\$ 2,092,668	\$ 2,406,918
Investments, at fair value	7,762,768	5,819,381
Accounts Receivable	1,003,523	779,888
Property & Equipment (net book value)	1,099,347	232,387
Other	119,534	142,762
Total Assets	<u>\$ 12,077,840</u>	<u>\$ 9,381,336</u>
LIABILITIES & NET ASSETS		
Accounts payable	\$301,248	\$176,611
Long-Term Payable	50,000	75,000
Accrued Expenses	22,118	6,097
Total Liabilities	<u>373,366</u>	<u>257,708</u>
Unrestricted Net Assets	<u>11,704,474</u>	<u>9,123,628</u>
Total Liabilities & Net Assets	<u>\$12,077,840</u>	<u>\$9,381,336</u>
REVENUES		
Service Fees	\$7,149,008	\$6,061,617
Other	3,252	15,649
Investment Income	<u>107,272</u>	<u>77,879</u>
Total Revenues	<u>\$7,259,532</u>	<u>\$6,155,145</u>
COST OF OPERATIONS		
Salaries, Service and Administration	\$4,448,351	\$4,125,170
Research and Development	502,760	290,318
Depreciation	63,377	38,137
Total Cost of Operations	<u>\$5,014,488</u>	<u>\$4,453,625</u>
Change in Net Assets from Operations	<u>\$ 2,245,044</u>	<u>\$ 1,701,520</u>
Other Income (Expense) Net realized and unrealized loss on investments	335,802	340,728
Change in Net Assets	<u>\$2,580,846</u>	<u>\$2,042,248</u>
Net Assets, beginning	\$9,123,628	\$7,081,380
Net Assets, ending	<u>\$11,704,474</u>	<u>\$9,123,628</u>

Financial report provided by Vickie White,
AJCA-NAJ Treasurer

CDCB VISION

To be the leading source of genetic information for dairy improvement.

CDCB MISSION

To drive global dairy cattle improvement by using a collaborative database to deliver state-of-the-art genetic merit and performance assessments for the herd decision making.

CDCB CORE VALUES

Providing premier dairy genetic information services and industry collaboration.

CDCB VALUES

Dairy-driven
Science-based
Cooperative

Transparent
Data-driven



USCDCB.COM

4201 Northview Drive
Suite 302
Bowie, MD 20716
240.334.4164

