



COUNCIL ON DAIRY CATTLE BREEDING ACTIVITY REPORT

OCT2020/SEP2021



COUNCIL ON DAIRY CATTLE BREEDING

USCDCB.COM

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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 2021 CDCB Industry Meeting held virtually on October 20, 2021.

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.**

WORD FROM THE CHAIR *Jay Weiker*



The past year reinforced that the only constant in life is change. This applied to personal, professional and business decisions made by producers and allied industry throughout the year. The resilience of the dairy community has been nothing short of incredible.

Following years of development, CDCB

introduced the evaluation for Feed Saved in December 2020. Then Residual Feed Intake (RFI) was included in the updated Net Merit \$ index in August 2021. As with the inclusion of any new trait in an index, it will take some time to analyze what the trait is telling us. The ongoing analysis of RFI and Feed Saved will provide insight into future adjustments to refine and enhance the components of the Net Merit \$ index. Another result of this process was the introduction of “relative emphasis” to list traits in selection indices.

An increasing amount of genotype data is being submitted to CDCB every year. In October 2018, nearly 2.6 million genotypes had been submitted. By October 2021, the figure is over 5.2 million genotypes. Over a 3-year period, the number of genotypes submitted has doubled! The adoption of genotyping of females has driven this continued growth.

CDCB is committing some financial reserves to programming projects that will help process more data more efficiently. CDCB launched a “Web Connect Project” that involved extensive programming to reinvent all web services, especially the query system used to access CDCB evaluation results. This project is in the testing phase with anticipated implementation early in 2022.

CDCB and the AGIL researchers effectively utilize the data that is available, but for many

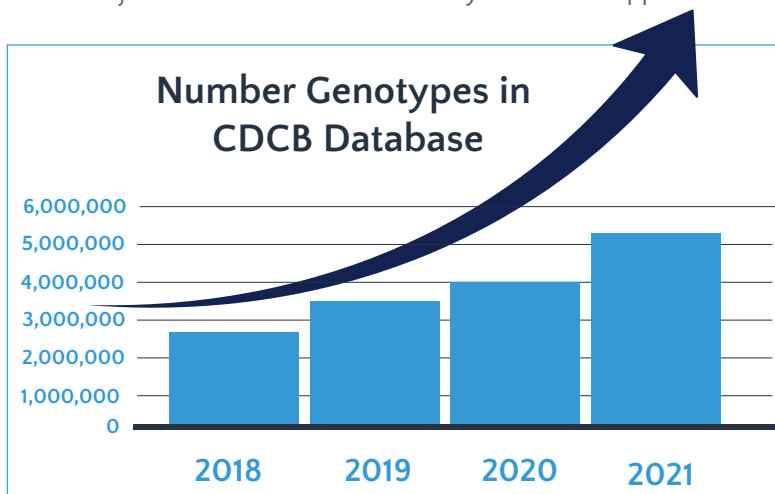
of the new traits being researched, the data is either not collected or it is not flowing to CDCB. In both instances, CDCB is evaluating new and innovative ways to collect this data. Good data from more sources will contribute to the continued success of the CDCB genomic evaluation system.

The collection of phenotypic data continues to evolve.

Moving forward it will be critical for the data collection and processing systems to keep pace with the constantly evolving management and reproduction practices utilized by producers.

Most databases and data collection systems were developed years or decades ago – before many of the current management practices were introduced. Robotic milking systems, activity monitors, sexed semen, and beef on dairy are just a few changes that can provide more data that would be interesting to utilize in research. CDCB is also developing a pipeline to report hoof treatment events that can be used in a hoof health evaluation.

One early goal for the year was to work with the industry and producers to establish clear processes to identify new traits to be developed – utilizing a process that is transparent and aligned with stakeholders from the beginning. Recently, task forces were established to develop a new trait and to review policies that impact breeds with fewer total animals, so they can also utilize the CDCB resources to maximize genetic progress within their breed. This process of involving industry and committees in the initial development of traits and the data collection to produce these traits is producing early results and appears to be a model for the future.



CDCB is in a sound financial position and has plans to utilize 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 of the national genetic evaluations produced by CDCB.

	HO	JE	BS	AY	GU	ALL BREEDS
Oct. 2018	2,245,665	297,408	38,514	8,904	4,258	2,594,749
Oct. 2019	2,825,645	356,515	43,647	8,649	4,335	3,238,791
Oct. 2020	3,532,302	444,910	49,100	9,355	5,234	4,040,901
Oct. 2021	4,578,410	555,195	56,666	12,278	6,343	5,208,892

CEO COLUMN João Dürr



“If you are not willing to risk the unusual, you will have to settle for the ordinary.”

– Jim Rohn

When USDA published the first genomic evaluations in 2009, it generated a mixed reaction worldwide. Enthusiasts of new technologies were amazed at the speed with which

industry and scientists collaborated diligently to genotype thousands of bulls and develop the statistical methods necessary to predict future performance of young bulls and cows based primarily on their genetic markers.

There were skeptics as well. It seemed too risky to bid so high on bulls that had no daughters born – rather than playing it safe using progeny-tested bulls that had proven themselves through performance of hundreds, or thousands, of daughters.

After a little more than a decade, genomic testing is now a routine management tool adopted in a growing number of herds. Young genomic bulls completely dominate the semen market. The boldness of the U.S. dairy industry and the trust in its scientists paid off big-time. North American genetics expanded its leadership across the planet.

Change is always unsettling.

Visionaries and innovators, however, seize opportunities when they are presented and thus hold the pens that write the history books.

This past year, U.S. dairy was offered another historical opportunity. After a significant research effort involving several universities and research centers, CDCB implemented genomic evaluations for Feed Saved in December 2020, addressing a long-time demand of producers that want to improve cows' efficiency in transforming feed into milk and components. Feed is invariably the highest expense item in milk production, and breeding feed-efficient cows is expected to have a high impact on herd profitability.

Additionally, efficient cows reduce dairy's carbon footprint, which is a universal goal of our times.

With a reference population formed by 7000-plus lactations, the genomic methods allow us to predict the genetic potential for Feed Saved on the whole population of genotyped animals. Yes, these predictions have lower reliabilities than we are used to in the traditional traits – the same way young genomic bulls' predictions have less certainty than progeny-tested bulls' predictions.

AGAIN we are embracing the opportunity to move out of our comfort zone to steer selection towards our ultimate breeding goal, which is maximizing cow profitability.

The inclusion of Feed Saved into the Lifetime Net Merit index was a big step forward in the collaborative effort that defines CDCB. In the history of indices created by USDA-AGIL and calculated by CDCB, never has a change been more extensively discussed with all sectors of U.S. dairy. The 2021 Net Merit revision was without a doubt the most important communication effort undertaken by CDCB, both during the review and validation of the new formula and in preparation for implementation in August 2021.

Another chapter in the successful history of dairy genetics has been written. From all at CDCB, we extend our appreciation to the members of CDCB committees that passionately engaged in all steps of the process and supported USDA AGIL and CDCB teams with their questions and suggestions. We recognize the vision of the CDCB board, which shows year after year its commitment to a stronger dairy industry.

Much more happened in the past 12 months. Many projects in progress will bring exciting new developments for the benefit of dairy producers – but you must read the entire activity report to find out!

It is a privilege to serve this industry. Thank you for your support.

BOARD OF DIRECTORS

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

In April, Eddie Ormonde of VAS, Tulare, Calif., and Mark Rodgers, dairy producer from Glover, Vt., began three-year terms representing Dairy Records Processing Centers (DRPCs). Dan Sheldon, Neal Smith and Jay Weiker were also re-elected to new terms.

Lee Day of Provo, Utah, and Robert Fourdraine of Madison, Wis., previously represented DRPCs. Thank you to Lee and Robert for their service on the CDCB Board.

OFFICER TEAM

A new officer team for 2021–2023 was elected in April:

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

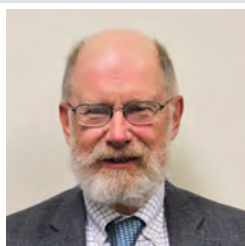
“The Board of Directors truly represents cooperation from across the dairy sectors, and they seek solutions that improve the livelihood for dairy farms worldwide,” states João Dürr, CEO of CDCB. “CDCB is empowered to achieve our mission through the vision and commitment of the industry leaders who serve on our Board today, and those that laid the foundation before them.”



Jay Weiker
Chair



John Clay
Vice Chair



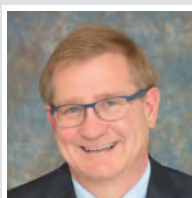
Dan Sheldon
Treasurer



Lindsey Worden
Secretary



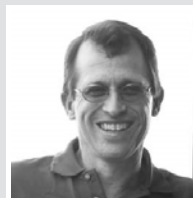
Susan Lee



Jay Mattison



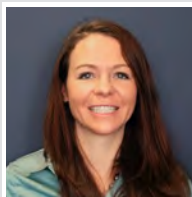
Eddie Ormonde



Mark Rodgers



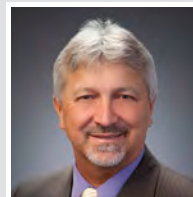
Paul Hunt



Katie Olson



Corey Geiger



Neal Smith

2021–2022 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

- **Corey Geiger**, *Ran Rose Holsteins, Mukwonago, Wis.*
- **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

thank you **Neal SMITH**

FOR SERVICE AS CDCB CHAIR FROM APRIL 2019 TO APRIL 2021

Neal's commitment to CDCB has been absolute from the start, engaging the team at AJCA to manage our accounts and finances. As chair Neal was able to maximize staff and team efforts by showing interest, trust and enthusiasm.

CDCB WORKING GROUPS

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

PRODUCER ADVISORY COMMITTEE (PAC)

Thank you to Patrick Crave, Waterloo, Wis.; Brent Czech, Rice, Minn.; and Matt Hendel, Caledonia, Minn., who served on the first PAC. In 2020–21, producers provided input on the recalibration of calving ease, launch of Feed Saved & Heifer Livability and the Net Merit revision.

PURPOSE

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

GROUP MEMBERS

Lloyd Holterman, *Chair, Rosy-Lane Holsteins, Watertown, Wis.*
Kent Buttars, *Butter Dell Dairy, Lewiston, Utah*
Bill Peck, *Welcome Stock Farm, Schuylerville, NY*
Mike Santos, Jr., *Terra Linda Dairy, Tulare, Calif.*
Sean Tollenaar, *Tollcrest Dairy, Wheatland, Calif.*

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*
Cari Wolfe, *American Jersey Cattle Association*

GENETIC EVALUATION METHODS (GEM)

The GEM group expanded in 2021, with new members Daniela Lourenco, Ryan Starkenburg, Robert Tempelman and Kent Weigel. The role of Chair transitioned from Chuck Sattler to Christian Maltecca. Thank you to Chuck for his leadership over several years.

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, *Michigan State University*
Paul VanRaden, *USDA AGIL*
Kent Weigel, *University of Wisconsin-Madison*
Cari Wolfe, *American Jersey Cattle Association*

COLOR 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*

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*
Cari Wolfe and Tom Lawlor, *representing Purebred Dairy Cattle Association*
Paul VanRaden, *USDA AGIL*
João Dürr, *CDCB*
Ezequiel Nicolazzi, *CDCB*

CDCB PERSONNEL

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

- **National Cooperator Database**, led by Chief Data Officer, José Carrillo
Maintaining efficient data flow protocols, ensuring data safety, optimizing data management procedures, and abiding by high data quality standards
- **Genetic Services**, led by Chief Operation Officer, Ezequiel Nicolazzi
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 manne
- **Research & Innovation**, led by Chief Innovation Officer, Javier Burchard
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.

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.

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*
Kristen Parker Gaddis, Ph.D., *Geneticist*
Gerald Jansen, *Technical Advisor*
Jay Megonigal, *IT Manager*
Rodrigo Mota, Ph.D., *Applied Geneticist*
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*

2021 Interns

Sydney Jewell and Anil Sigdel interned with CDCB in summer 2021 – marking the fifth summer that CDCB has provided this unique opportunity for the next generation of animal geneticists. Read more about Sydney and Anil's research projects on page 16.



CDCB team gathers outside the office in Bowie, Maryland, in September 2021.

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.



Kristen Parker Gaddis



Gerald Jansen



Ezequiel Nicolazzi



Duane Norman



Marius Temzem



Kaori Tokuhisa



George Wiggans



Nick Wu

CDCB DATA PROVIDERS

DAIRY RECORDS PROVIDERS

Aguiar Milk Testing, Inc.
AgSource Cooperative Services
Arizona DHIA
Central Counties DHIA
Dairy Lab Services
Dairy One Cooperative Inc.
DHIA Cooperative, Inc.

DHIA West
Gallenberger Dairy Records
Heart of America DHIA
Idaho DHIA
Indiana State Dairy Association
Integrated Milk Testing Services
Jim Sousa Testing

Lancaster DHIA
Mid-South Dairy Records
Minnesota DHIA
Northstar Cooperative DHI Services
Puerto Rico DHIA
Rocky Mountain DHIA
San Joaquin DHIA

Southern DHIA Affiliates
Tennessee DHIA
Texas DHIA
Tulare DHIA
United Federation of DHIA's
Washington State DHIA

GENOMIC NOMINATORS

ABS Global, Inc.
American Jersey Cattle Association
Bio-Genesys Ltd.
CRV
Czech Moravian Breeders' Corporation, INC (CMBC)

Genetic Visions-ST LLC
Holstein Association USA, Inc.
Holstein Canada
Labogena DNA

National Association of Animal Breeders, Inc.
Neogen Corporation dba Geneseek
PEAK Genetics
Select Sires Inc.

Semex Alliance
Sexing Technologies
Synergy (Unione per i Servizi alla selezione e biodiversita)
Weatherbys Scientific
Zoetis

PUREBRED DAIRY CATTLE ASSOCIATION

American Guernsey Association
American Jersey Cattle Association
American Milking Shorthorn Society
Brown Swiss Cattle Breeders' Association

Holstein Association USA, Inc.
Red and White Cattle Association
U.S. Ayrshire Breeders' Association

DAIRY RECORDS PROCESSING CENTERS

AgriTech Analytics
AgSource Cooperative Services
Amelcor
Dairy Records Management Systems

GENOMIC LABORATORIES

Bio-Genesys Ltd.
Genetic Visions-ST LLC
Labogena DNA
Neogen Corporation dba Geneseek

Czech Moravian Breeders' Corporation, Inc. (CMBC)
Weatherbys Scientific
Zoetis

INTERNATIONAL COOPERATORS

Agriculture and Horticulture Development Board (GBR)
ANAFI (ITA)
BSW Intergenomics (8 countries)
Lactanet (CAN)

National Livestock Breeding Center (NLBC) (JPN)
Interbull Centre (35 countries)
Qualitas (CHE)
vit (DEU)

thank you Leigh WALTON FOR TREMENDOUS SERVICE



Leigh Walton and Lillian Bacheller were honored with the 2010 National DHIA Outstanding Service Award.

In 2020, Leigh Walton retired after a 47-year career – seven years at CDCB and 40 years of federal service at United States Department of Agriculture.

Leigh served as Technical Services Manager at CDCB, providing the computer expertise necessary for quality, on-time U.S. dairy genetic evaluations. Previous to CDCB, Leigh was

Information Technology Specialist for over 30 years at USDA's Animal Improvement Programs Laboratory (AIPL) in Beltsville, Md. He was particularly instrumental in the transition of evaluation responsibilities from USDA AIPL to CDCB in spring 2013.

"At USDA, Leigh was responsible for coordinating and conducting all computer processing for the national genetic evaluations. He developed an automated documentation system, automated procedures for processing edits and submitting jobs, and an automated system for verifying genetic evaluation documentation.

The increased efficiency allowed labor reductions despite growth in data and traits evaluated and contributed significantly to AIPL's ability to provide dairy producers and the U.S. industry with timely evaluations. Because of Leigh's contribution, processing time for USDA-DHIA evaluations was reduced from 8 to 3 weeks."

– **H. Duane Norman**, Research Leader at USDA AIPL from 1998–2012

"Not only was Leigh responsible for keeping the data flowing to the dairy industry on a timely basis for all of those years, he did it in an exemplary fashion with little fuss. Leigh navigated many different obstacles with ease and made daunting deadlines look simple, and he did it with a very humble attitude. His ability to keep a level head and stay organized and focused are traits that few people possess."

– **Jay Meganigal**, IT Manager, CDCB

Thank you, Leigh, for your countless behind-the-scenes contributions to improve dairy cattle worldwide.



Leigh Walton (right) was presented the 2016 Distinguished Service Award by National Association of Animal Breeders, represented above by Chuck Sattler.

CDCB IN NUMBERS



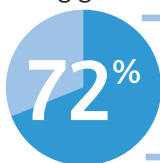
Progress over 20 years

per Dairy Herd Information (DHI)

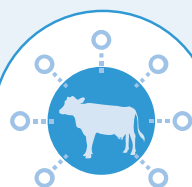
- Number cows on DHI increased 35%
- Test day milk yield increased 10.7 pounds
- Average somatic cell count decreased from 326 to 177

(cells/ml, 1000s) DHI, 2000–2020

Young genomic sires account for

all A.I.
breedings
in U.S. (2020)>5.6 million
genotypes in world's largest
animal database.

GENOTYPES

12%
Jersey86%
Holstein9% of genotyped
animals are male91% of genotyped
animals are female1.09 million animals genotyped in the last 12 months
(10.1.20 to 9.30.21)6 annual
DHI summaries
produced4.08M cows in
11,691 herds enrolled
in DHI test plans (2021)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 animalsMonthly genomic
evaluationsTriannual evaluations conventional,
genomic & Interbull (in APR, AUG & DEC)

13M

Lactation, Calving, Breeding
and Health records added for
each triannual evaluation

6.7M

DHI records
in CDCB health
evaluations Holstein

885k

DHI records
records in CDCB health
evaluations JerseyDairy Cows
by BreedAMONG 3.8M COWS WITH RECORDED
BREED IN DHI HERDS (2020)

Ayrshire 5,562

Brown Swiss 18,198

Guernsey 5,103

Holstein 3,078,299

Jersey 487,937

Milking Shorthorn 5,461

Crossbred Dairy 227,206

Other 9,568

YEAR IN REVIEW NOV 2020/ SEPT 2021

NOVEMBER 2020

- 300+ individuals from 26 countries joined CDCB's Industry Meeting, "Genetics of Dairy Feed Efficiency."
- CDCB and American Jersey Cattle Association released information on Jersey Neuropathy with Splayed Forelimbs (JNS). [View USDA report.](#)

DECEMBER 2020

- New traits, Feed Saved and Heifer Livability, launched with the December 1 triannual evaluations.
- Genomic evaluations available for **six type traits** that previously had only traditional Predicted Transmitting Abilities, affecting various breeds depending on the trait.
- CDCB Board of Directors approved investments in infrastructure, research and development in 2021.
- Board approved the first phase of hoof health data development, focused on training hoof trimmers for data collection.
- Joint initiative of NDHIA*, USDA AGIL** and CDCB approved to revisit milk, fat and protein projection factors.
- Dr. Randy Baldwin named Research Leader for USDA Animal Genomics Improvement Laboratory (AGIL)
- CDCB honored Leigh Walton, who retired in 2020 after seven years at CDCB and 40 years of federal service at USDA.

JANUARY 2021

- CDCB provided input to USDA research priorities, advocating for research on precision data pipelines and novel quantitative methods for genetic evaluations and herd management tools.

FEBRUARY 2021

- New weekly record set for animals receiving their first CDCB genomic evaluation – 27,229 – on February 16, beating the previous high from August 2019.

MARCH 2021

- Dr. Asha Miles joined USDA AGIL** as Research Geneticist.
- The 5 millionth individual genotype was recorded in the National Cooperator Database on March 5.
- CDCB staff presented at the 56th annual meeting of the National Dairy Herd Information Association (NDHIA).
- New annual summaries posted: DHI* Participation, State and National Standardized Lactation Averages by Breed, Summary of 2020 DHI Herd Averages, and Milk Somatic Cell Count Declined in DHI Herds During 2020
- Invited review by John Cole, João Dürr and Ezequiel Nicolazzi, "What are we breeding for, and who decides?" published March 10 in the Journal of Dairy Science®.

5M Genotypes in National Cooperator Database

A new milestone was achieved on March 5, 2021. That's when the **5 millionth individual genotype** was recorded in the national dairy cooperator database.

This database of both genotypic and phenotypic — or animal performance — data was built through tremendous cooperation by dairy producers, industry collaborators, international partners, and the federal government over several decades.

The first U.S. Holstein sires were genotyped in 2008. After seven years, the 1 millionth genotype was added to the national cooperator database in May 2015. Since then, the database has grown more rapidly as genomic testing has been readily adopted.

Genomic evaluations for females have become an indispensable tool for mating, culling and herd management decisions in more herds worldwide. The vast majority — 90% of genotyped animals — in the CDCB database are female. By breed, 86% of all genotypes are Holstein and 12% are Jersey.

The National Cooperator Database of dairy phenotypic and genomic data managed by CDCB remains the world's largest animal database, at 5,642,815 genotypes on September 30, 2021.



Photo from Holstein Association USA



Photo from GENEX

MAY 2021

- CDCB hosted 70 participants at its 4th workshop for genomic nominators and labs on May 26. The 2021 virtual event featured a separate program customized for new individuals and organizations.

JUNE 2021

- CDCB welcomed interns, Sydney Jewell and Anil Sigdel.

JULY 2021

- CDCB sponsored the Lush Award in Animal Breeding, presented to Shogo Tsuruta during the American Dairy Science Association® (ADSA) meeting.

AUGUST 2021

- Net Merit selection indices were updated, incorporating three new traits and important updates to economic weights.
- CDCB and University of Minnesota announced the new project, “Reducing lesion-related lameness using a combination of epidemiological, genomic and extension approaches.”
- The CDCB Board approved a new policy for the use of discovered maternal grandsires and maternal great grandsires.
- Publication of the haplotype calls for curly calf syndrome in Ayrshires was approved.
- The task force on Colored Breeds Artificial Insemination Service Fees (CBIAS-TF) was established to support greater benefit from genomic technologies in Ayrshire, Brown Swiss, Guernsey and Milking Shorthorn.
- Publication of the haplotype calls for curly calf syndrome in Ayrshires was approved. [Detail.](#)

APRIL 2021

- For the April 6 triannual evaluations, revisions were made in the scaling of genomic inbreeding to [account for X chromosome differences](#) between males and females.
- Feed intake records from two Canadian herds added to reference population for U.S. Feed Saved evaluations
- CDCB began calculating and sharing haplotype results for all the Canadian population, as part of a bilateral collaboration.
- CDCB’s Feed Saved trait incorporated into Total Performance Index® by Holstein Association USA
- CDCB Board welcomed two new Directors, elected new officers, and approved new members of the Producer Advisory Committee and Genetic Evaluation Methods group.
- The virtual ICAR-Interbull conference featured 12 presentations related to research or methodology driven in the U.S. or utilizing data from the National Cooperator Database.
- National Association of Animal Breeders (NAAB) launched www.usacattlegenetics.com for comprehensive information on U.S. dairy genetics, data collection and animal identification.



Photo from Select Sires

SEPTEMBER 2021

- “Improving Cow Mobility through Genetics” announced as theme of the 2021 CDCB Industry Meeting, conducted virtually on October 20
- John Meyer, past Chair of CDCB, recognized as 2021 National Dairy Shrine Guest of Honor.

* DHI= Dairy Herd Information; NDHIA=National Dairy Herd Information Association

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

NET MERIT IMPROVED TO MAXIMIZE COW PROFITABILITY

The revised formula for the national selection index, Net Merit, was implemented in August 2021 – delivering an improved tool to dairy producers to breed more profitable and efficient cows.

The 2021 revision is quite significant, with three new traits and important updates to economic weights.

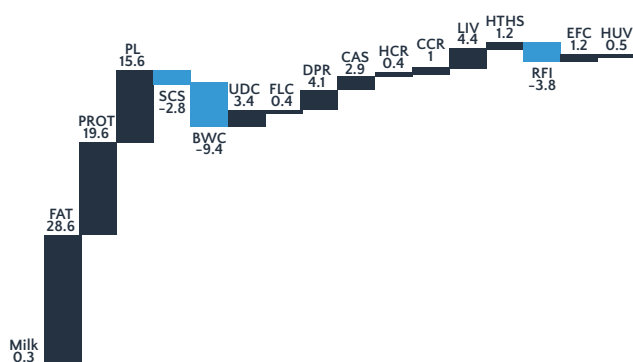
“The goal of Net Merit has remained constant – to select for a balance of traits that maximize profitability,” stated João Dürr, CEO of CDCB. “We want the next generations of cows to be healthier, longer living, more resilient, more efficient, and ultimately more profitable than the current generation. That is what Net Merit is designed to do.”



KEY TAKEAWAYS OF NET MERIT 2021

- Three new traits were incorporated – Feed Saved, Heifer Livability and Early First Calving.
- Net Merit 2021 more accurately reflects the differences in maintenance costs between cows. The same research that allowed measurement and calculation of genomic evaluations for Feed Saved also showed that cows' maintenance costs were previously underestimated.
- Net Merit now includes more than 40 traits, some as individual traits and some through a composite (i.e., calving ability, health dollars, udder, feet and legs, and body weight composite).
- Relative emphasis is now used instead of relative value to describe the emphasis of traits within the index.

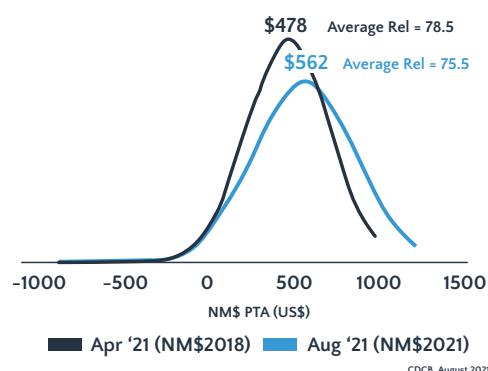
Relative Emphasis (%) on Traits in Net Merit\$ 2021



Relative emphasis considers that traits have different reliabilities and ranges of genetic variation – particularly beneficial when adding new traits with high economic importance and lower reliability, such as Feed Saved.

- The emphasis given to various traits also changed, with more emphasis toward longer Productive Life and smaller Body Weight Composite.
- There is a high correlation (98.1%) between the previous (2018) and new (2021) Net Merit formulas.
- There is an increase in the variation of Net Merit, reflected by an increased range of Net Merit PTAs for all animals – both male and female.

Comparison of Net Merit PTA Range and Reliability April and August 2021



The figure above shows the distribution of NM\$ Predicted Transmitting Abilities (PTA)*, comparing the 2018 and 2021 Net Merit versions. NM\$ 2021 (in orange) has a wider distribution – or larger variance – and a higher mean PTA (\$562, compared with the mean of \$478 in April). As expected, the inclusion of residual feed intake (RFI), which is a trait with high economic value and low average reliability made the NM\$ mean reliability decrease from 78.5% to 75.5% among the A.I. bulls.

In summary, Net Merit has always been based on the best available research to provide unbiased estimates of expected lifetime profit. A comprehensive index like Net Merit – which accounts for all traits appropriately and without bias – is the best way to maximize profitability through genetic improvement in all evaluated traits.

The national index, Net Merit, was developed nearly 30 years ago by the renowned scientists at USDA. The AGIL team provides ongoing review and proposed the important revisions in 2021.

*Includes all A.I. bulls with NAAB status of Active (A), Foreign (F), Genomic (G) or Progeny-test (P), August 2021, approximately 7000 bulls.

GENETIC EVALUATION CHANGES

DECEMBER 2020

- Feed Saved trait available for Holsteins
- Heifer Livability introduced in Holsteins and Jerseys
- New genomic evaluations on 6 type traits
- Updates in the inbreeding calculation procedure
- Breed code update for EFI and heterosis purposes in monthly genomic runs
- Update to blend weights in multi-breed evaluations for animals with phenotypic information
- BBR stability update
- Updates in the genetic correlations used in evaluations

December 2020 changes detailed on [CDCB website](#).

APRIL 2021

- Fertility traits editing update
- Feed Saved: Inclusion of Canadian data
- Cow Livability edits corrections
- New genomic inbreeding calculation method
- Parent average recalculation and revisions to evaluation workflow
- Exchange of haplotypes with Canada
- Clinical mastitis (CMA) introduced as independent international trait
- Heifer livability update in heritability
- Change in determination of breed conflicts and initial BBR

April 2021 changes detailed on [CDCB website](#).

AUGUST 2021

- Revision to Net Merit selection indices
- New SNP set and SNP-by-chip quality revision
- Discontinuation of long-range haplotyping
- Faster heterosis calculation
- Changes in genomic evaluation parameters

August 2020 change detailed on [CDCB website](#)
December 7 is the final 2021 triannual evaluation

NET MERIT:

HOW DOES THE NEW NET MERIT SUPPORT DAIRY FARM GOALS?

"Using Net Merit will result in breeding more profitable cows because it takes into account Productive Life, feed intake, reproduction, fat, protein, along with other traits, and weights these traits based on economic impact in U.S. herds. Even though we have sacrificed some reliability, we will make more progress."

– **Lloyd Holterman, Rosy-Lane Holsteins, Chair of CDCB Producer Advisory Committee**

"Being part of the PAC has given me appreciation for all the work that went into Net Merit 2021. We constantly need to be looking for a more profitable cow. Heifer livability is a big part of this. A heifer that is resilient translates into a resilient cow. I am excited on what the future holds, and I look forward to making daughters better than their dams."

– **Sean Tollenaar, Tollcrest Dairy, member of CDCB Producer Advisory Committee**

"Net Merit is a complete index backed by income and expense metrics that relate directly to our farms. It's expensive to raise replacements. In updating the metrics in the productive life trait, we better reward third and fourth lactation cows for their ability to produce more milk. After all, these cows already have covered their raising costs."

– **Corey Geiger, CDCB Board of Directors and President of Holstein Association-USA**

"NM2021 shows that NM\$ is dynamic, as a total merit index needs to be. Adding feed conversion efficiency and heifer related indexes is an important signal, to milk production and cost focused dairy farmers, as to which animals should be the parents of the next generation. Using genetics to enhance net dairy farm returns will be key to future farm success."

– **Murray Hunt, The Bullvine**

"Net Merit puts the latest research into practice to improve farm profitability and sustainability. We are finally taking full account of feed costs, in terms of charging animals for their full maintenance costs and measuring biological differences in the efficiency of feed utilization."

– **Kent Weigel, University of Wisconsin-Madison**

"An important change to NM2021 was revising the economic weight on body weight composite since the previous weight was understating the maintenance costs for heavier cows. The Net Merit index update from NM2018 to NM2021 is the most important update relevant to the economic and environmental sustainability of the dairy industry, since the introduction of productive life and somatic cell score to the NM in 1994."

– **Rob Tempelman, Michigan State University**



2022 TRIANNUAL EVALUATION DATES:

April 5, August 9 and December 6, 2022

NEW GENETIC EVALUATIONS

Feed Saved in Holsteins, and **Heifer Livability** in Holsteins and Jerseys, debuted on December 1, 2020, as individual traits. Both were incorporated into the Net Merit genetic index in August 2021.

BREED FOR FEED EFFICIENCY: FEED SAVED

Feed Saved is the first national evaluation in the U.S. to help dairy producers leverage genetic variation for a more feed-efficient herd. This new tool can help reduce dairy's environmental footprint and enable producers to save on feed costs, the largest expense item on most dairies.

Cows vary in their ability to convert feed to milk, and genomic tools and data technologies now allow us to identify and select for animals with that genetic advantage. The goal is to identify specific cows that eat less than expected while maintaining production and body condition. The CDCB Feed Saved trait is defined as the expected pounds of feed saved per lactation. Larger positive values represent more pounds of feed saved and indicate a more feed-efficient cow.

Feed Saved is possible through years of research in the U.S. and abroad. The collection of the necessary cow records and genotypes has been possible through collaboration between CDCB, USDA, and several universities and research herds. The initial Feed Saved evaluations in December were based on a reference population of more than 6,300 Holstein cows in research herds across the U.S. In April 2021, feed intake records from two Canadian herds were added into the reference population.

Research continues to improve genetic selection for feed efficiency. Emphasis areas include increasing reliability of the trait by adding phenotypic and genotypic data for more cows, better understanding the genetics related to methane emission, and seeking ways to enhance the genetic selection tools that improve dairy efficiency.



HEIFER LIVABILITY FOR HOLSTEIN AND JERSEY

Genetic progress has been ongoing to reduce cow deaths in milking herds through the Cow Livability and Productive Life traits. Now, Heifer Livability supports enhanced survival rates in young Holsteins and Jerseys.

Genomic evaluation of this trait will increase profitability, and even more importantly will improve animal health and welfare – which will enrich the industry's image with the public.

Leveraging the National Cooperator Database maintained by CDCB, disposal codes were studied from 3.4 million heifer records of all breeds with birth dates between 2009 and 2016. Differences in breeds and sires confirmed the presence of a genetic component for heifer livability. This analysis showed 96% of heifers survive from two days to 18 months of age, the period for which Heifer Livability (HLIV) is based. The HLIV evaluation is expressed in percentage points above or below the breed average, with larger positive values being more favorable.

Heifer Livability reveals a heifer's overall resistance to causes that lead to death, most commonly digestive and respiratory diseases (USDA APHIS, 2018). Improving heifer survival rates has clear benefit, with the average cost of heifer loss estimated at \$500 (Neupane et al, 2020).

Heifer Livability Resources

[CDCB Trait Reference Sheet](#)

[Genetic Evaluations for Heifer Livability](#), by Norman, Neupane, VanRaden

[Genomic Evaluation of Heifer Livability](#), by Neupane et al
[Published paper Slides](#)

[Value of selecting for cow and calf livability](#), by VanRaden et al

Feed Saved Resources

[CDCB Trait Reference Sheet](#)

[Genetics of Feed Efficiency](#), by Kent Weigel: [Recording](#) | [Slides](#)

[Feed Saved Methodology](#), by Paul VanRaden: [Recording](#) | [Slides](#)

[Genomic Evaluations for Feed Saved](#), by Kristen Parker Gaddis: [Video](#)



COLLABORATION & DEVELOPMENT

With “Cooperative” being a core value, CDCB routinely works with U.S. and global partners to produce evaluations that are as accurate as possible, based on the latest knowledge available and high-quality phenotypic and genotypic data. Read on for more about a few of current projects.

YIELD PROJECTION FACTORS

In 2021, CDCB, USDA AGIL and NDHIA (National Dairy Herd Information Association) embarked on a project to update or develop new yield projection factors. This project will update work of more than 20 years ago to provide more accurate lactation information for the modern cow. 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 CDCB and USDA AGIL scientists forecast many other opportunities to leverage this updated dataset.

UNIVERSITY OF GEORGIA: EVALUATION METHOD STUDIES

CDCB, USDA AGIL and the University of Georgia (UGA) have collaborated since January 2019 to further develop genetic and genomic evaluations. A primary goal 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. In August 2021, the UGA team presented five recent studies and potential application of the findings.



Matias Bermann, Ignacy Misztal and Daniela Lourenco of University of Georgia visited with João Dürr (right) and CDCB and USDA AGIL scientists in August 2021 in Bowie, Maryland.

HOOF HEALTH PROJECT INITIATED WITH THE U OF MINNESOTA

CDCB and the University of Minnesota (UMN) are collaborating on the new project, “Reducing lesion-related lameness using a combination of epidemiological, genomic and extension approaches.”

It is estimated that about 50% of dairy cows will be affected by lameness during their productive life, resulting in economic losses, poor health, and suboptimal animal welfare. Hoof horn lesions are the second leading cause of lameness. Led by Javier Burchard, CDCB, UMN and collaborators are working to create improvement understanding and a pipeline for hoof health data collection, to advance genetic evaluations and expand management tools.

Expectations of this new study with Dr. Gerard Cramer at UMN include:

- Improved understanding of causal factors related to hoof horn disorders
- Use of an integrated database a novel welfare assessment tool for lameness
- Application of the database in future research to aid in development of intervention treatments for hoof horn lesions



MULTI-STAGE PROJECT PLAN

- Objective 1** Create an integrated framework comprised of hoof trimmer data and on-farm records
- Objective 2** Create a genetic hoof health index, combining our integrated framework with the U.S. Council of Dairy Cattle Breeding (CDCB) pedigree data
- Objective 3-5** Apply of our integrated framework and genetic hoof health index in on-farm research studies to confirm the efficacy of these resources to improve dairy cow hoof health
- Objective 6** Create, provide, and evaluate training and extension resources to hoof trimmers, veterinarians, and farm personnel to implement and use the data generated in this study

Planning for this initiative began with a comprehensive workshop in September 2020 facilitated by CDCB with representatives from USDA AGIL, Lactanet (Canada), Hoof Trimmers Association, University of Minnesota, University of Calgary, Dairy Management, Inc. and Foundation for Food and Agriculture Research. Learn more in the [February 2021 Progressive Dairy](#) or at [UMN website](#).

CDCB INTERNS PRESENT RESEARCH FINDINGS

2021 marks the fifth summer that CDCB has provided internships to support the next generation of animal geneticists. Interns Sydney Jewell and Anil Sigdel describe their projects and experience with CDCB.

CDCB'S 2021 INTERNS presented their research outcomes to the CDCB team in Bowie, Maryland. *From left to right: José Carrillo, Duane Norman, Kristen Gaddis, Sydney Jewell, Anil Sigdel and João Dürr.*



MASTITIS, SCS EFFECTS ON LATER LACTATIONS

By Sydney Jewell

At CDCB, I conducted a project investigating clinical mastitis (CM) and somatic cell score (SCS) as predictors of future production and longevity. CDCB offers evaluations for both CM and SCS – two genetically correlated traits describing different aspects of udder health. The effect of mastitis within the lactation in which it occurs is relatively well understood. My project explored the effect of mastitis or elevated SCS on subsequent lactational production and longevity, in Holsteins and Jerseys using records in the CDCB database. Subsequent milk, fat and protein pounds were used as production measures and subsequent days in milk (DIM) and productive life (PL) were used as longevity measures. Findings included:

- A case of CM in first lactation Holsteins and a case of CM in second lactation in both breeds was associated with lowered longevity and production in subsequent lactations.
- A similar relationship was seen in SCS; a higher SCS in first or second lactation was associated with lower subsequent longevity and production.
- We investigated if more variation in longevity and production could be explained by using both predictors. In fact, models that included both CM status and SCS did explain the most variation in those measures.

This study more clearly illustrates the economic effect of mastitis and provides support that a multi-trait evaluation of udder health could be beneficial.

This fall, I have started graduate school at Cornell University in Dr. Heather Huson's lab focused on dairy cattle genetics. I hope to continue conducting research and teaching through a career in academia. My experience with the CDCB helped me to build data handling and analysis skills, as well as confidence as a researcher. I am very grateful for everyone at the CDCB for their help and guidance this summer!



STILLBIRTHS IN NON-HOLSTEIN BREEDS

By Anil Sigdel

I am a PhD student in Dairy Cattle Genetics and Genomics at the University of Wisconsin-Madison. I received my master's degree from the University of Florida in 2018, where I studied the genetic basis of thermotolerance in dairy cattle. Through an internship at CDCB this summer, I carried out research analyzing stillbirth data in non-Holstein dairy cattle in U.S. dairy herds.

I worked closely with Dr. Nick Wu and others to research genetic evaluations for stillbirth using a sire maternal grandsire model in non-Holstein dairy cattle. Our assessment showed that only Brown Swiss and Jersey proved to have a large enough dataset for accurate estimates of variance components and genetic parameters. Our heritability estimates suggest that genetic selection to reduce stillbirth in these breeds is feasible. The estimated genetic correlations between direct and maternal genetic effects were -0.35 and -0.15 in Brown Swiss and Jersey respectively. The antagonistic genetic relationships between direct and maternal effects for stillbirth is due to the relationship between calf size and dam's pelvic dimension. Selection for direct stillbirth results in smaller progeny, which have less problems being born yet also can be a risk factor for stillbirth. Therefore, the optimal breeding strategy for stillbirth will be selection of sires on an index that includes estimated breeding values for both service sire stillbirth (SSB) and daughter stillbirth (DSB).

My plan is to complete my PhD in spring 2022 and then work as a Quantitative Geneticist to develop novel methods for genetic and genomic evaluations for economically important traits that improve health and productive efficiency of livestock. Having the opportunity to work at CDCB with real-world problems, while acquiring valuable knowledge and analysis skills, was an amazing experience. I made valuable contacts with seasoned professionals in dairy genetics.

FEED SAVED LAUNCHED AT CDCB INDUSTRY MEETING

More than 300 individuals from 26 countries joined CDCB's first virtual Industry Meeting on November 2, 2020. The meeting featured feed efficiency and opportunities to improve stewardship and profitability of dairy production through genetic selection.

Three renowned geneticists presented the research, data collection, methodology and expected results for the new Feed Saved trait, and then answered audience questions on a panel ([view](#)) moderated by Dr. John B. Cole.

- **Genetics of Feed Efficiency**, Kent Weigel, University of Wisconsin-Madison | [Recording](#) | [Slides](#)
- **Feed Saved Methodology**, Paul VanRaden, USDA AGIL | [Recording](#) | [Slides](#)
- **Feed Saved: Expected Results**, Kristen Parker Gaddis, CDCB | [Recording](#) | [Slides](#)

MITLOEHNER OUTLINES FACTS ON METHANE, ENVIRONMENTAL FOOTPRINT OF DAIRY

"Genetics is actually the key to further improvements of our carbon footprint," said Frank Mitloehner of University of California-Davis, as he concluded his presentation Rethinking Methane: The Path to Climate Neutrality.

[Recording](#) | [Slides](#)

In the U.S., the carbon footprint of a glass of milk has shrunk by two-thirds in the last 70 years. "We went from 25 million dairy cows (around 1950) to now 9 million cows, and with this much smaller herd, we are producing 60% more milk," shared Mitloehner, crediting improved genetics, reproduction, veterinary care, feed efficiency and quality. "As long as we don't grow livestock numbers, the amount of methane produced and the amount of methane destroyed are in balance. This is a total change in narrative around impact of ruminant livestock on climate."

"If we continue to reduce methane, animal agriculture will be viewed as a potential solution, because we can actually pull carbon out of the atmosphere by reducing methane," Mitloehner stated.

Mitloehner was joined by Corey Geiger of *Hoard's Dairyman*, dairy producer Lloyd Holterman and Juan Tricarico of Dairy Management Inc., to discuss how U.S. dairy can demonstrate that improved productivity and efficiency has positive environmental impacts ([View](#)).

"Many dairyman view sustainability as something that's going to cost money and take effort," said Holterman, owner of Rosy-Lane Holsteins and chair of the CDCB Producer Advisory Committee. "I would argue that sustainability is

something that creates more profit. That's a redirection of our thinking. And it's the real direction of our genetic programs."



[VIEW MEETING RECORDINGS ON CDCB YOUTUBE](#)

GENOMIC NOMINATORS AND LABS GATHER, VIRTUALLY

CDCB hosted its fourth workshop for genomic nominators and labs in May, via a fast-paced, two-day virtual format.

"The CDCB system is unique with robust standards and expectations," said José Carrillo, CDCB Chief Data Officer.

"We wanted to ensure we properly introduce new collaborators, including those nominators and labs new to the CDCB system and some individuals new in their roles at a long-time collaborator."

MAY 26 AGENDA

For all nominators and labs 70 PARTICIPANTS

- Changes implemented by CDCB in 2020-21
- Web Connect and web site updates
- Quick turnaround evaluation
- CDCB future developments
- Q&A session

MAY 27 AGENDA

For new individuals and organizations 32 PARTICIPANTS

- Collaborator roles and responsibilities
- CDCB system and toolbox for nominators and labs
- General data exchanges and issue resolution
- Evaluations (weekly, monthly, and tri-annual), descriptions and timelines
- Q & A session

"The workshop always provides a good opportunity to learn more about the challenges and concerns of the collaborators who are vital to delivering quality U.S. genomic evaluations around the world," Carrillo continued. "Our overarching goals are to continually improve communication and enhance CDCB services."

In five years, the nominator workshop attendance has grown from 25 to 70 individuals representing artificial insemination companies, breed associations, genomic laboratories, and National Dairy Herd Information Association. The first CDCB genomic nominator workshop was May 2017 in Linthicum Heights, Maryland.

Participants expressed interest in a choice of virtual or in-person, Carrillo said the team will explore a hybrid format to offer that flexibility and maximize participation.

¹ Dairy Herd Information Association

U.S. LEADERSHIP EVIDENT AT ICAR-INTERBULL

The 2021 ICAR-Interbull conference was held virtually April 26–30, with the U.S. dairy industry well represented among the presenters and in global leadership roles.

The central theme for the [ICAR Conference](#) was circular economy and its impact and challenges in animal performance recording. The Interbull Open meeting focus was “Innovations in national and international genetic and genomic evaluations.”

Twelve presentations related to research or methodology driven in the U.S. and/or utilizing data from the national cooperator database, from researchers at CDCB, USDA AGIL and various institutions.



Ezequiel Nicolazzi of CDCB was elected to represent the U.S. on the Interbull Steering Committee. Thank you to Gordon Doak, who has served in this role the past two years.



João Dürr, CDCB CEO, was elected to the board of the International Committee for Animal Recording (ICAR).



Jay Mattison of National Dairy Herd Information Association was recognized for service to ICAR, having retired from the ICAR Board as President last September.

CDCB, USDA SCIENTISTS PRESENT AT ADSA

Scientists from CDCB and USDA AGIL were among the presenters at the 2021 Virtual Annual Meeting of the American Dairy Science Association® (ADSA®), July 11–14.

PRESENTER	PRESENTATION
Kristen Parker Gaddis <i>Geneticist, CDCB</i>	Genomic evaluations for Feed Saved in Holsteins (Abstract book)
George Liu <i>Research Biologist, USDA AGIL</i>	A comprehensive catalog of regulatory variants in the cattle transcriptome – a prototype for the FarmGTEx Project (Abstract book)
Mahesh Neupane <i>Research Associate, USDA AGIL</i>	Genetic and genomic evaluation of late-term abortion recorded through Dairy Herd Improvement test plans (Abstract book)

PROJECTS BY CDCB AND AGIL RESULTING IN PUBLICATION

[Haplotype tests for economically important traits of dairy cattle](#), AIPL Research Reports, GENOMICSS (12–20). December 3, 2020. Cole, J.B., VanRaden, P.M., Null, D.J., Hutchison, J.L., Hubbard, S.M.

[Genomic predictions for yield traits in US Holsteins with unknown parent groups](#), Journal of Dairy Science, May 1, 2021. Cesarani, A., Masuda, Y., Tsuruta, S., Nicolazzi, E.L., Van Raden, P.M., Lourenco, D., Misztal, I.

[Invited review: The future of selection decisions and breeding programs: What are we breeding for, and who decides?](#), Journal of Dairy Science, May 1, 2021. Cole, J.B., Dürr, J.W., Nicolazzi, E.L.

[Data Ownership, privacy, use, sharing and stewardship – The U.S. Experience](#), ICAR Proceedings. 2021. Dürr, J.W.

[Improving dairy feed efficiency, sustainability and profitability by impacting farmer's breeding and culling decisions](#), ICAR Proceedings. 2021. M. J. VanDeHaar, R.J. Tempelman, J.E. Koltes, R. Appuhamy, H.M. White, K.A. Weigel, R. Baldwin, P. Van Raden, F. Penagaricano, J. Santos, J.W. Dürr, E. Nicolazzi & J. F. Burchard and K. L. Parker Gaddis

[Improving the model for genetic evaluation of calving traits in the US Holstein and Brown Swiss](#), Interbull Annual Meeting Proceedings. 2021. Biffani, S., Tiezzi, F., Dürr, J.W., Cole, J.B., VanRaden, P.M., Maltecca, C., Nicolazzi, E.L.

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[Single-step genomic predictions for yield traits in U.S. Holsteins with UPG and phenotype-pedigree truncation](#), Interbull Annual Meeting Proceedings. 2021. Lourenco, D., Cesarani, A., Masuda, Y., Tsuruta, S., Nicolazzi, E.L., Van Raden, P.M., Misztal, I.

[Inheritance of a mutation causing neuropathy with splayed forelimbs in Jersey cattle](#), Journal of Dairy Science, June 28, 2021. Al-Khudhair, A.S., Null, D.J., Cole, J.B., Wolfe, C.W., Van Raden, P.M.

[Genomic evaluation of dairy heifer livability](#), Journal of Dairy Science, August 1, 2021. Neupane, M., Hutchison, J.L., Van Tassell, C.P., Van Raden, P.M.

[Multiple trait random regression modelling of feed efficiency in dairy cattle](#), Journal of Dairy Science, June 28, 2021. Khanal, P., Parker Gaddis, K.L., Van Raden, P.M., Weigel, K.A., White, H.M., Penagaricano, F., Koltes, J.E., Santos, J.E., Baldwin, R.L., Burchard, J.F., Dürr, J.W., VanDeHaar, M.J., Tempelman, R.J.

[Partitioning SNP heritability using related individuals](#), Journal of Dairy Science, June 28, 2021. Jiang, J., Van Raden, P.M., Ma, L., O'Connell, J.R.

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[Phenotypic and genotypic impact of milk components and body weight composite on dry matter intake](#), Journal of Dairy Science, 2021. Togiani, S., VanRaden, P.M., VanDeHaar, M.J., Tempelman, R.J.

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[Net merit as a measure of lifetime profit: 2021 revision](#), AIPL Research Reports. NMS\$ (05–21), May 7, 2021. Van Raden, P.M., Cole, J.B., Neupane, M., Togiani, S., Parker Gaddis, K.L., Tempelman, R.J.

[An alternative interpretation of residual feed intake by phenotypic recursive relationships in dairy cattle](#), Journal of Dairy Science, 2021. Wu, X.L., Parker Gaddis, K.L., Burchard, J.F., Norman, H.D., Nicolazzi, E.L., Cole, J.B., Connor, E., Dürr, J.W.

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[Genetic and genomic evaluation of late term abortion recorded through Dairy Herd Improvement test plans](#), Journal of Dairy Science, June 28, 2021. Neupane, M., Hutchison, J.L., Cole, J.B., Van Tassell, C.P., Van Raden, P.M.

[An alternative interpretation of residual feed intake by phenotypic recursive relationships in dairy cattle](#), ICAR Proceedings, 2021. JDS Communications, September 23, 2021. Wu, X.L., Parker Gaddis, K.L., Burchard, J.F., Norman, H.D., Nicolazzi, E.L., Connor, E.E., Cole, J.B., Dürr, J.W.,

WHAT ARE WE BREEDING FOR, AND WHO DECIDES?



The future of dairy genetic programs is examined in an invited review published March 10, 2021, in the Journal of Dairy Science® (JDS). John Cole, along with João Dürr and Ezequiel Nicolazzi of CDCB, authored the review, **“The future of selection decisions and breeding programs: What are we breeding for, and who decides?”**

According to a news release by JDS, the authors provide an insightful review of how U.S. dairy industry breeding selection objectives are established, and they detail opportunities and obstacles related to new technologies for documenting animal performance.

Genetic selection has been an extremely efficacious tool for the long-term enhancement of livestock populations, and the implementation of genomic selection has doubled the rate of gain in dairy cattle. Data captured through the national dairy herd improvement program are used to calculate genomic evaluations for comparing and ranking animals for selection. Over time, most of the focus on the selection indices used to rank bulls and cows on their genetic merit has changed from yield traits to fertility, health and fitness traits.

Today, most U.S. breeding stock are selected and marketed using the net merit dollars (NM\$) selection index, which progressed from two traits in 1971 (milk and fat yield) to a mix of 40 individual traits following the most recent update in August 2021. Updates to the index depend upon the estimation of a variety of values, and it can be challenging to reach an agreement among stakeholders on what should be included in the index at each review and how those traits should be weighted. Phenotypes for some of the new traits are difficult or costly to measure or depend upon changes to on-farm practices that have not been widely implemented. There is also a need to collect more comprehensive data about the environment in which animals perform, including information about feeding, housing, milking systems, and infectious and parasitic load.

The number of traits evaluated continues to increase and is mind-boggling to many, which indicates that new approaches to classify and express traits may be necessary.

DAIRY PRODUCER VOICES

Four members of the CDCB Producer Advisory Committee were featured on the [Dairy Voice podcast](#) in 2021.

LLOYD HOLTERMAN of Rosy-Lane Holsteins in Wisconsin and BILL PECK of Welcome Stock Farm in New York shared their philosophies on breeding profitable dairy cattle in Episode 49. [September 2, 2021](#)

In Episode 47, KENT BUTTARS of Butter-Dell Holsteins in Utah spoke on what he sees ahead in the industry. [July 29, 2021](#)

MIKE SANTOS of Terra Linda Dairy in California gave an inside look at breeding and feeding programs in Episode 46. [July 15, 2021](#)

Holterman, Buttars, Peck and Santos – along with Sean Tollenaar of Tollcrest Dairy in California – are the five producers serving on the Producer Advisory

Committee (PAC) for 2021–2022. CDCB established PAC in 2019 to provide boots-on-the-ground input for the development of genetic evaluations, services and opportunities. In the recent 18 months, producers on the PAC have provided input on several topics, including the re-calibration of calving ease, launch of Feed Saved and Heifer Livability, and the 2021 Net Merit revision.



OUTREACH

EZEQUIEL NICOLAZZI and **KRISTEN PARKER GADDIS** summarized the re-scaling of calving traits (August 2020) and introduced Feed Saved on a webinar hosted by Dairy Cattle Reproduction Council (DCRC). [View recording.](#) *October 2, 2020*

EZEQUIEL NICOLAZZI spoke on dairy genomic evaluations at a conference by Asociación Argentina de Producción Animal. *November 25, 2020*

JAVIER BURCHARD was featured by Dleche.cl, a popular digital platform in Chile, describing the collaborative efforts to discover a trait, collect phenotypes, standardize and analyze data analyses, and transfer new genetic improvement tools to dairy producers. [Listen \(in Spanish\) here.](#) *November 2020*

JAVIER BURCHARD presented and moderated the session Simply Water at the II International One Health Symposium & IV One Health Symposium organized in Paraná, Brazil, and attracting a global audience. *November 3-4, 2020*

JOÃO DÜRR described the progress to improve feed efficiency in this Holstein News video by Holstein Association USA and Zoetis. *November 2020*

GEORGE WIGGANS presented updates on the implementation of genomic selection in dairy cattle during the **Field Day** hosted by the Agricultural Genome to Phenome Initiative. [View recording.](#) *January 27, 2021*

JAVIER BURCHARD presented “Predicting Milk, Fat and Protein Yields from Heterogeneous Data Sources in Dairy Cows” at the National Dairy Herd Information Association Field Managers Meeting. *February 4, 2021*

KRISTEN PARKER GADDIS described the new Feed Saved and Heifer Livability traits and research on Johnes resistance and hoof health to university staff and students in the Animal Breeding and Genetics group at Iowa State University. *February 12, 2021*

EZEQUIEL NICOLAZZI presented a seminar, “Use of genomic technology for selection in USA,” at the University of Turin in Italy. *May 17, 2021*

DUANE NORMAN updated Jersey breeders on genetic developments and new traits during the American Jersey Cattle Association annual meetings in Bettendorf, Iowa, *June 25-26, 2021*

DUANE NORMAN and **TAYLOR MCWHORTER** (former CDCB intern) presented “Background of U.S. Service-Sire Fertility Evaluations, Current and Potential for Producers” for a BoviNews seminar. *July 6, 2021*

JOÃO DÜRR was interviewed by Joel Hastings, Dairy Business editor, about the 2021 revision of Net Merit. [Listen here.](#) *July 21, 2021*

JOÃO DÜRR described U.S. dairy improvement in the prominent publication by Associação Girolando in Brazil. *August 2021*

CDCB PUBLICATIONS: POPULAR PRESS

[Learn More about the New Trait “Feed Saved”](#) By Kristen Parker Gaddis, Hoard’s Intel, *October 26, 2020*

[Genetic Tool for Feed Efficiency Coming in December](#) By Kristen Parker Gaddis, Progressive Dairy, *November 6, 2020*

[Hay Burners vs Hay Converters](#) By Kristen Parker Gaddis, Hoard’s Dairyman, *November 2020*

[Two new genetic traits coming in December](#) By João Dürr, Hoard’s Intel, *November 30, 2020*

[Feed Saved trait can vary 1,600 pounds](#) By João Dürr, Hoard’s Intel, *December 28, 2020*

[CDCB Leads Efforts to Reduce Lameness with Genetics](#) By Javier Burchard, H. Duane Norman, Kristen Parker Gaddis, Progressive Dairy, *February 25, 2021*

[The U.S. has recorded 5 million genotypes](#) By Kaori Tokuhisa and José Carrillo, Hoard’s Intel, *March 18, 2021*

[Genomics drives new trait development](#) By Ezequiel Nicolazzi, Hoard’s Intel, *April 5, 2021*

[Five million genomic tests fuel genetic evaluations](#) By Kaori Tokuhisa and José Carrillo, Hoard’s Dairyman, *April 25, 2021*

[More feed-efficient cows are on the way](#) By João Dürr, Hoard’s Dairyman, *June 2021*

[Lifetime Net Merit revised in August for balanced selection, profitable dairy cows](#) By João Dürr, Kristen Parker Gaddis, Tom Lawlor, Rob Tempelman and Paul VanRaden, Dairy Business, *July 2, 2021*

[New Net Merit formula debuts this week](#) By João Dürr, Hoard’s Intel, *August 9, 2021*

[Net Merit revised with August genetic evaluations](#) By João Dürr, Progressive Dairy, *September 15, 2021*

[Can we find genetic solutions to lameness?](#) By Javier Burchard, Hoard’s Intel, *September 16, 2021*



FINANCIAL REPORT

Below is a summary of the Council on Dairy Cattle Breeding (CDCB) audited financial statements for fiscal year 2020 and 2019.

During 2019, CDCB entered into an agreement with DataGene Limited for computer programming/software development, which continued into 2020. 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 2020 with Michigan State University and the University of Wisconsin-Madison.

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, 2020 and 2019. 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, 2020 and 2019, 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.

2020 OPERATING REVENUE

2020 operating revenue increased 36% compared to 2019. CDCB implemented a fee structure change in June 2019, with full impact in 2020.

2020 EXPENSES

Total expenses increased during 2020 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.

2020 AND 2019 AUDITED FINANCIAL STATEMENTS

ASSETS	2020	2019
Cash	\$ 2,406,918	\$ 1,091,011
Investments, at fair value	5,819,381	5,400,773
Accounts Receivable	779,888	795,934
Property & Equipment (net book value)	232,387	73,274
Other	142,762	83,986
Total Assets	\$ 9,381,336	\$ 7,444,978
LIABILITIES & NET ASSETS		
Accounts payable	\$ 176,611	\$ 274,390
Long-Term Payable	75,000	75,000
Accrued Expenses	6,097	14,208
Total Liabilities	257,708	363,598
Unrestricted Net Assets	9,123,628	7,081,380
Total Liabilities & Net Assets	\$ 9,381,336	\$ 7,444,978
REVENUES		
Female Fees	\$ 3,008,355	\$ 1,891,918
Male Fees		
Initial Fees	1,431,128	1,295,571
AI Fees	1,581,775	1,202,525
Other	56,008	37,107
Investment Income	77,879	89,074
Total Revenues	\$6,155,145	\$ 4,516,195
COST OF OPERATIONS		
Salaries, Service and Administration	\$4,125,170	\$ 3,530,393
Research and Development	290,318	246,400
Depreciation	38,137	77,032
Interest Expense	-	-
Total Cost of Operations	\$4,453,625	\$3,853,825
Change in Net Assets from Operations	\$ 1,701,520	\$ 662,370
Other Income (Expense) Net realized and unrealized loss on investments	340,728	356,258
Change in Net Assets from Operations	\$2,042,248	\$1,018,628
Net Assets, beginning	\$7,081,380	\$6,062,752
Net Assets, ending	\$9,123,628	\$7,081,380

Financial report provided by Vickie White,
AJCA-NAJ Treasurer



Photo source: American Jersey Cattle Association

USCDCB.COM

4201 Northview Drive
Suite 302
Bowie, MD 20716
240.334.4164

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

