

COUNCIL ON DAIRY CATTLE BREEDING ACTIVITY REPORT

OCT18/SEP19

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 2019 CDCB Industry Meeting held at the Alliant Energy Center, Madison, WI, on October 1, 2019.

CDCB CORE VALUE

**PROVIDING PREMIER DAIRY GENETIC INFORMATION
SERVICES & INDUSTRY COLLABORATION**

WORD FROM THE CHAIR Neal Smith



It's truly an honor to serve as the Chair of the Council on Dairy Cattle Breeding, an organization that provides vital service for dairy improvement. Having been involved with CDCB from its inception, I am grateful for the countless leaders who have come together in clear cooperation and guided CDCB to achieve its vision of high quality genetic evaluations for

benefit to producers and improvement of dairy cattle worldwide. In particular, I extend gratitude and thanks to John Meyer, who retired from the CDCB Board in April after serving multiple terms as Director and as CDCB Chair the past two years. The Board will advance CDCB priorities built on the solid foundation and visionary direction set by John and predecessor leaders.

CDCB Priorities

One of our immediate top priorities has been continued development and implementation of a reliable suite of health traits for all viable dairy breeds in the U.S. This requires more effective data collection beginning at the farm. All CDCB member sectors have worked together to increase producer awareness and bring more quality health data into the system. In 2019, we have made strong gains in the number of health events from various breeds into the CDCB national cooperator database, and CDCB expects to introduce disease resistance evaluations for Jerseys in the near future.

We must determine how to leverage and incorporate new pipelines for phenotypic data into the national cooperator database. Improvements in technology are as evident on the dairy farm as anywhere else. Milking and other management tools are so advanced today, we should be able to source new data that was not possible a few years ago. We may need to re-think our traditional rules on what records are considered "official." This is not new – but as technology advances we will have to stay on the cutting edge or be left in the dust.

It's imperative that CDCB have a producer-first mindset as we develop new services and tools. The benefit to dairy producers

in herd management is top of mind as we seek new traits and methodology. The launch of genomic evaluations for feed efficiency in 2020 provides one example. Clearly, feed is a large portion of dairy farm operating expenses, and leveraging genetics to help manage total feed investments is a benefit to producers. More efficient use of feed, land and natural resources to produce milk is also important in the eyes of dairy customers and the public at large. Genetics make a difference.

Collaboration is Key

CDCB is a great example of accomplishment when people work together toward common goals. In the big picture, we strive to provide the most accurate, reliable genetic evaluations in the world for dairy producers. USDA Animal Genomics and Improvement Laboratory is a key partner to achieve our mission.

We need to build stronger relationships between CDCB, its members and producers, and the key to this effort is effective communication. Going forward, we are focused on building stronger relationships with industry partners and collaborators. To develop the genomic products that our producers need and deserve, we must improve collaborations with all genomic service providers.

The current economic challenges make cooperation more important than ever. When we work together to share ideas, data and information, we can deliver the best possible results back to the farm. Our producers deserve it. We must get the job done.

IN APRIL, NEWLY-ELECTED CDCB CHAIR NEAL SMITH



presented a plaque to retiring Chair John Meyer (right). The plaque inscription reads: *"With deep appreciation and gratitude for serving on the Board of Directors of the Council on Dairy Cattle Breeding for multiple terms. Your insight, perseverance and dedication to the launch of the CDCB as a business operation was guided by your allegiance to the dairy industry. Your leadership chairing the Board of Directors from 2017 to 2019 helped the CDCB to reach new levels of excellence."*

CEO COLUMN João Dür



There is only one certainty in the dairy industry: CHANGE. While dairy producers are masters of adapting to changing conditions, today's race is harder because of the speed of change. Dairy management is transforming at a record pace, and dairy herd business models are challenged. Supporting industry partners face similar crossroads.

Several factors foster the current metamorphosis – shifts in consumer behavior, misalignment between supply and demand for dairy, and emergence of innovation across the entire dairy chain.

In this context, CDCB is constantly challenged to improve communication, revalidate research and development priorities, extend the data flow process to include novel types of information, and innovate to serve as the primary, pre-competitive source of genomics for dairy farmers.

This message came loud and clear at the CDCB Industry Meeting in Reno, Nev., in February. Through the meeting, invited speakers and panelists celebrated 10 years of genomic evaluations as an example of chain reinvention and envisioned big data as the next catalyst of big change. The 150 participants – a cross-section of producers and diverse industry partners – eagerly dissected the opportunities and challenges of data capture, management and analytics through strategic questions during roundtable discussions. There was significant alignment around the desire for pre-competitive collaborative databases, and there was agreement that CDCB has a leadership role. The CDCB is carefully considering this input in planning our future strategies.

As we set future goals, we must also fulfill current needs and expectations. CDCB has improved the services provided to dairy producers and other stakeholders in

partnership with the Animal Genomic and Improvement Laboratory (AGIL) at ARS-USDA*. Significant enhancements made to the evaluation system include:

- Increase in number of markers in genomic predictions, from 60K to 80K SNP set, simultaneously adopting the new bovine reference genome assembly, ARS-UCD1;
- Inclusion of crossbred animals in dairy genomic evaluations;
- Early First Calving (EFC) as a new trait;
- Inclusion of global data on the clinical mastitis resistance genomic evaluations through participation in Interbull evaluations;
- Thorough review of fertility evaluations to address seasonal variation of PTAs.

Other relevant initiatives of the last 12 months included adoption of a simplified fee structure that assigns credits to those providing data to the national cooperator database; creation of the Producers Advisory Committee to counsel the CDCB board on strategy, policy and activity; adoption of a test run process for important changes in genetic evaluation methods and procedures before implementation; and approval of a policy for the use of national cooperator database for SNP array validation and SNP information disclosure.

Last, but not least, the CDCB acted on the very first priority mentioned in this column: the development of new data pipelines. CDCB and Foundation for Food and Agriculture Research (FFAR) have each committed to invest \$1 million to fund research and measurement of feed intake and sensor data at four universities and USDA-AGIL. CDCB expects to launch genomic evaluations for feed efficiency – a trait with major economic impact – in Holsteins in 2020. In the Jersey breed, work with CDCB members has resulted in a dramatic increase in health data into the national cooperator database, allowing the development of disease resistance genomic predictions for Jerseys to be launched soon.

If reality presents itself as a constant change, it's most important to stay focused on the ultimate purpose of CDCB and genetic improvement – empowering dairy producers to deliver the greatest source of nutrients available: MILK

“THERE WAS SIGNIFICANT ALIGNMENT

around the desire for pre-competitive collaborative databases, and there was agreement that CDCB – as an objective third-party – has a leadership role in this arena.”

CDCB BOARD OF DIRECTORS

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

Four new Board members were welcomed in 2019:

- **Corey Geiger**, representing *Purebred Dairy Cattle Association*
- **Dave Hallberg**, representing *Dairy Records Providers*
- **Katie Olson**, on behalf of *National Association of Animal Breeders*
- **Lindsey Worden**, representing *Purebred Dairy Cattle Association*

The four new Directors fill terms vacated by Boyd Schaufelberger, Pat Baier, Nate Zwald and John Meyer. CDCB expresses sincere gratitude to these individuals for dedicating their time and expertise to the betterment of CDCB.

In April, CDCB recognized two retiring officers. John Meyer of Holstein Association USA retired from the CDCB Board, after multiple terms as Director and the past two years as CDCB Chair. Chuck Sattler of Select Sires, Inc., also completed a two-year term as Secretary and continues as a Director. Thank you for your leadership!

In April 2019, the CDCB Board elected new officers who serve in those roles for two years:

- **Neal Smith**, *Chair*
- **Jay Weiker**, *Vice Chair*
- **Dan Sheldon**, *Secretary*
- **John Clay, Ph.D.**, *Treasurer*

The CDCB Finance Committee includes Dan Sheldon, John Clay, Chuck Sattler and Neal Smith.

2019-20 BOARD OF DIRECTORS

Dairy Records Providers

- **Dave Hallberg**, *Hall-Lar Registered Holsteins, Pennock, Minn.*
- **Jay Mattison**, *National DHIA, Verona, Wis.*
- **Dan Sheldon**, *Secretary, Woody Hill Farms, Salem, NY*

Dairy Records Processing Centers

- **John Clay, Ph.D.**, *Treasurer, Dairy Records Management Systems, Raleigh, NC*
- **Lee Day**, *Amelikor, Provo, Utah*
- **Bill Verboort**, *AgriTech Analytics, Visalia, Calif.*

National Association of Animal Breeders

- **Katie Olso, Ph.D.**, *ABS Global, DeForest, Wis.*
- **Chuck Sattler**, *Select Sires, Inc., Plain City, Ohio*
- **Jay Weiker**, *Vice Chair, NAAB, Madison, Wis.*

Purebred Dairy Cattle Association

- **Corey Geiger**, *Ran Rose Holsteins, Mukwonago, Wis.*
- **Neal Smith**, *Chair, American Jersey Cattle Association, Reynoldsburg, Ohio*
- **Lindsey Worden**, *Holstein Association USA, Inc., Brattleboro, Vt.*

Non-Members Supporting the CDCB Board

- **Jack Cravelle**, *CDCB Attorney, Porter Wright Morris & Aurthur LLLP*
- **João Dürr, Ph.D.**, *CDCB Chief Executive Officer*
- **Ezequiel Nicolazzi, Ph.D.**, *Technical Director*
- **Duane Norman, Ph.D.**, *CDCB Technical Advisor & Industry Liaison*
- **Paul VanRaden, Ph.D.**, *USDA AGIL Industry Liaison*

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



The 2019-20 CDCB Board of Directors includes (front row, L-R) Corey Geiger, Ran-Rose Holsteins; Neal Smith, American Jersey Cattle Association; Dan Sheldon, Woody Hill Farms; John Clay, Dairy Records Management Systems; Lindsey Worden, Holstein Association USA, Inc.; Katie Olson, ABS Global; and Chuck Sattler, Select Sires, Inc. (Back row, L-R) Lee Day, Amelikor; Dave Hallberg, Hall-Lar Registered Holsteins; Bill Verboort, AgriTech Analytics; Jay Weiker, National Association of Animal Breeders; Jay Mattison, National DHIA; and João Dürr, CEO CDCB.

CDCB ESTABLISHES PRODUCERS ADVISORY COMMITTEE

The new Producers Advisory Committee (PAC) will provide grassroots input for development of strategy, policy and activity, including future priorities and opportunities to be pursued by the CDCB.

PAC members are dairy producers that have demonstrated leadership among their peers and are committed to the improvement of the dairy industry.

The first dairy producers appointed by the CDCB Board to serve on this committee include:

- **Kent Buttars**, *Butter Dell Dairy, Lewiston, Utah*
- **Patrick Crave**, *Crave Brothers Dairy, Waterloo, Wis.*
- **Brent Czech**, *New Heights Dairy LLC, Rice, Minn.*
- **Matt Hendel**, *Hendel Farms, Caledonia, Minn.*
- **Lloyd Holterman**, *Rosy-Lane Holsteins, Watertown, Wis.*

“The staff and Board of the CDCB are very excited about this new avenue for producer input to help ensure that our services are relevant for today’s dairy farms,” stated João Dürr, CDCB CEO. “This is a vital step in our goal for improved communications with the dairy producers who depend on CDCB products for genetic improvement and herd management.”



CDCB DATA PROVIDERS

DAIRY RECORDS PROVIDERS

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

GENOMIC NOMINATORS

ABS Global, Inc.	Genetic Visions-ST LLC	National Association of Animal Breeders, Inc.	Semex Alliance
Alta Genetics	Genex Cooperative, Inc.	Neogen Corporation dba Geneseek	VHL Genetics
American Jersey Cattle Association	Holstein Association USA, Inc.	Select Sires Inc. / Accelerated Genetics	Weatherbys Scientific
Bio-Genesys Ltd.	Holstein Canada		Zoetis
CRV USA	LaboGena DNA		

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 Cooperative Services
Amelcor
Dairy Records Management Systems

GENOMIC LABORATORIES

Bio-Genesys Ltd.	Genetic Visions-ST LLC
EuroFins Bio Diagnostics Inc.	VHL Genetics
LaboGena DNA (certification in progress)	Weatherbys Scientific
Neogen Corporation dba Geneseek	Zoetis Genetics

INTERNATIONAL COOPERATORS

Agriculture and Horticulture Development Board (GBR)	Canadian Dairy Network (CAN)
ANAFI (ITA)	Interbull Centre (35 countries)
BSW Intergenomics (8 countries)	Qualitas (CHE)
	vit (DEU)

CDCB WORKING GROUPS

CDCB appreciates the industry and academic leaders that serve on CDCB working groups to provide valuable input in a spirit of ongoing collaboration and continuous improvement of CDCB products. Some committee member changes were approved by the Board in August 2019. CDCB thanks Mark Chamberlain and Angie Coburn for their years of dedicated service to Dairy Evaluation Team (DERT) and Pursuing Data Quality (PDQ), respectively.

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.

PROGRESS

The pre-release review by this group (under confidentiality agreement) and subsequent checks by the CDCB staff 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 Starkenberg, *ABS Global, Inc.*
Bob Welper, *URUS*
Cari Wolfe, *American Jersey Cattle Association*

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.

PROGRESS

In late 2018, the group assessed the final draft of methods used to compute genomic evaluations for crossbred animals, resulting in publication in April 2019. GEM also reviewed enhancements to this methodology to be implemented by the end of 2019. The group provided feedback to the fertility modifications applied in August 2018 and is evaluating a proposal on future traits.

GROUP MEMBERS

Chuck Sattler, *Select Sires Inc., Chair*
Chad Dechow, *Penn State University*
Tom Lawlor, *Holstein Association USA*
Christian Maltecca, *North Carolina State University*
Paul VanRaden, *USDA AGIL*
Cari Wolfe, *American Jersey Cattle Association*
Ezequiel Nicolazzi, *CDCB*

PURSuing DATA QUALITY TEAM (PDQ)

PURPOSE

Provide independent, impartial advice and strategic guidance for dairy data quality.

GROUP MEMBERS

Sam Comstock, *Holstein Association USA*
Burke Day, *Amelcor*
Jenny DeMunck, *URUS*
Jana Hutchison, *USDA AGIL*

Erick Metzger, *American Jersey Cattle Association*
Steven Sievert, *Quality Certification Services Inc.*
Duane Norman, *CDCB*
Kristen Parker Gaddis, *CDCB*

FREQUENCY OF EVALUATIONS 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).

PROGRESS

Analysis and recommendations will be presented to the CDCB Board by December 2019.

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*
Ezequiel Nicolazzi, *CDCB*

thank you
**Gordon A.
 DOAK**

U. S . REPRESENTATIVE TO THE INTERBULL STEERING COMMITTEE

Gordon Doak serves as the U.S. representative on the Interbull Steering Committee. Gordon has been instrumental in CDCB since its formation and retired in 2018 after 42 years with National Association of Animal Breeders. *Thank you, Gordon, for your continued commitment to dairy cattle improvement.*

CDCB PERSONNEL



Thank you to the CDCB staff for dedicated service.

Front row (L-R): Javier Burchard, Duane Norman, Kristen Parker Gaddis, Kendra Randall, Kaori Tokuhisa, Fiona Guinan (intern) and Lillian Bacheller. **Back row (L-R):** João Dürr, Leigh Walton, José Carrillo, Jay Megonigal, Marius Temzem, Ezequiel Nicolazzi, Frank Ross and George Wiggans. Not pictured: Rohith Shetty.

João Dürr, Ph.D., *CEO*
Ezequiel Nicolazzi, Ph.D., *Technical Director*
Javier Burchard, Ph.D., *Innovation Director*
Duane Norman, Ph.D., *Technical Advisor & Industry Liaison*
Leigh Walton, Ph.D., *Technical Applications Mgr.*
George Wiggans, Ph.D., *Technical Advisor*
Lillian Bacheller, *Senior Applications Developer*
José Carrillo, Ph.D., *Genomic Data Mgr.*
Kristen Parker Gaddis, Ph.D., *Geneticist*
Jay Megonigal, *Data Scientist*
Kendra Randall, *Administrative Assistant*
Frank Ross, *Web Application Mgr.*
Rohith Shetty, *Programmer*
Marius Temzem, *Database Administrator*
Kaori Tokuhisa, MSC, *Genomic Data Analyst*

CDCB INTERNSHIPS



Fiona Guinan

Interning throughout 2019, Fiona Guinan developed additions to the management reports that had been requested by the industry and this information will be provided in the DHI annual reports. Fiona also worked diligently to enhance the CDCB website.

Fiona presented her findings, “Changes occurring in the breed composition of U.S. dairy herds,” at the Interbull meeting in June. She reported that percentage of herds with mostly Holsteins has decreased somewhat, while those with Jerseys and crossbreds has increased slightly. DHI cows coded as crossbred increased since 1990 from 0.1 to 5.3% while those coded as Jerseys increased from 5.7 to 14.8%.

From a dairy farm in Ireland, Fiona earned a B.S. in Agricultural Science from University College Dublin in September 2018. She has maximized internship opportunities on farms and in highly-regarded companies in the U.S. and Ireland. Fiona will initiate a graduate program in January 2020 in bovine genetics and data analysis.



Laura Jensen

Joining CDCB in January, Laura Jensen conducted and presented research, Extending genomic evaluations to direct health traits in Jerseys, at the American Dairy Science Association meeting in June 2019.

Laura’s work is instrumental to achieve CDCB’s goal to provide disease

resistance evaluations for breeds beyond Holstein. Her research on Jersey health evaluations with Drs. Kristen Parker-Gaddis and Duane Norman included 134,403 observations and 310,232 Jersey genotypes. Initially, Jersey reliabilities for health traits were somewhat lower than Holsteins, but the accuracy will increase with the large gain in producer-recorded health events into the CDCB database. CDCB expects to launch health traits for Jerseys in the near future.

Laura graduated in Animal Science (Dairy emphasis) from the University of Minnesota in May 2018, completed several internships and has earned numerous judging and industry awards. Post-graduation, Laura embarked on a six-month cultural immersion program in Austria and Costa Rica. Laura is initiating a master’s program in bovine genetics at the University of Florida.



Taylor McWhorter

Taylor McWhorter interned at CDCB over the summer and investigated the use of beef service sires bred to dairy cows and heifers to determine sire conception rate (SCR) for the beef bulls.

Taylor’s work analyzed 226,990 breedings

which included 10 beef breeds and 7 dairy breeds. For Angus bulls with significant matings, a mean conception rate of 33% was observed (47% standard deviation) compared with 34% for breedings with a HO sire mated to a HO cow. Mean SCR reliability was 62% for 113 publishable bulls.

Taylor received her Bachelor’s in Animal Science from the University of Georgia in

May 2018 and enjoyed diverse interests including Sigma Alpha, international studies and club soccer. In graduate work at the University of Georgia, Taylor is studying animal breeding and genetics under Dr. Daniela A.L. Lourenco, altering the way genomic relationships are constructed to reduce bias in single-step genomic evaluations (ssGBLUP) for dairy and beef cattle, pigs, and chickens.

CDCB IN NUMBERS



2009

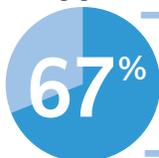
Year **genomic evaluations** available in U.S.



77 DOLLARS PER YEAR

Average genetic gain in Net Merit, annually since 2011

Young genomic sires account for



67% all A.I. breedings in U.S. (2019)



>3½ million genotypes in world's largest animal database.

GENOTYPES



12% Jersey

86% Holstein

♂ **11%** of genotypes are male

♀ **89%** of genotypes are female

700,000 animals genotyped in 2018



6 annual DHI summaries produced

4.2M cows in **13,819 herds** enrolled in DHI test plans (2019)

67% increase in animals receiving genetic evaluations 1990-2018

48 traits calculated by CDCB

- **4** selection indexes
- **5** production traits
- **18** health, fertility & calving traits
- **22** conformation traits
- **23** official genetic conditions & haplotypes

Weekly genomic predictions for new genotyped animals

Monthly genomic evaluations

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

14M phenotypic records added for each triannual genetic evaluation

12M DHI records in CDCB health evaluations

Dairy Cows by Breed

AMONG 3.98M COWS WITH RECORDED BREED IN DHI HERDS (2018)

- Ayrshire** 6,487
- Brown Swiss** 20,786
- Guernsey** 6,169
- Holstein** 3,243,490
- Jersey** 485,849
- Milking Shorthorn** 3,688
- Crossbred** 207,368
- Other** 10,072

YEAR IN REVIEW OCT 18 / SEP 19

OCTOBER 2018

- Nearly 175 attendees attended the **4th annual CDCB industry meeting** during World Dairy Expo in Madison, Wis.

DECEMBER 2018

- The more robust **80k SNP and the new-and-improved genome assembly, ARS-UCD1, were adopted** to enhance reliability of genomic evaluations and improve haplotype determination. *Detail on page 14.*
- The **3 millionth genotype was uploaded to the CDCB national cooperator database** on December 13, with ~700,000 new genotypes added in 2018.
- CDCB Board approved and communicated plans to launch **genetic evaluations for crossbred animals and Early First Calving (EFC)** in April 2019.

FEBRUARY 2019

- CDCB hosted **150 producers and genetic enthusiasts at its first meeting** in Reno, Nev., held in conjunction with the Western Dairy Management Conference. *Detail on page 12.*
- New **annual summaries based on DHI** information** were posted: DHI Participation, Lactation Averages by Breed, DHIA Herd Averages, DRPC Activity and Somatic Cell Counts.

APRIL 2019

- The first **genomic evaluations for crossbred animals** and a new trait, **Early First Calving (EFC)**, were launched with the triannual evaluations. *Detail on page 15.*
- A new **CDCB fee structure and service schedule** was effective April 3, for simplification and to support future development of new evaluations, tools and infrastructure.
- A **Frequency of Evaluations Task Force** was created to evaluate the costs, benefits and potential implementation strategy if the existing frequency would be modified.

NOVEMBER 2018

- **Javier Buchard joined CDCB as Innovation Director**, a new role to leverage new data opportunities to improvement dairy genetics and herd management.
- Several dairy publications reprinted the article by Duane Norman and Kristen Parker Gaddis, **Do You Need Genetic Evaluations for Health Traits for Your Herd?**, to encourage improvements to on-farm recording and collection of health event information.

JANUARY 2019

- **Fiona Guinan and Laura Jensen joined CDCB as interns**, marking the 4th year of CDCB internship opportunities.



MARCH 2019

- CDCB was **accredited by Interbull and ICAR***** as an official interpretation center for Parentage Verification.
- CDCB **evaluations for mastitis resistance are now validated and included in Interbull** udder health evaluations.
- CDCB hosted **webinars in advance** of the **genomic evaluations for crossbred animals** and **new fee structure**.





JUNE 2019

- CDCB sponsored the symposium [“Breeding and Genetics: Ten Years of Genomic Selection,”](#) jointly hosted by American Dairy Science Association and Interbull in Cincinnati, Ohio.
- CDCB staff and interns **presented a record** number of papers at ADSA and Interbull meetings.
- CDCB sponsored the Lush Award in Animal Breeding, presented to **Dr. Nicolas Gengler** at the **ASDA meeting**.
- **Dr. Paul VanRaden** of USDA AGIL* was awarded the 2019 Zinpro Award for Excellence in Dairy Science during the ADSA meeting.
- **Lillian R. Bacheller** joined CDCB as a full time Software Applications Developer, following a 42-year career at USDA.

AUGUST 2019

- [Updates to fertility evaluations](#) are implemented for more stable, accurate future evaluations.
- Number of **animals receiving CDCB weekly evaluations reached new all-time high** on August 20; 26,876 new animal genotypes received in the previous seven days.
- **Producers Advisory Committee** is established; first 5 producers appointed by CDCB Board.
- **GEM, DERT committee** member changes approved.
- Board approved new **Test Run Policy** for continuous improvement in validation and adoption of genetic evaluation changes.
- Board approves **Use of National Cooperator Database for SNP Array Validation and SNP Information Disclosure**.

MAY 2019

- 22 attendees from 13 genomic laboratories, associations and genetic companies were engaged at CDCB’s **3rd annual Genomic Nominator and Laboratory Workshop**.
- CDCB welcomed **intern Taylor McWhorter**, a PhD student at the University of Georgia.
- [Foundation for Food and Agriculture Research \(FFAR\)](#) and CDCB announced commitments to **fund research and measurement of feed intake and sensor data** at four universities and USDA AGIL,* resulting in 2020 launch of U.S. genetic evaluations for feed efficiency.



Photo Courtesy of GENEX

SEPTEMBER 2019

- CDCB launches presentations and event coverage on new [YouTube channel](#).



Photo courtesy of American Jersey Cattle Association

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

** Dairy Herd Information, Dairy Records Processing Center

***ICAR, International Committee for Animal Recording

CDCB MEETING ATTRACTS 150 GENETIC ENTHUSIASTS IN RENO

FEBRUARY 25, 2019, RENO, NEVADA

CDCB hosted 150 genetic enthusiasts at its first Industry Meeting held with the Western Dairy Management Conference in Reno, Nev. Around the theme “The Genomic Revolution: The Next 10 Years,” the CDCB team aspired to engage a diverse group of dairy producers and industry reps for input to help advance herd management, genetic progress and data utilization. The meeting attracted 34 dairy producers and 120 representatives of CDCB member organizations, genomic and international collaborators, animal identification and sensor systems, dairy equipment, animal health and nutrition companies.



CDCB CEO [João Dürr](#) opened with this challenge: “A lot of data generated on farms today is not being collected into the national cooperative database. We have a choice to make – will we, or will we not, marry the new tools of big data with the legacy systems of data collection for genetic evaluations.” The conversation was stimulated by talks from visionaries who offered provoking insights.

- Vision: How does dairy look in 2029?, by [Jack Britt, PhD](#)
- Genomic Legacy: What have we achieved in the genomic revolution? [Paul VanRaden, PhD](#), USDA AGIL
- What has changed in the dairy business since 2009? [Mark Stephenson, PhD](#), University of Wisconsin-Madison
- Transforming Big Data into Value: Put Data to Work for Your Dairy, [Miel Hostens, DVM](#), Ghent University

- Big Data for Innovative Solutions in Ag, [Cameron Holbrook](#), Amazon Web Services

In two panel discussions, invited dairy producers joined these speakers to engage various perspectives and create interactive dialogue.

Roundtable discussions concluded the day, designed to promote conversation and record input in a consistent manner to inform CDCB strategic direction. Specifically, the tabletop talk centered around four questions:

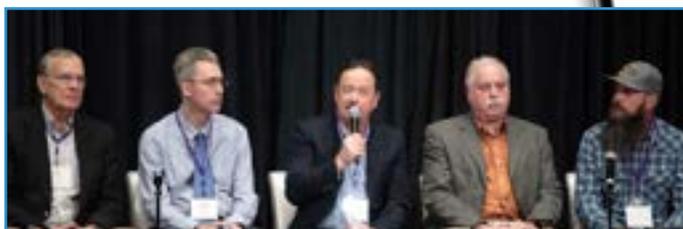
- 1 If the industry does not move to big data analytics in a collaborative (pre-competitive) manner, what would be the alternative(s)?
- 2 If there is a collaborative transition to big data for the dairy chain, would producers be willing to contribute data into a national database? Under what conditions and expectations?
- 3 In a collaborative and precompetitive database incorporating more big data, what is the role of CDCB and its members? Who else could be involved?
- 4 Ultimately, what are the necessary steps to advance big data in dairy genetics and herd management?

PREVAILING CONCLUSIONS

There was significant alignment around the desire for pre-competitive collaborative databases, and agreement that CDCB can play a leadership role in this arena.

In absence of a collaborative database, several noted an expansion of the current environment – or continued increase in the capture, management and analysis of

(continued on page 13)



Panelists forecast future advancements possible through genomics. From left to right: Jack Britt, Paul VanRaden, Pat Maddox of RuAnn Dairy, Mark Stephenson and Denton Ross of Arizona Dairy Company.



All photos by Randall S. Blodgett

“How can dairy leverage big data?” was the topic for the afternoon panel, including Cameron Holbrook, Mark Rodgers of MKVT Polled Holsteins, Miel Hostens and Austin Hyde of Hegler Creek Dairy (left to right).

The CDCB extends sincere gratitude to all speakers, panelists, roundtable leaders and attendees for sharing their time and perspective.

PREVAILING CONCLUSION TO CDCB IN RENO

information by competitive private institutions for proprietary use or gain. Without collaboration, participants forecast further fragmentation of data collection, management and analysis, which results in concerns of data silos, data quality, and increased confusion on farm and through the system.

Generally, attendees believe producers are willing to provide data IF participation returns value to their operation, IF the above concerns are addressed satisfactorily, and IF other conditions are met. It is essential that data contribution yields

“value back to the dairy,” and the brainstorm resulted in diverse, specific ideas for added-value.

Several groups stated that CDCB should lead cooperative efforts to foster data expansion in a pre-competitive, transparent manner and facilitate value for producers that provide data. There was candid discussion around the need for unbiased organization(s) to pursue a pre-competitive initiative to ensure the credibility and continued global leadership of the U.S. genetic system.

ADSA HIGHLIGHTS 10 YEARS OF GENOMIC SELECTION JUNE 23-26, 2019, CINCINNATI, OHIO

Genetics were in the spotlight at the 2019 Annual Meeting of American Dairy Science Association (ADSA) in Cincinnati, Ohio. CDCB sponsored the symposium “Breeding and Genetics: Ten Years of Genomic Selection,” jointly hosted by ADSA and Interbull on June 24, 2019. An impressive speaker panel detailed the incredible genetic improvement of the past decade and forecast upcoming genomic innovations and new developments.

During the adjacent ADSA and Interbull meetings, CDCB staff and interns presented a record number of papers (listed on page 16). CDCB sponsored the Lush Award in Animal Breeding, presented to [Dr. Nicolas Gengler](#), and [Dr. Paul VanRaden](#) of USDA AGIL earned the 2019 Zinpro Award for Excellence in Dairy Science.

GLOBAL DATA, GENETIC SECTORS CONVERGE IN MADISON OCTOBER 2, 2018. MADISON, WISCONSIN

CDCB hosted its 4th annual industry meeting at the 2018 World Dairy Expo in Madison, Wis., with the theme “[The Future of Phenotyping: How technology is shaping phenotypes in the genomic era.](#)” The crowd of nearly 175 was comprised of dairy producers and representatives from artificial insemination (AI), genomic nominators, breed associations, dairy herd information (DHI) and dairy records processing centers (DRPCs). Corey Geiger, Managing Editor of Hoard’s Dairyman, emceed the event that included these presentations:

- [Opening Remarks](#), *John M Meyer, CDCB Chair*
- [Progress. Preview. Perspective](#), *João Dürr, CEO*
- [USDA AGIL Research Report](#), *Paul VanRaden*
- [CDCB Services: Continuous Improvement](#), *Ezequiel Nicolazzi*
- [How sensors and automation are changing dairy data for good](#), *Steven Sievert, Manager, Quality Certification Services Inc.*

- [Value of cooperative phenotypic databases in the genomics era](#), *Albert DeVries, Ph.D., University of Florida*
- [Producer needs and opportunities](#), *Paul Trierweiler, dairy producer*



Dairy producer Paul Trierweiler, Steven Sievert and Albert DeVries (left to right) provide insights on phenotyping of the future, on a panel facilitated by Corey Geiger (far left). Photo by Randall S. Blodgett

GENOMIC NOMINATOR AND LAB WORKSHOP MAY 16, 2019, BALTIMORE, MARYLAND

CDCB hosted the 3rd annual workshop, engaging 22 attendees from 13 genomic laboratories, associations and genetic companies. Through the interactive format, participants provided positive and beneficial feedback on topics including:

- Genomic evaluations for crossbred animals
- New trait, Early First Calving

- 2018 Genomic Nominator Performance Review
- 2018 Genotyping Lab Performance Review report and report card for labs
- Previous changes and possible future improvements to CDCB web queries
- New file formats

GENETIC EVALUATION CHANGES

With each triannual evaluation, adoption of new tools and information support CDCB and USDA AGIL goals for continuous improvement and accurate, reliable evaluations.

DECEMBER 2018

- Adoption of new reference genome assembly, ARS-UCD1
- Increase in number of markers in genomic predictions, from 60K to 80K SNP set
- Changes in haplotype distribution in Holstein, Jersey and Brown Swiss
- Large number of gene tests added to haplotype determination
- Criteria update for young heifers in female file

December 2018 change detailed on [CDCB website](#)

APRIL 2019

- Enhancement of genomic evaluations for crossbred animals
- Early First Calving (EFC) trait introduced
- Variance adjustments for health trait evaluations
- Correction of AY heterosis calculation for MACE from Scandinavian breeds
- Genomic parent averages in monthly and weekly files
- New genomic evaluation file formats (CSV)

April 2019 change detailed on [CDCB website](#)

AUGUST 2019

- Enhancements to fertility evaluations
- Refinement of breed base in traditional evaluations of crossbred animals
- Incorporation of global data in Mastitis Resistance
- Modifications to Unknown Parent Groups for Red Holsteins

August 2019 change detailed on [CDCB website](#)

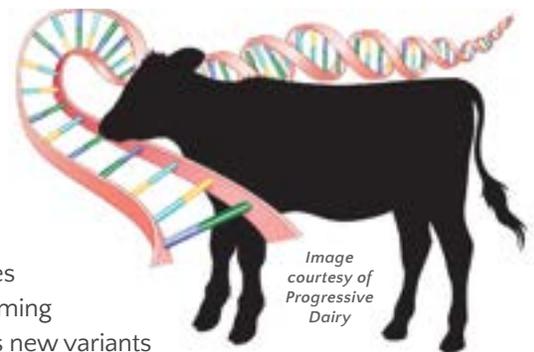
NEW GENOME ASSEMBLY, 80K SNP ADOPTED IN EVALUATIONS

Starting in December 2018, CDCB genomic evaluations utilize the new-and-improved genome assembly and more robust 80k SNP.

USDA AGIL and USDA ARS* researchers, with University of California-Davis, released a new cattle genome sequencing reference map – also known as the genome assembly and named ARS-UCD1 (Rosen et al., 2018). The updated assembly led to a new SNP list for genomic evaluations, and adoption is expected to improve imputation accuracy and recessive haplotype calculation. ARS-UCD1 replaced the University of Maryland version used since 2009 (UMD3) as the common language worldwide to track variation in cattle. ARS-UCD1 used longer reads to improve accuracy over repetitive sections of DNA and showed improved imputation of genotypes, alignment of sequence from other animals and annotation of gene structure.

The number of markers used in CDCB genomic predictions increased to 79,239 (or 80k) from the previous 60,671 used since 2014.

The revised list includes more exact gene tests added to SNP chips, removes poorer performing markers, adds new variants with larger effects on traits, and changes the marker order based on ARS-UCD1. One important mutation controlling about 30% of fat yield is now directly included (DGAT1; Gautier et al., 2007).



2020 TRIANNUAL EVALUATION DATES:

April 7, August 11 and December 1, 2020

Genetic Base Change in April 2020

CDCB EXTENDS GENOMIC EVALUATIONS TO CROSSBREDS

In April 2019, owners of crossbred animals received genomic evaluations for the first time. These evaluations are based on a weighted combination of solutions estimated from purebred populations. The U.S. was the first country to apply this approach to evaluate crossbred animals, due to cutting-edge research and a complex development process by CDCB and USDA AGIL. Previous steps included publication of values for Breed Base Representation (2016) and the change to all-breed base for calculation of genomic evaluations (April 2018).

These developments provide a means for all genotyped animals to receive the best possible estimate of their genetic value, irrespective of breed composition. Producers can now reap increased value of genotyping, particularly

across their entire herd. With this enhancement, nearly 49,000 new animals have received genomic evaluations since April. For crossbred animals that previously received predictions, their current evaluations are more accurate because multi-breed composition is considered. Evaluations of purebreds improved slightly by removing mixed-breed animals from the group of animals used to estimate SNP effects.

Shifts in U.S. Dairy Population, by Breed

Cows on DHI, 1990 to 2018

Jerseys from 5.7% to 14.8%

Crossbreds from 0.1% to 5.3%

Herds with Crossbreds

herds with >1 crossbred animal
2.7% to 36.1%

NEW TRAIT: EARLY FIRST CALVING

There is considerable interest in the optimum age at first calving (AFC), as heifer rearing is 15 to 20 percent of total milk production cost. The current average AFC in the U.S. is 24.5 months. CDCB leveraged AFC records recorded for decades for all cows in DHI** to develop an economically-important trait using data already being collected. Early First Calving (EFC) was introduced in April

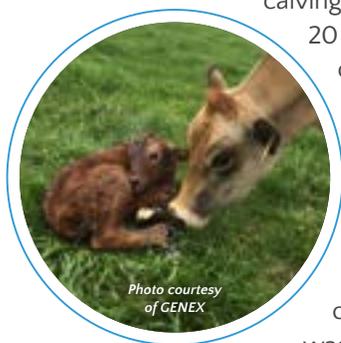


Photo courtesy
of GENEX

2019. EFC is defined in days and positive values indicate the desirable direction. If a bull transmits the genetics expected to reduce first calving by 2 days, his PTA is +2.0. The new trait is grouped together with the fertility traits of heifer conception rate, cow conception rate and daughter pregnancy rate to conveniently facilitate multi-trait methods in the future.

There appear to be genetic differences by breed. The CDCB database shows that Jerseys enter the milking herd earlier, while Ayrshires usually enter at the oldest age.

IMPROVEMENTS TO FERTILITY EVALUATIONS

With the August 2019 evaluations, updates were applied to address the noticeable seasonal fluctuation in trends for fertility traits. Comprehensive investigation by CDCB and AGIL found the primary cause was that seasonal grouping was derived previously from the heifers' breeding dates instead of cows' breeding dates. In August, four updates were applied: changes in management groups, discontinuation of an outdated edit on breeding

records, exclusion of early abortions in Early First Calving calculations, and restoration of some older (pre-1990) records in Daughter Pregnancy Rate (DPR). The improvements are intended to increase the stability and accuracy of fertility evaluations over time. Research continues in the spirit of continuous improvement for accurate, stable evaluations.

INTERBULL VALIDATION FOR CDCB MASTITIS RESISTANCE

CDCB evaluations for mastitis resistance (MAST) are now validated and included in Interbull udder health evaluations. This additional level of scrutiny provides assurance in

the methodology and accuracy of MAST evaluations. Additionally, CDCB included MACE*** information in the MAST evaluations beginning in August 2019.

*USDA ARS AGIL = United States Department of Agriculture, Agricultural Research Service, Animal Genomics and Improvement Laboratory

** DHI = Dairy Herd Improvement ***MACE = Multiple Across-Country Evaluation

STAKEHOLDER OUTREACH OCT 18 / SEP 19

INVITED PRESENTATIONS

João Dürr described the U.S. genetic improvement systems and standards to **University of Maryland Animal Science students**, supporting CDCB efforts to help expand career interests in genetics and research.

November 2018

George Wiggans presented “[Heritability and Impact of Genomics in Dairy Cattle](#)” to the **American Association of Bovine Practitioners (AABP)** through a webinar series on genomics and genetics. Wiggans described the evolution and use of genomics U.S. leadership in international data exchange, current and future traits,

January 16, 2019

In Shanghai, China, George Wiggans presented “[Genomic Selection in Dairy Cattle](#)” at a **conference hosted by Neogen-China**, with attendees including representatives of National Animal Husbandry Association, China Dairy Association, China Agricultural University, North American and local AI companies, and core breeding farms.

March 29, 2019

João Dürr delivered a lecture on large-scale dairy genetic evaluation tools to **animal science graduate students** at University of Maryland.

May 6, 2019

Ezequiel Nicolazzi was the invited speaker at the **American Jersey Cattle Association Annual Meeting** in New York, updating breeders on the development of direct health evaluations for Jersey animals, genomic evaluations for crossbred animals and other future products.

June 2019

During the **2nd International Congress of the Jersey Breed** held in Brazil, João Dürr presented “Impact of the genomic revolution on the genetic progress of the Jersey Breed.”

June 2019

CDCB Geneticist Kristen Parker-Gaddis presented “[Data Pipelines for Implementation of Genomic Evaluation of Novel Traits](#)” at the **ADSA-Interbull joint symposium**.

June 24, 2019

CDCB staff presented several scientific papers at the **Interbull annual meeting** session.

June 2019

- [George Wiggans](#), *Extending genomic evaluation to crossbred cattle – U.S. implementation*
- [Jose Carrillo](#), *CDCB’s Genotyping Laboratory Certification Program*
- [Fiona Guinan](#), *Changes occurring in the breed composition of U.S. dairy herds*
- [Ezequiel Nicolazzi](#), *Enhancements to U.S. genetic and genomic evaluations in 2018 and 2019*

CDCB presentations at the **American Dairy Science Association meeting** in *June 2019* included:

- [George Wiggans](#), *Genomic predictions using more markers and gene tests*
- [Laura Jensen](#), *Extending genomic evaluations to direct health traits in Jerseys*
- [Kristen Parker-Gaddis](#), *Development, implementation, and future perspectives of health evaluations in the U.S.*

Kristen Parker Gaddis presented “Improving cattle against BRD through genomics” at a beef symposium in Denver, sharing experience and methodology of CDCB disease resistance traits.

August 7–8, 2019

João Dürr presented the keynote at the XIII Congresso Brasileiro de Buiatria, speaking on the top quality US dairy system, impact of genomics and leadership of CDCB in developing Breed Base Representation and genomic evaluations for multi-breed animals.

September 10, 2019

George Wiggans was invited lecturer at the University of Liverpool School of Veterinary Science, presenting Genomic Selection in the U.S. as part of an intensive course on breeding and genetics.

September 13, 2019

Javier Burchard attended the 2019 Dairy Cattle Improvement Industry Forum in British Columbia with focus on traceability, feed intake measurement, calf performance and novel future traits.

September 17–18, 2019

INDUSTRY AND GOVERNMENT COLLABORATION

Javier Burchard attended [“Foster our Future.”](#) organized by The Foundation for Food and Agriculture Research. The well-attended event provided very encouraging testimony of current innovation trends and the progressive environment fostered by the U.S. government and the private sector. Sonny Perdue, Secretary of Agriculture, emphasized significance of private-public partnerships to develop and support agriculture research and create modern tools to increase productivity and profitability while contributing to environmental sustainability. [*February 5, 2019*](#)

At the **National DHIA Annual Meeting, Leadership Workshop & Educational Session** in San Diego, CDCB staff presented updates in spirit of the conference theme – Collaboration, Credibility and Connectivity. João Dürr and Javier Burchard presented to the DHIA Managers, and Dürr also updated the Quality Certification Services (QCS) Field Service Advisory Committee. Duane Norman shared a CDCB update during the NDHIA Business General Session. [*March 5-7, 2019*](#)

Javier Burchard joined several hundred attendees representing retailers, processors, cooperatives and dairy farms, at the annual **Dairy Sustainability Forum**

hosted by the Innovation Center for U.S. Dairy to discuss global and local sustainability challenges and solutions. The [U.S. Dairy Stewardship Commitment](#) – a social responsibility pledge to consumers, customers and other stakeholders – has been signed by 22 dairy processors and cooperatives, representing two-thirds of U.S. milk production. [*May 8-9, 2019*](#)

Javier Burchard participated in the **2019 ICAR Conference and IDF/ISO Analytical Week** in Prague, where dialogue revolved around the considerable amount of new technologies that will inevitably impact phenotype sources and data quality. Presentations focused on the integration of sensor devices within the ICAR Guidelines, animal identification services, daily yield calculations, accuracy of recording and sampling devices, new technologies, added value from milk analysis, animal welfare, artificial insemination and how to implement animal data exchange standards. [*June 17-21, 2019*](#)

At the **National Genetics Conference** during the Holstein Association USA Convention, João Dürr participated and John Cole of USDA AGIL presented talks on [inbreeding](#) and [feed intake evaluations](#). [*June 2019*](#)



FUTURE DEVELOPMENTS

FEED EFFICIENCY EVALUATIONS A REALITY FOR 2020

CDCB expects to launch genomic evaluations for feed efficiency in 2020, a long-awaited objective now realistic through collaboration and research investment by various parties.

“There is tremendous potential to improve feed efficiency through genomics and genetic selection,” says João Dürr, Chief Executive Officer of CDCB. “There is great promise for dairy producers to produce milk more efficiently through decreased feed costs. Importantly, genetic selection for feed efficiency is another tool to reduce the carbon, or greenhouse gas, footprint of dairy production, helping meet customer and public expectations.”

The genomic evaluations are likely to be described as residual feed intake (RFI), and the new trait will be incorporated appropriately into Net Merit and other CDCB indexes.

CDCB, FFAR INVESTS IN RESEARCH, DATA COLLECTION

CDCB and the [Foundation for Food and Agriculture Research \(FFAR\)](#) announced in May 2019, their investment of \$1 million each to fund research and measurement of feed intake and sensor data at five institutions. Research is led by Dr. Michael VandeHaar at Michigan State University, with collaboration at University of Wisconsin, Iowa State University, University of Florida and USDA Animal Genomics Improvement Laboratory.

“Our goal is to increase the efficiency and sustainability of producing milk, as feed for dairy cows requires millions of acres of cropland and represents half of total costs on dairy farms,” states Dr. VandeHaar.

This investment helps overcome a leading challenge – collecting enough data on enough cows to develop reliable genomic breeding values for feed intake. Researchers involved will also evaluate whether genetic predictions can be used to decrease methane emissions from dairy cattle.

BUILDING ON PREVIOUS RESEARCH

In 2010, a team of global leaders in dairy nutrition and genetics formed to develop genomic tools for improving feed efficiency and worked effectively for seven years to develop a feed efficiency database, supported by USDA funding. Research demonstrated that feed intake is controlled partly by genetics, and the top 20% of cows for RFI, compared the bottom 20%, need 6% less feed to produce the same amount of milk while remaining healthy.



Photo courtesy of ABS Global

Reasons some cows require less feed than others of similar body weight and milk production could be because they digest feed better, have a more efficient metabolism, or spend less energy on unproductive activities.

The new investment by FFAR and CDCB will build on the previous research and add intake measures on 3600 cows from five research herds. This will enhance reliabilities of feed intake breeding values and enable publication and inclusion in Net Merit and other selection indexes.

The new research will collect a comprehensive set of phenotypes through various sensors, including production, intake, body weight, height, condition, reproduction, health, body temperature and feeding behavior, locomotion, milk spectra and methane emissions

IMPORTANCE TO SOCIETY

Improving feed efficiency of dairy cows will enable dairy to remain a valuable human nutrient source amidst population increases and competition for land. Additionally, new research will collect data on methane emissions and metabolic data to evaluate whether genetic predictions can be used to decrease methane emissions, which will further inform the discussion around the impact of cows on the environment.

FINANCIAL REPORT

Provided below is a summary of the Council on Dairy Cattle Breeding (CDCB) audited financial statements for fiscal year (FY) 2018 and 2017 (January–December). During 2018 the CDCB transitioned a portion of cash to an investment portfolio managed by Morgan Stanley. Also during 2018, CDCB entered into research/grant agreements with the University of Wisconsin–Madison and USDA–ARS. 2018 operating revenue and expenses reflect similar trends to prior years. CDCB is in a sound financial position at year–end 2018.

Financial statements are prepared monthly and reviewed by the CDCB Board of Directors. In addition, Tidwell Group, LLC performed an audit for years ended December 31, 2018 and 2017. 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, 2018 and 2017, 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.

2018 OPERATING REVENUE

increased 18% compared to 2017. CDCB reported a shift in source of revenue originating from female fees increasing from 28% of total revenue in 2017 compared to 33% in 2018.

EXPENSES INCREASED

28% due to additional staff, increased DRPC fees for additional health trait information, and research and development.

2017 AND 2018 AUDITED FINANCIAL STATEMENTS

ASSETS	2018	2017
Cash	\$ 585,117	\$ 5,583,484
Investments, at fair value	\$4,955,441	-
Accounts Receivable	700,367	538,836
Property & Equipment (net book value)	59,881	221,880
Other	76,992	95,099
Total Assets	<u>\$ 6,377,798</u>	<u>\$ 6,439,299</u>
LIABILITIES & NET ASSETS		
Accounts payable	\$ 203,879	\$ 206,337
Long-Term Payable	100,000	-
Accrued Expenses	11,167	5,592
Total Liabilities	<u>315,046</u>	<u>211,929</u>
Unrestricted Net Assets	6,062,752	6,227,370
Total Liabilities & Net Assets	<u>\$ 6,377,798</u>	<u>\$ 6,439,299</u>
REVENUES		
Female Fees	\$ 1,195,638	\$ 851,497
Male Fees		
Initial Fees	869,490	892,298
AI Fees	1,525,050	1,287,525
Other	19,097	28,594
Investment Income	<u>10,109</u>	<u>1,071</u>
Total Revenues	<u>\$3,619,384</u>	<u>\$3,060,985</u>
COST OF OPERATIONS		
Salaries, Service and Administration	\$3,363,300	\$ 2,744,789
Research and Development	243,404	3,490
Depreciation	168,495	210,276
Interest Expense	-	1,139
Total Cost of Operations	<u>\$3,775,199</u>	<u>\$ 2,959,694</u>
Change in Net Assets from Operations	<u>\$ (155,815)</u>	<u>\$ 101,291</u>
Other Income (Expense) Net realized and unrealized loss on investments	(8,803)	-
Change in Net Assets from Operations	<u>\$ (164,618)</u>	<u>\$ 101,291</u>
Net Assets, beginning	\$6,227,370	\$6,126,079
Net Assets, ending	<u>\$6,062,752</u>	<u>\$6,227,370</u>

CDCB VISION

THE COUNCIL ON DAIRY CATTLE BREEDING (CDCB) IS AN INDUSTRY COLLABORATION THAT BENEFITS THE DAIRY COMMUNITY BY PROVIDING GOLD STANDARD GENETIC EVALUATIONS FOR THE IMPROVEMENT OF DAIRY CATTLE POPULATIONS.



COUNCIL ON DAIRY CATTLE BREEDING

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