ACTIVITY REPORT

October 2015 to September 2016

Council on Dairy Cattle Breeding
4201 Northview Drive. Suite 302
Bowie, MD 20716
www.cdcb.us
October 4, 2016

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About CDCB

The Council on Dairy Cattle Breeding (CDCB) is a non-profit organization responsible for calculating and distributing the genetic evaluations and genomic predictions, for managing the national database, and for analyzing and distributing dairy cattle data in the United States. The CDCB allied partners' cooperator database is the largest in the world devoted to dairy animals, with over 95 million female phenotypic records, over 1.4 million animal genotypes and approximately 500,000 males with genetic evaluations or genomic predictions.

This report was prepared for the 2016 CDCB Industry Meeting held at the Alliant Energy Center, Madison, WI, on October 4, 2016.

CDCB Core Value:
Providing Premier Dairy Genetic Information Services & Industry Collaboration

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

CDCB Board of Directors

The CDCB stakeholders consist of four sectors of the dairy industry that represent U.S. dairy producers, data records processors, breed associations and AI companies. Each sector, Dairy Records Processors (DRPs), the Dairy Records Processing Centers (DRPCs) the Purebred Dairy Cattle Association (PDCA) and the National Association of Animal Breeders (NAAB), has equal representation on the CDCB Board of Directors.

Dairy Records Providers

Jay Mattison, Chair
National DHIA

Kent Buttars
Rocky Mountain DHIA

Dan Sheldon
DairyOne

National Association of Animal Breeders

Gordon Doak, Vice-Chair
NAAB

Charles Sattler
Select Sires, Inc.

Nate Zwald
Alta Genetics, Inc.

Purebred Dairy Cattle Association

Neal Smith, Treasurer
AJCA-NAJ

John M. Meyer
Holstein Association USA, Inc.

Gordie Cook
Holstein Association USA, Inc.

Dairy Records Processing Centers

John Clay, Secretary
Dairy Records Management System

Patrick Baier
AgSource Cooperative Services

Ted Foster
Dairy Records Management System

Non-voting Advisory Member of the CDCB Board of Directors – 2016 (1 year term)

Juan Tricarico
Innovation Center for U.S. Dairy

Non-members Supporting the CDCB Board of Directors

Paul VanRaden
ARS-USDA Industry Liaison

Jack Gravelle
CDCB Attorney
Porter Wright Morris & Arthur LLP

João Dürr
CDCB Chief Executive Officer

Duane Norman
CDCB Technical Advisor and Industry Liaison

CDCB Standing Committees

Executive Committee

- Jay Mattison, Chair (NDHIA)
- Gordon Doak, Vice-Chair (NAAB)
- Neal Smith, Treasurer (AJCA-NAJ)
- John Clay, Secretary (DRMS)

Finance Committee

- Neal Smith, Chair (AJCA-NAJ)
- Charles Sattler (Select Sires, inc.)
- Dan Sheldon (DairyOne)
- John Clay (DRMS)

Representative in the Interbull Steering Committee

- Marjorie Faust (ABS Global, Inc.)

CDCB Data Suppliers

Dairy Records Providers

AgSource Cooperative Services
Arizona DHIA
Dairy Lab Services
Dairy One Cooperative Inc.
DHI Cooperative Inc.
DHIA West
Gallenberger Dairy Records
Heart of America DHIA
Idaho DHIA
Indiana State Dairy Association
Integrated Dairy Herd Improvement
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.
Alta Genetics USA
American Jersey Cattle Association
Brown Swiss Cattle Breeders' Association
Genetic Visions-ST LLC
Genex Cooperative, Inc.
Holstein Association USA, Inc.
Holstein Canada
National Association of Animal Breeders, Inc.
Neogen Corporation dba GeneSeek
New Generation Genetics, Inc.
Select Sires Inc.
Semex Alliance
Tri-State Breeders Cooperative dba Accelerated Genetics
VHL Genetics
Zoetis Genetics

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 Dairy Cattle Association
U.S. Arshire Breeders' Association

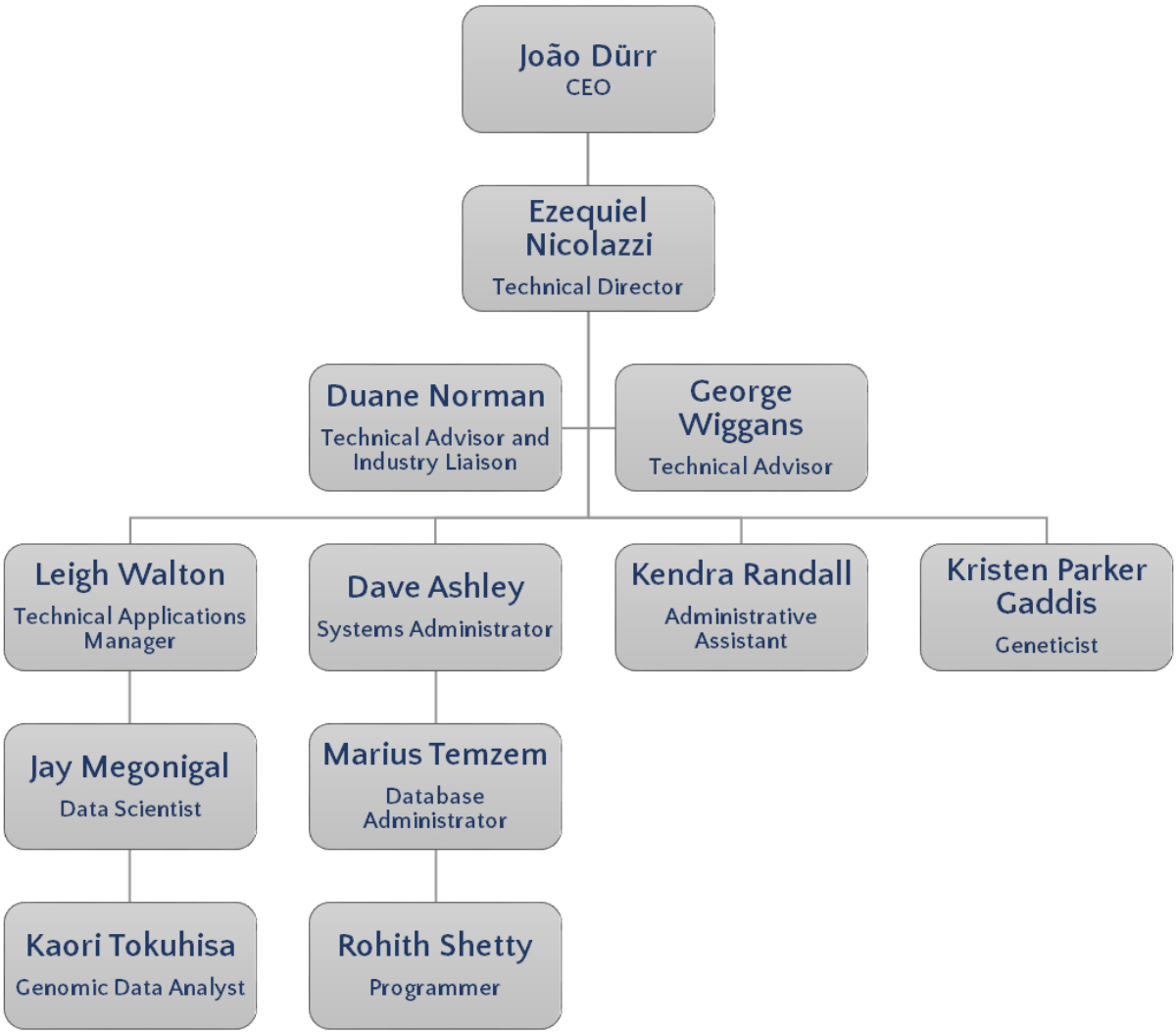
Dairy Records Processing Centers

AgriTech Analytics
AgSource Cooperative Services
Dairy Records Management Systems
DHI-Provo

Genomic Laboratories

Bio-Genesys Ltd.
Genetic Visions-ST LLC
Neogen Corporation dba GeneSeek
VHL Genetics
Weatherbys Ireland DNA Laboratory
Zoetis Genetics

CDCB Personnel



Word from the Chair

"Coming together is a beginning"

A journey that started in the 1980's with a loosely organized group from AI, breed associations, DHIA and USDA came together to chart a course for the USA genetic and management systems of dairy cattle. Twice yearly meetings and discussions centered on activities in each sector and some common areas of overlap. Committees and task forces worked on key industry areas to bring recommendations to the Council governance group with USDA-Agricultural Research Service (USDA-ARS) calculating genetic evaluations and management benchmarks. This system worked effectively into late 2008. Technology, methodology, commercial delivery and dairy farm operations drove the need to address changes in dairy genetics and management systems that the Council on Dairy Cattle Breeding was set up to handle.

"Keeping together is progress"

The CDCB group and some key dairy industry members pushed for a venue that established the CDCB Dairy Data Working Group in 2009. This Dairy Data Working Group, followed by the CDCB Business Plan Working Group formed some basic assumptions about dairy data and a beginning business structure for CDCB to operate as a service organization. At the same time negotiations were being held with USDA-ARS to establish a Non-Funded Cooperative Agreement. This agreement would allow for the industry cooperator database and genetic and genomic evaluation service work to be transferred to the CDCB from USDA-ARS, while the USDA-ARS to CDCB Transition Date and Implementation Working Group was putting together a timetable and plan to achieve the transition. One of the last tasks, a CEO Search Task Force, solicited candidates for the CDCB CEO position. After a global search, Joao Durr joined the CDCB as the CEO and has led the staffing and transition activities over the last two years. The bumps in the road for this journey were navigated and the CDCB staff led a transparent transition. I would like to give my professional and personal thanks to Joao Durr and the CDCB staff for achieving these huge accomplishments.

"Working together is success"

The CDCB happened because individuals and organizations opened their doors of expertise over the last 20 years through volunteering to support and develop the CDCB and CDCB operations. Now the CDCB staff is building the next era of working together with the industry. A process of vision planning has been on-going for the past year between the CDCB staff and board. There are still many tasks and policies to be developed but the process is started. Some of the next key steps are to review and update the strategic business plan, access and use of data protecting confidentiality and an invigorated research effort for the benefit of dairy farmers and consumers. The CDCB staff and board under Joao's visionary leadership will drive dairy genetics and management to even higher levels based on the new technologies and innovation. Volunteers and staff working together will move forward the CDCB efforts to even greater success in the coming years.

If everyone is moving forward together, then success takes care of itself. - Henry Ford

Jay Mattison, CDCB Chairman

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Word from the CEO

"Providing premier dairy genetic information services and industry collaboration".

This is the core value of the Council on Dairy Cattle Breeding, as defined by the CDCB Board of Directors. It summarizes the scope of the business, points out a clear long term goal and provides the way it can be achieved.

What is the CDCB all about? To serve the dairy industry by providing genetic information services. That encompasses aggregating the largest existing dairy database in the world, providing accurate and transparent genetic and genomic evaluations for a multitude of traits and breeds and offering dairy farmers the information they need to make sound breeding decisions.

The long term goal is simply to be the premier provider of these services, making the U.S. genetics the gold standard. American leadership has been influential for decades, but maintaining this high standard on a fast-changing high-tech business environment requires a vigilant commitment to excellence.

The way this is done requires collaboration between the industry sectors that constitute the CDCB. Dairy records providers, dairy records processors, purebred breed associations and the artificial insemination organizations working together for the benefit of the U. S. dairy farmers is the essence and the strength of the CDCB. A superficial analysis may mistakenly perceive that different sectors hold conflicting interests and divergent aspirations, when in fact there is a vital complementarity among the stakeholders that maximizes the value of each partner's business. This synergy between farmer oriented organizations is what makes the CDCB relevant.

Since the CDCB Industry Meeting held on September 2015, a series of milestones have been established. The planned transition of services from the USDA was successfully accomplished not only from the operational viewpoint (database and evaluations fully hosted and run by CDCB), but also regarding the formal commitment of all stakeholders and service users represented by the signature of their respective material license agreements with the CDCB. The initial investments in personnel and infrastructure have been completed, and the operation now has nine full-time employees, three part-time consultants, and the necessary data storage and processing capacity. A data acquisition service fee schedule was established to remunerate phenotypic data suppliers and to stimulate the development of new data pipelines.

The Animal Genomics and Improvement Laboratory (AGIL) continues delivering world class research to improve the genetic evaluation system. Two good examples are the new genomic tool Breed Base Representation (BBR) and the novel trait cow livability. Securing steady funding for AGIL research programs and ensuring succession for recently retired scientists are of strategic importance for the dairy industry as a whole. The CDCB is committed to keep ARS administrators informed about the unparalleled impact this research group continues to have on the dairy industry.

Looking ahead the CDCB enters a new phase of reviewing the legacy system to identify opportunities for improvement, implementing data access and distribution policies that reflect the expectations of the members, establishing a comprehensive structure of working groups to advise the Board of Directors, developing new products for the benefit of the dairy producers and continuing to improve data quality and accuracy of genetic and genomic predictions. The CDCB team is looking forward to another year of contributing to make a stronger dairy industry.

João Dürr, CDCB Chief Executive Officer

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Financial Report

The CDCB audited results for fiscal year (FY) 2015 (which is the 2015 calendar year) follow with some notes. The CDCB is in a solid financial position, and 2015 was the year in which most operating expenses have been established, including payroll and benefits as well as one-time capital expenditures. Monthly financial statements are prepared and reviewed by the CDCB Board and the accounting firm of Clark, Schaefer and Hackett CPAs conducted the FY 2015 audit. The audit documented a solid set of processes and financial statements for the CDCB.

2015 Audited Financial Statements

Assets

The assets of the financial standing of the CDCB for FY 2015 have unrestricted Net Assets of $5,576,638 with accounts payable of $163,525 and Notes payable of $299,966 (which are the member stakeholder capitalization payments).

Assets	
Cash	5,237,174
Accounts Receivable	470,876
Property and Equipment (net book value)	279,350
Other	52,729
Total Assets	6,040,129
Liabilities	
Accounts payable	163,525
Notes payable	299,966
Unrestricted Net Assets	**5,576,638**
Total Liabilities & Unrestricted Net Assets at December 31, 2015	**6,040,129**

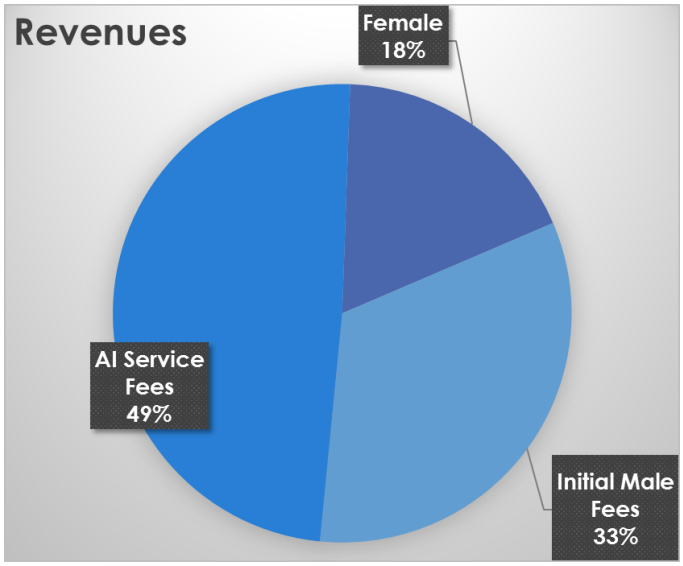
Revenues

The FY 2015 revenues split by female and male initial fees and male artificial insemination fees had results of $2,978,418. This represents a 9% reduction in total revenues compared to the FY 2014, as a result of the service fees reduction adopted in March 2015.

The number of females receiving genomic evaluations in FY 2015 was 316,146 (91%) and the number of males was 31,178 (9%). A subset of 1,902 bulls (6%) paid artificial insemination fees in FY 2015.

Fees	
Female	524,346
Male	
Initial	*975,670*
AI Service	*1,466,600*
Other	11,802
Total Revenues	**2,978,418**

The percentage revenue breakoutfor the FY 2015 is 18% for female initial fees, 33% for male initial fees and 49% for male AI fees.



Cost of Operations

Salaries, Service and Administration	1,724,639
Depreciation and Amortization	54,768
Interest Expense	3,234
Total Cost of Operations	**1,782,641**
Net Income from Operations	**1,195,777**

The CDCB is still building staff capacity in FY 2016 which will result in greater payroll and benefit expense. There will also be additional capital expenditures for hardware and software as the CDCB completes the operations infrastructure. There was an operational margin of $1,195,777 reported for FY 2015.

The CDCB Board and staff greatly appreciate the efforts of Neal Smith, CDCB Treasurer, and Vickie White of the American Jersey Cattle Association for their professional expertise in working with the CDCB accounts and funds.

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CDCB in Numbers

CDCB hosts and manages the cooperator' phenotypic and genomic databases of U.S. dairy herd's data, which are a strategic asset in providing value and leadership to the U.S. dairy industry. Management and performance benchmarks as well as genetic and genomic evaluations are derived from these data.

In January 2016, 4.4 million cows out of more than 17 thousand herds were enrolled into dairy herd improvement services (DHI) and voluntarily contributing data to the CDCB system (Table 1)

Table 1 – Dairy cow enrollment in DHI test as of January 1, 2016, by breed.

Breed	Herds	Cows
Ayrshire	64	3,436
Brown Swiss	150	10,291
Guernsey	92	4,330
Holstein	14,066	3,615,132
Jersey	887	320,400
Milking Shorthorn	27	1,427
Red and White	6	431
Mixed	1,936	445,963
Total	**17,228**	**4,401,410**

Table 1 – Number of phenotypic records added to the official evaluation runs since December 2015.

Record type	New records added between Dec 2015 and Apr 2016	New records added between Apr 2016 and Aug 2016
First lactation test day records	3,012,084	3,061,753
Later lactation test day records	4,578,898	4,752,008
Heifer breeding records	963,249	918,528
Cow breeding records	5,164,212	4,833,899
Calving ease records	401,247	458,785
Stillbirth records	332,704	381,462

Out of this pool, approximately 8 million new test day records, 6 million breeding records and 800 thousand calving records are added at each of the triannual official genetic evaluations provided by the CDCB (Table 2).

Since the start of the U.S. genomic evaluations in 2009, the CDCB has accumulated over 1.4 million genotypes for the 5 dairy breeds evaluated (Figures 1, 2 and 3).

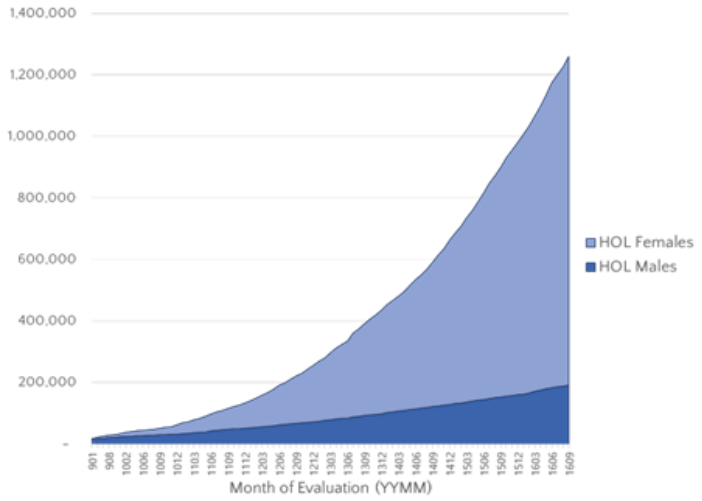
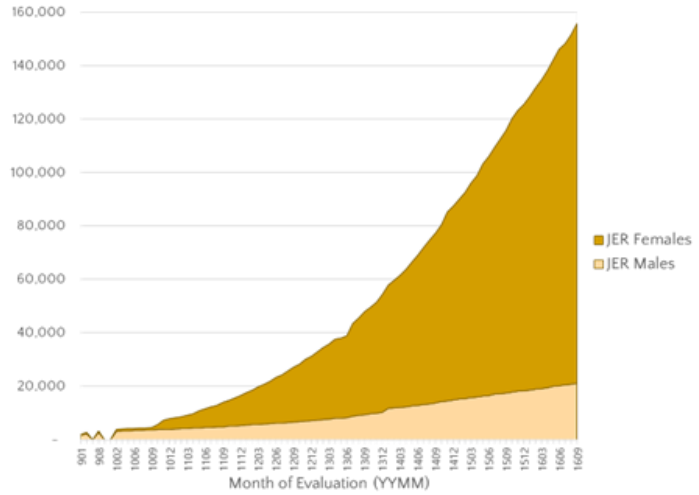


FIGURE 1 – Number of Holstein genotypes monthly added to the CDCB database since January 2009.

FIGURE 2 – Number of Jersey genotypes monthly added to



the CDCB database since January 2009.

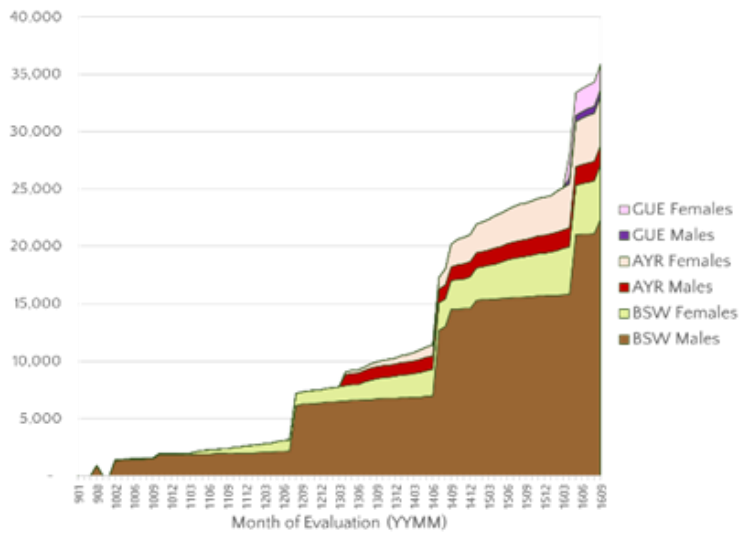


FIGURE 3 – Number of Ayrshire, Brown Swiss and Guernsey genotypes monthly added to the CDCB database since January 2009.

Animals from 53 countries from all continents (89% from North America) have been added to the CDCB database, producing a ratio of 5.1 females per male (Table 3).

Even though CDCB genomic predictions are tailored for the U.S. populations, Figure 4 shows that U.S. and Canadian bulls are predominantly used as sires of the genotyped animals in all continents which makes the CDCB predictions relevant for most foreign animals as well.

Finally, Figure 3 shows the estimated female genetic trends for cow livability, which is the latest trait added to the CDCB portfolio.

Table 2 – Number of genotypes stored in the CDCB database by continent of origin, sex and availability of phenotypic information (September 2016).

Continent	Predictor		Predicted		Total
	Females	Males	Females	Males	
Africa	6	–	374	48	428
Asia	15	1,826	2,101	883	4,825
Eastern Europe	24	425	2,120	591	3,160
West and Central Europe	226	15,250	57,113	45,886	118,475
Latin America	343	2	11,983	752	13,080
North America	324,437	29,240	772,096	133,902	1,259,675
Oceania	96	439	5,966	2,284	8,785
Total	**325,147**	**47,182**	**851,753**	**184,346**	**1,408,428**

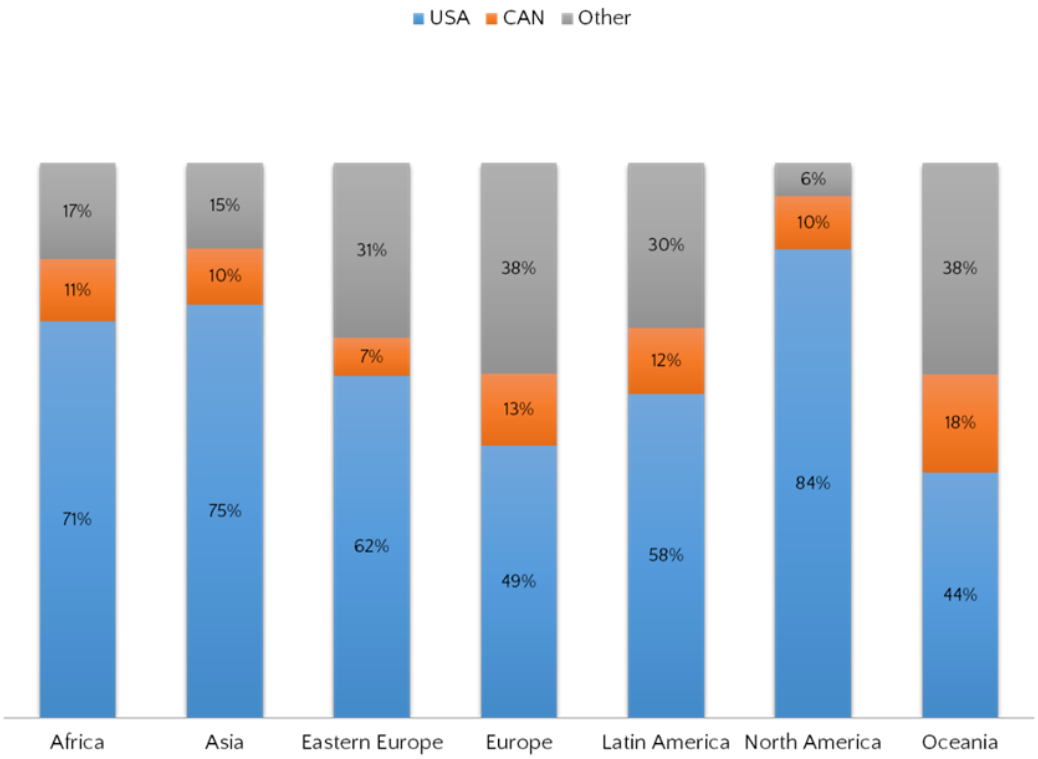


Figure 4 - Country of sire on genotypes used by the CDCB by continent (September 2016).

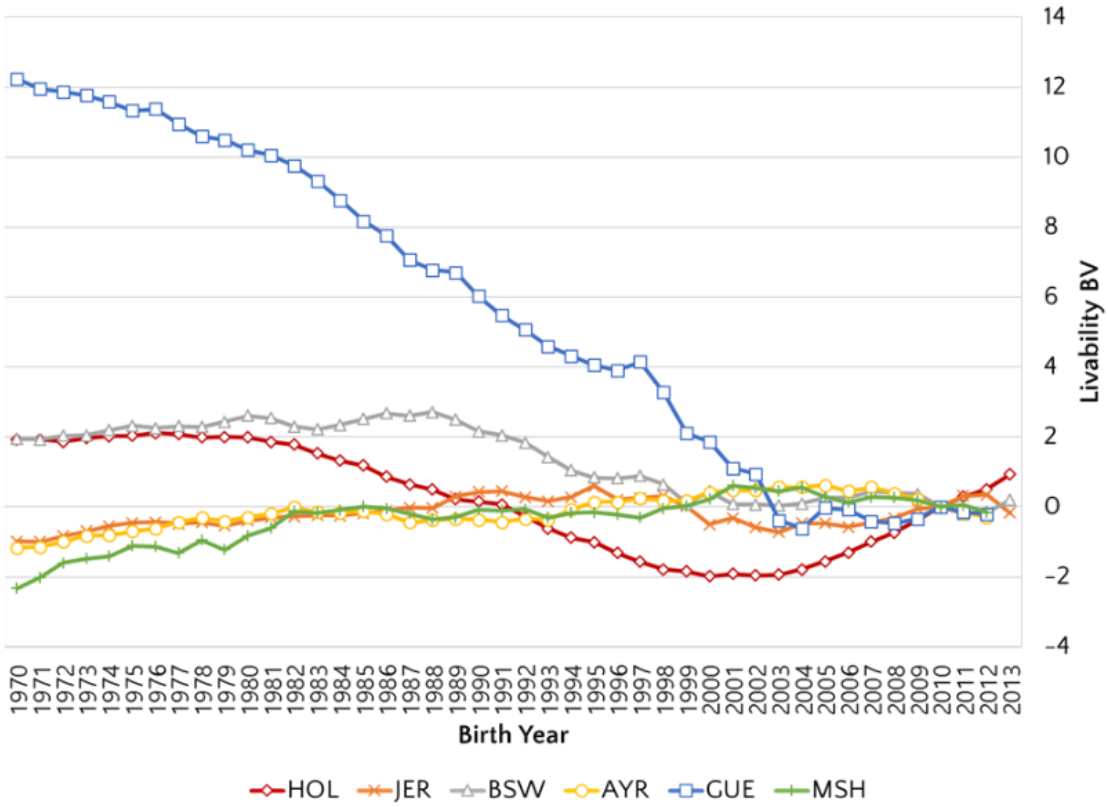


Figure 1 - Cow livability genetic trends by breed for females (calculated on August 2016).

Progress Report

Staffing

The process of developing the CDCB initial team has been completed. Staff consist of nine permanent employees and three part-time consultants. The most recent enrollments include Rohith Shetty (programmer, February 2016), George Wiggans (consultant – Technical Advisor, August 2016), Ezequiel Nicolazzi (Technical Director, September 2016) and Kristen Parker Gaddis (Geneticist, October 2016).

Activities

Transition completed

A Non-Funded Cooperative Agreement (NFCA) was developed and signed on March 27th, 2013 between the Animal Genomics and Improvement Laboratory (AGIL), United States Department of Agriculture and the Council on Dairy Cattle Breeding (CDCB) determining the transition of the U.S. dairy cattle genetic and genomic evaluations from AGIL to CDCB. The transition was completed on December 17, 2015, with all data processing for genetic evaluations being conducted by the CDCB staff. Building the CDCB system and transferring the legacy files was only possible due to the unconditional support provided by the AGIL staff, showing once again their absolute commitment to the dairy industry. AGIL will continue performing research and developing methods, procedures, and algorithms for CDCB to compute estimates of genetic merit of dairy animals.

U.S. Dairy Genetic Evaluations need to be labelled "CDCB"

Upon completion of the transition of services from the USDA, CDCB is now solely responsible for the Cooperator Database and the estimates of genetic merit published in the United States. As a consequence, all predictions of genetic and genomic evaluations calculated and made available by the CDCB must be labelled as "CDCB estimates (run date)" in contrast to the label "USDA/CDCB estimates (run date)" which was recommended during the transition period. Industry partners that make CDCB results public in print or electronically are advised to adopt the labelling policy.

Material License Agreements

All Material License Agreements proposed by the CDCB to data suppliers have been signed and filed by December 2015, completing a very important step for the industry collaboration effort that represents the core value of CDCB.

Data Acquisition Service Fee Schedule

The CDCB Board of Directors adopted the proposal from the Data Flow Working Group (John Clay, John Meyer, Chuck Sattler, Bruce Dokkebakken and João Dürr) to establish a Data Acquisition Service Fee Schedule. The aim is remunerating phenotypic data suppliers for the additional services associated with the preparation of data for the cooperator database. Since December 2014 the service fees that NAAB previously paid to the DRPCs have been covered by CDCB. The proposed system is based on a fee per record included in the CDCB genetic evaluations, with different values for the various record types (Table 2). Payments are made following the official evaluation dates (April, August and December) and fees are only for the records added to the system since the previous run. Record completeness also impacts the fee per record. The aim is to continuously stimulate data suppliers to increase the number and quality of records that meet the standards adopted by CDCB for genetic evaluations. Service fees for new data acquisition were included in the 2016 budget and the system needs to be re-evaluated every time new types of records become available.

Annual Dairy Herd Information (DHI) reports

The CDCB continues providing national benchmarks on behalf of the National DHIA by publishing annual statistics that include DHI participation, state and national standardized lactation averages by breed for cows on official test, summary of herd averages, Dairy Records Processing Center activity summary, somatic cell counts of milk from DHI herds, reasons that cows in DHI programs exit the herd and reproductive status of cows in DHI programs.

Research Priorities

The CDCB Board has submitted a document with suggested research priorities to be considered in addition to those developed from the AGIL/DFRC/ARS stakeholders listening session held May 9, 2016. Each member sector provided its own list of specific research suggestions under four general areas proposed by the CDCB staff: health and functional traits; bovine sequencing data; management and profitability of dairy herds; and genetic evaluation methods. The document was well received and is being considered by the ARS administration for the elaboration of the five-year research plan that will start in 2017. The CDCB will continue the efforts to facilitate the maintenance of a unified set of research priorities to be used as a reference by researchers and funding agencies.

Genomic Nominators Training

Following request from a group of PDCA members (American Guernsey Association, American Milking Shorthorn Association, Brown Swiss Cattle Breeders' Association and U.S. Ayrshire Breeders' Association), a full day training on genomic nomination was offered by the CDCB and AGIL staff on April 26, 2016, in Bowie, MD. Representatives from the respective PDCA members and a representative of the Idaho DHIA participated in the training session, which covered all rules and procedures involved in the CDCB genomic nomination process.

CDCB Internship Program

CDCB initiated an internship program this summer (2016). We were pleased with the outcome and hope to continue this activity in future years. We were fortunate to have **Amber Gabel** of Newport, PA in this position. Amber is currently a senior in the honors program at Pennsylvania State University and will receive both a B.S. and M.S. degrees in June 2017. Chad Dechow is her advisor in her M.S. effort.

Amber was well prepared for her intern position. She was active in 4-H and FFA before college and is currently active in college activities. Last year she served as an officers in 4 collegiate organizations. She was a member of the 2014 PSU dairy judging team and captain of this year's winning national collegiate dairy quiz bowl team. She has been recipient of the American FFA degree. She was a semi-finalist as a National Holstein Distinguished Junior member and a delegate to the Jersey Youth Academy. She is this year's winner of National Dairy Shrine's Junior Merit Scholarship and was one of last year's Klussendorf Scholarship recipients.

She was supervised by Duane Norman, but collaborated with several staff members at the CDCB and USDA's Animal Genomics and Improvement Programs Laboratory. As an outcome of her CDCB internship, she was designated by Penn State's Ag Alumni Society as one of ten students from 40 applicants who will receive a $1000 award in recognition of her summer experience. CDCB couldn't have been more pleased with her performance. Her results put the CDCB in a sound position where it can make improvements in fertility evaluations, traits valued highly by U.S. dairy producers.

Changes in Genetic Evaluations

DECEMBER 2015:

Additional breeds from Interbull

Bulls with breed codes MO (Montbeliard), SM (Simmental), and Fleckvieh (FL) were changed from the Holstein to the Simmental scale in the Interbull evaluation Holstein scale. As a result, foreign MO, NO, SM, and FL bulls were converted back onto the U.S. Holstein base. Their PTAs include the expected heterosis when mated to Holstein cows and are comparable to Holstein evaluations, the same as before. Reliability improved for foreign bulls with U.S. daughters for these additional breeds because of more pedigree information and additional ancestor PTAs are available from Interbull.

Editing changes for sire conception rate

Minor changes were made to editing in regard to gestation length, estrus cycle, herd conception rate, and bull age grouping. The gestation period used in editing was changed from 280 days to ones appropriate for the specific breed (AY, 282; BS, 288; GU, 286; HO, 279; JE, 280; MS, 281; and WW, 280 days). An edit was changed to allow for variation in the estrus cycle. An edit was reduced from 21 to 17 days to allow for normal variation (18 to 24 days) in the heat cycle. Previously, the herd's conception rate over the 4-year period needed to be between 10 and 90% for the inseminations to be used. The upper limit was lowered to 75%. The number of bull age categories for SCR in the Jersey breed was reduced from 10 to 6 to make them resemble more closely a smooth biological curve.

Genetic variance for Jersey type traits

Discovery and elimination of a computer program bug reduced the genetic standard deviation of several conformation traits in Jerseys by about 5%. Fortunately, the program bug caused almost no change in PTA rankings. Formulas for net merit were not affected.

Unknown parent group definitions

The system to assign unknown parent groups was revised to improve stability and convergence with data updates. The new group definitions were applied to yield traits, productive life (PL), somatic cell score (SCS), daughter pregnancy rate (DPR), heifer conception rate (HCR), and cow conception rate (CCR). Some of the recent groups had too few cows, so some were merged. Most genomic Predicted Transmitting Abilities (PTA) changed little; however, those for young, non-genotyped animals with missing sires or dams changed the most.

APRIL 2016:

Breed base representation for crossbreds

Breed base representation (BBR) estimates the percentage of DNA contributed to animal by each of 5 purebred referenced breeds: AY, BS, GU, HO, and JE. The 5 estimates sum to 100 % (with a minimum of 0 and a maximum of 100). BBR values of 94 to 99 are set to 100%. The BBR estimates developed by AGIL have a standard error of about 2%, caused by normal variation within a breed as well as by imputation from lower density chips. BBR values are distributed only once for each animal unless genotyped again with a higher density chip. These are made available for the new animals on the weekly files. Genotyped, progeny-tested bulls within each breed serve as the purebred reference population for that breed. The BBRs provide information about breed composition that is more accurate than breed-check markers. It is expected that BBR will provide a means for making genetic predictions for crossbreds possible in the future.

Edits and adjustments for heifer conception rate

Age limits were lowered from 12 to 8 months to provide heifer conception rate (HCR) records for about 3% more animals. Use of records from these younger animals should improve timeliness and reliability of HCR evaluations. Earlier fertility is a result improved herd management, greater use of sexed semen, and access to sires with favorable calving ease. Conception rates for sexed semen have improved considerably in the last 2 years. Therefore, new adjustment factors were implemented as well for HCR.

Genomic evaluation of Guernseys

Genotypes from 2,376 Guernsey bulls and cows from collaboration between the United States, Canada, the United Kingdom, and the Isle of Guernsey were used to launch CDCB's genomic evaluations for Guernsey cattle. A study showed gains in reliability over parent averages of 16.8 percentage points averaged across traits. The research leading to these results received funding from the European Union's Seventh Framework Programme for

research, technological development and demonstration. Select Sires and the American Guernsey Association contributed to project development and provided genotypes.

Mutations in HCD and in BH2

The Holstein haplotype test for cholesterol deficiency (HCD) was improved by using the exact location of the mutation. Now only the portion of the haplotype containing the mutation is required. Soon, direct test results could also be included within the haplotype to further improve accuracy, as is done with several other recessive haplotypes. Brown Swiss haplotype 2 (BH2) test results were also improved by using the exact location of the mutation. Direct laboratory tests for the BH2 mutation may be available in the near future. Nearly all calves homozygous for BH2 or for HCD die at a young age. Genomic testing, selection, and mating programs are all useful to reduce the occurrence of these and other recessive defects.

Reliability and inbreeding in weekly evaluations

Genomic reliability, genomic inbreeding, and genomic future inbreeding were provided in the weekly processing starting in January 2016, whereas previously those fields were computed only during the monthly runs. A comparison of weekly results was consistent with the following official monthly evaluation for animals that were in both. Full monthly processing now takes about 5 days; so an alternative similar to the weekly system might need to replace the monthly evaluations as computing times continue to increase.

JUNE 2016:

Revised genomic edits for heifer conception rate

Three changes were introduced in June 2016 to improve genomic predictions for HCR in breeds with small reference populations such as Guernseys. For specifics on the technical details, refer to https://www.cdcb.us/reference/changes/eval1606.htm. Some large changes occurred within the smaller breeds for foreign and very old bulls due to limited HCR data before 2000.

AUGUST 2016:

Cow livability evaluation

Predicted transmitting abilities (PTA) for Cow Livability was developed by AGIL and published by CDCB. Cow Livability (CL) measures a cow's ability to stay alive while in the milking herd, whereas PTA for productive life (PL) measures a cow's ability to avoid either dying or being culled. If a cow dies, or has to be euthanized, there is a total loss of income, compared to those sold for beef. About 16% of cows die instead of being sold, with death losses averaging 6% per lactation, highest in older lactations. Reasons that cows exit the herd, including died, have been reported through DHI and stored in the national database for decades. These historical records allow accurate CL evaluations to be computed. Economic values for CL and PL were derived using prices assumed in the current version of net merit (NM$). The relative emphasis on CL was estimated at 7.4%, so the emphasis on PL will decline from 19.1 to 13.5% because its economic value will include only the losses other than death. The plan is to include CL in NM$ once breeders become more familiar with the new trait.

Genomic mating file format

Sizes of the genomic mating files were reduced by revising the format and excluding cows that are likely to be dead. The format change reduced the file sizes by one half. Another change removed U.S. cows culled or those with over 27 months since last calving without a record in progress. Those edits were applied to domestic females at least 3 years old at the start of the evaluation. These edits removed about 20% of U.S. cows from the file, and will limit file sizes more in the future as genotyped females become older and leave their herd. Previously all genotyped females were included in the mating file for each breed.

Genotype exchanges with Japan and Switzerland

Genotypes for 3,000 Holstein proven bulls from Japan were added to the reference population in May 2016, with U.S. and Canadian proven bull genotypes provided to Japan in exchange. This agreement was between the National Livestock Breeding Center of Japan and the Cooperative Dairy DNA Repository (CDDR). Because the Holsteins of Japan and North America are highly related and the genetic correlations are also high for most traits, reliabilities of U.S. genomic predictions are expected to increase slightly.

Genotypes for Holstein and Red Holstein bulls from Switzerland were provided by Qualitas AG pursuant to an exchange agreement between the Holstein Association of Switzerland, SwissHerdbook Cooperative Zollikofen, and the CDDR. After removing duplicates, 4,284 bulls were added to the CDCB database. The genotypes were added in the February 23, 2016 weekly release. This agreement with Switzerland is similar to previous exchanges with

Italy, the United Kingdom, and Canada; thus, bull genotypes are shared by those 5 countries.

Mutation in HH5

Holstein haplotype 5 (HH5) carrier status was improved by using the exact location of the mutation. Previously 46,784 animals were determined to be HH5 carriers; 69 additional animals became designated carriers using the known location of the mutation. Direct test results for the mutation could be included in the future to further improve accuracy, as is done with several other recessive haplotypes.

New Cooperation on exchange of genotypes for genomic young Holstein bulls between North America and Germany

Starting with the August 2016 evaluation, the members of the Cooperative Dairy DNA Repository (CDDR) and the German Genomic Consortium (all German Holstein organizations) will routinely exchange the genotypes of all new young genomic AI bulls that are at least 10 month of age. The owners of the bulls will receive non-published genomic breeding values from the other country's routine genomic evaluation. With these evaluations they can decide which bulls are to be published on the other country's scale. As 'Approved Partners' both sides are granted beneficial fees for genomic evaluation and publication.

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