Council on Dairy Cattle Breeding

CDCB Services: Continuous Improvement

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Roadmap

- Disease resistance – continuous progress
- New bovine assembly (& co.)
- Genomic evaluations for crossbred animals
- Publication query
- Age at first calving
- Constructed dams
- Genomic Parent Average
- New formats
- Genomic nominators and genotyping labs QC

Disease resistance – continuous progress

- 6 health traits published officially in April 2018 (+ December 2017 test run)
- Official publication is starting point, not final result.
  - *Enhancement on models*
  - *Breeds involved*
  - *Further developments*

Disease resistance – Research on modeling

- Variance pre-adjustments
  - Account for difference in variance among lactations
  - Categorical traits are pre-adjusted using year-groups, lactation number, heritability
    - Livability (LIV) currently uses this pre-adjustment
  - Changes should be small if implemented
    - Most health traits have PTA correlations ~95% or higher among bulls with REL ≥ 50% in testing

Disease resistance – Breeds involved

- Jersey health records
- Sept. 2018 – 117,000 usable health records from 71,000 Jersey animals in 202 herds

Health event	Number of records	Number of cows	Number of herds	Incidence
Milk fever	53,807	35,986	78	1.2%
Displaced abomasum	50,490	33,916	70	1.0%
Ketosis	34,767	20,527	70	2.8%
Mastitis	85,826	55,093	160	11.9%
Metritis	60,453	40,782	74	5.7%
Retained placenta	49,687	32,920	73	2.3%

Disease resistance – Breeds involved

- Growth in the amount of Jersey health records received
  - Many traits **have more than doubled** the number of health records in the past 6 months
- Depending on the trait, Jersey ~3 to 6% of the amount of records compared to Holstein.
  - Jersey population is ~14% the size of Holstein (based on yield data used for genetic evaluation)
- **Number of records needed for Jersey health evaluations will depend on the reliability deemed acceptable for these low heritable traits**

Health event	Records added since March 2018
Milk fever	24,642
Displ. Abom.	23,455
Ketosis	3,364
Mastitis	48,697
Metritis	36,412
Retained placenta	25,330

Further developments

- Clinical mastitis PTAs submitted to Interbull for international validation
  - Not many countries submitting direct trait (CAN, FRA, BEL, NLD and ITA)
  - Genetic correlations U.S. SCS with foreign clinical mastitis is .**88 (SCS has been a good proxy!)**
- Multiple-trait models
  - SCS and clinical mastitis
  - Health traits with other functional traits such as productive life or livability
  - Similar health traits (e.g., reproductive disorders, metabolic disorders)

New bovine assembly (& co.)

- New assembly changes SNP positions, which will likely impact haplotype creation and are expected to have slight impact on imputation result
- Smaller scale: changing of SNP position might affect haplotype calling
- Review of SNPs used for haplotype calling (inclusion of many causative mutations now available)
- CDCB new prediction SNP list 60k → 80k
- Implementation: aim is December 2018

Crossbred evaluations

- How:
  - Predictions are based on purebred reference populations (i.e. SNP effects are breed-specific)
  - Crossbreds: combine single breed SNP effects based on BBR proportions
- Why:
  - CDCB is not promoting crossbreeding, nor the use of one breed or the other.
  - Committed to provide the best possible service to all farmers.
    - 35,000 animals not receiving a genomic evaluation
    - > $1,000,000 spent in genotyping (only) but no genomic evaluation results.

Crossbred evaluations (II)

- When:
  - Research conducted and presented by AGIL (2017)
  - Implementation plan developed by CDCB
  - Business rules under revision
  - Testing and review by industry
  - Expected 2019

Publication (reason) query

- Large # requests for clarification
- Why animals (don't) receive an evaluation result?
  - Many rules apply and and dynamic database (changes may apply after cutoff).
  - Editing and publication criteria may change over time.
  - Publication rules to be applied at cutoff and available immediately.
- Solution:
  - Tool to inform, at the beginning of the evaluation, the reasons why an animal is being published or not.
  - Will allow displaying evaluation history
  - Expected implementation: **2019**.

Age at First Calving

- See Paul's presentation
- Current status: *under research* (AGIL)
- Implementation plan to be defined as soon as research is completed at AGIL
- Expected delivery: **2019**

Constructed dams

- See Paul's presentation
- CDCB is communicating with ICAR (International Committee for Animal Recording)
  - Global standard for livestock animal recording
  - Genomics and its role in pedigree identification.
- **International standard for constructed dam ID**
- **Definitions on how to distribute this information**

Genomic Parent Average (**gPA**)

- Industry cooperators' request
  - Distribute gPA instead of traditional P(T)As in genomic evaluation files
- Implementation in progress (AGIL released software)
  - Probably November 2018.
- Included in **new format** for genomic evaluation files only.

New format for genomic evaluations

- So-called "CSV" and "XML" files, containing genomic evaluations only.
- More than 6 months of discussions with different groups (Nominators, Breed associations, NAAB committees, DRPC).
- Objective: Total flexibility to future changes, standardization of fields and formats.
- Initial test files released (there will be some modifications)
- Implementation:
  - Expected November 2018.
  - Long transition phase
  - XMLs will be discontinued.
- Revision of all other input/output formats will follow.

Quality control of data providers

- Continuous evaluation of the industry providers performance in terms of data quality, their interaction with CDCB systems and their reactivity and accuracy in correcting records.
- Early detection of potential issues
- Open communication channels with providers for problem solving

Objective:

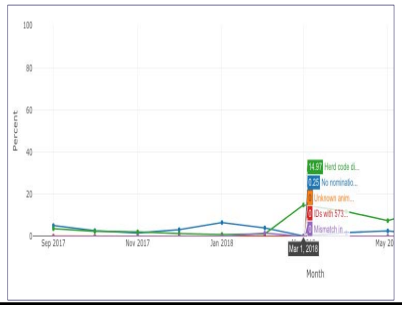
Maintain the highest standard of data quality

Quality control of data providers

- **Genomic nominators**
  - Yearly workshop (2017 / 2018)
  - QC guidelines defined in 2015, updated in 2017 and 2018.
    - Including metrics for routine (monthly) evaluation of performance
  - 2017 – Collection of SOP and first formal nominator audit
  - 2018 – Monthly request for feedback on potential issues related to data submission
  - Reports, web stats and graphs of performance (and trajectory) available.

```
*****,Total genotypes for Zoetis for 1809
PASS,**,No nomination when loading
PASS,**,Unknown animal ID
PASS,**,Sire pedigree missing
FAIL,**,Dam pedigree missing
PASS,**,CDCB blanked dams due to conflict
PASS,**,IDs with 573/574
PASS,**,Mismatch in fee code 1 or 2
FAIL,**,Herd code discrepancy
PASS,**,Usability code = N
PASS,**,Fee code = N
PASS,**,Genotype withdrawn
PASS,**,Genotype reassigned
FAIL,**,Changes in pedigree
```

	Threshold	September 2017	October 2017	November 2017	December 2017	January 2018
No nomination when loading	1%	5.2%	2.81%	1.7%	3.24%	6.61%
Unknown animal ID	1%	0.18%	0.03%	0.1%	0.11%	0.15%
IDs with 573/574	1%	0.0%	0.0%	0.0%	0.0%	0.03%
Herd code discrepancy	1%	3.72%	2.47%	2.2%	1.37%	0.96%
Mismatch in fee code 1 or 2	2%	0.0%	0.0%	0.02%	0.0%	0.0%
CDCB blanked dams due to conflict	2%	0.34%	0.38%	0.35%	0.18%	0.35%
Usability code = N	5%	2.94%	1.17%	8.49%	9.66%	7.32%
Fee code = N	1%	0.21%	0.17%	0.12%	1.08%	0.05%
Genotype withdrawn	1%	0.0%	0.86%	0.0%	0.0%	0.03%
Genotype reassigned	1%	0.34%	0.38%	0.39%	0.18%	0.84%
Changes in pedigree	25%	47.26%	37.67%	31.38%	28.79%	38.5%
Sire pedigree missing	1%	0.52%	0.34%	0.04%	0.11%	0.12%
Dam pedigree missing	10%	7.64%	12.01%	5.4%	14.18%	13.71%



Quality control of data providers

- **Genotyping laboratories**
  - Yearly workshop (first in 2018)
  - QC guidelines defined in 2017 (GENLAB working group)
    - Definition of genotyping laboratories roles and responsabilities
    - Including metrics for routine (monthly) evaluation of performance
    - Formal need for monthly QC
  - End of 2018 – Collection of SOP and first formal nominator audit
  - 2019 – Monthly request for feedback on potential issues related to data submission
  - Reports, web stats and graphs of performance (and trajectory) available as for genomic nominators

Conclusion

- Projects in this presentation are the ones with direct impact on industry. *Many* more "behind the scenes" not reported here.
- Most projects close to conclusion (most expected in 2019).
- Communication
- All projects, irrespectively of impact, have the same objective: "providing premier dairy genetic information services and industry collaboration" (rif. CDCB core value)

THANK YOU FOR YOUR ATTENTION