

Constructed ID's

Frequently Asked Questions

Effective in February 2023, CDCB will create placeholder “Constructed IDs” that connect animals to their Maternal Grandsires (MGS) and other ancestors discovered through genotyping. This methodology is being implemented to incorporate additional pedigree information and generate more accurate U.S. evaluations.

The Constructed ID serves as a placeholder to eliminate “dead-ends” in the pedigree. The Constructed IDs will follow the same standards as the identification of an actual animal, while being unique, traceable, stable and recognizable as a placeholder. This methodology can be applied to create a Constructed Dam (when the Maternal Grandsire is identified) or a Maternal Granddam (MGD) (when the MGGS is identified) through haplotype matching.

Beginning February 14, 2023, these Constructed ID's and the newly discovered ancestors (MGS and/or MGGS) will be added to the pedigrees of genotyped animals with incomplete pedigrees that currently use an Unknown Parent Group. After the pedigree information has been added for relevant animals, the subsequent weekly, monthly and triannual evaluations will be more accurate with higher reliability.

CDCB will deploy a batch implementation that will continue until all discovered animals are in place in the database. Gradually over the next several months, more than one million genotyped animals will be impacted.

This procedure was approved by the CDCB Board of Directors through the policy: [Adding genomically discovered maternal grandsires \(MGS\) and maternal great grandsires \(MGGS\) to pedigrees.](#)

The Constructed IDs represent a new way CDCB is using genomics for pedigree discovery. The U.S. is the first country using genomic information to connect the pedigree of animals through unknown ancestors, based on published research by scientists at CDCB and the USDA Animal Genomics and Improvement Laboratory (AGIL).

Key Takeaways

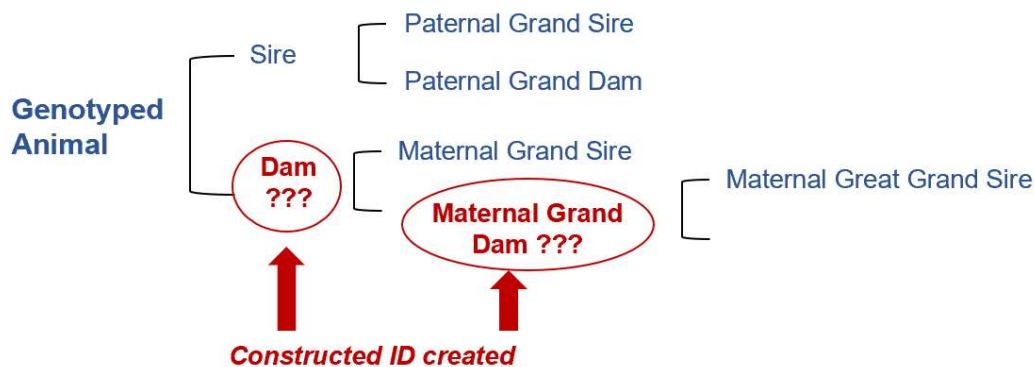
- With this new procedure, more and better pedigree information will be utilized, resulting in more accurate U.S. genetic evaluations.
- The sole purpose of the Constructed IDs is to connect an animal with an ancestor discovered through genotyping, which eliminates dead-ends in a pedigree.
- “Constructed ID's” represents a new way CDCB is using genomics for pedigree discovery, based on published research.
- A real ID and complete pedigree are ALWAYS preferred. A Constructed ID will only be created when there is no other option.
- The Constructed IDs will only be generated by CDCB and will be easily recognizable.
- Over one million animals benefitted from the addition of Constructed IDs, in an October 2022 test run.
- Impact on A.I. bulls will be negligible, as their pedigrees are typically complete.
- Effective February 14, 2023, all evaluation and service results will start reporting the Constructed IDs for affected animals.
- The Constructed IDs will not be reflected for all affected animals immediately; there will be a gradual application in the CDCB database over several months.

Why is the Constructed ID method being implemented?

Genetic and genomic estimations are improved, and reliabilities are increased, when more pedigree information is connected to individual animals that currently have a gap, or unknown in their pedigree. Genotyping and haplotype matching has allowed for missing maternal male ancestors to be discovered and added to the pedigree. More complete pedigrees lead to higher accuracy and consistency of genomic data and parent averages by building a deeper pedigree for animals that previously had a limited link to their maternal ancestors. Also, completing pedigree gaps and identifying pedigree errors can help dairy producers make beneficial mating decisions.

What is the problem being addressed?

When the dam of a genotyped animal is unknown, haplotype matching allows us to identify the Maternal Grand sire (MGS); however, the U.S. system requires a dam ID to record the MGS. To close this gap, CDCB will create a placeholder dam ID – a Constructed Dam ID. The Constructed ID will be unique, traceable, stable and recognizable as a placeholder. This same methodology can be applied to create a Constructed MGD ID when the Maternal Great Grand Sire (MGGS) is discovered.



When will this go into effect?

Starting with the February 14, 2023, weekly evaluation, Constructed IDs will be incorporated in the pedigree of animals that have discovered MGS or MGGS. Since the pedigree addition happens after the weekly evaluation, the affected animals will use the Constructed ID-enhanced pedigree in the next monthly evaluation.

When will this implementation be complete for all affected animals?

The full database sweep and implementation will require several months. Due to the large number of animals to be processed, the implementation will occur in batches to allow the continuation of routine CDCB evaluations.

Why is the implementation being done in batches?

CDCB estimates that more than one million animals will require reprocessing. If the entire file is implemented in a single solution, reprocessing of this magnitude would likely lock the CDCB database for at least 15 days (more than two weeks).

A single implementation would be ideal; however, it would restrict CDCB's ability to run weekly evaluations and limit other ongoing updates necessary to run evaluations.

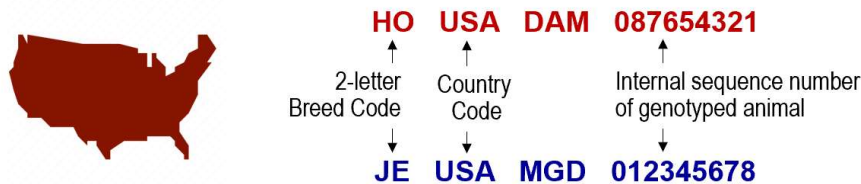
How are Constructed IDs designated?

The Constructed ID must be:

- **Unique** in the pedigree, as its purpose is to link source animals to their ancestors
- **Traceable** and connected to the source animal from which it was derived (and animal's country)
- **Stable**, perpetually connecting the Constructed ID and its source animal – unless the true ancestor is found
- **Recognizable** as a placeholder and never considered as the ID of a true ancestor

Examples of Constructed IDs for an animal of U.S. origin are shown below. For further recognition, the name of constructed animal will be “Dam of [ID of source animal]” or “MGD of [ID of source animal].”

U.S. Origin Constructed Dam ID HOUSADAM087654321

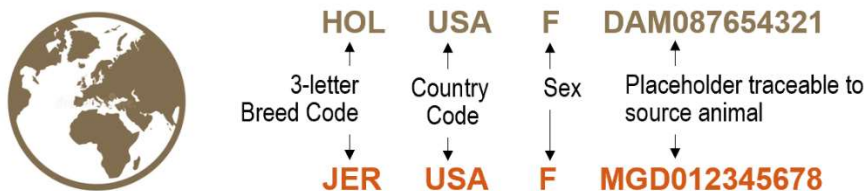


U.S. Origin Constructed MGD ID JEUSAMGD012345678

For animals of international origin, there are two differences:

- 3-letter breed code instead of 2
- Sex (F or M) after country code

International Origin Constructed Dam ID HOLUSAFDAM087654321



International Origin Constructed MGD ID JERUSAFMGD012345678

How will the Constructed ID be identified in pedigrees and records?

Breed associations, Dairy Records Processing Centers, genomic nominators and others producing records and pedigrees will make independent decisions how the Constructed IDs are represented.

How many animals will this impact?

To assess the impact on evaluation results (of implementing the Constructed IDs and adding new pedigree information), a test run was performed in October 2022 by CDCB. **Over one million animals benefitted from this procedure**, which resulted in the creation of nearly 650,000 Constructed Dam IDs and over 715,000 Constructed MGD IDs. Note these numbers are approximately 3-fold higher compared to numbers published by [Nani et al in 2019](#), because of the considerable increase in genotyped received since 2019.

The CDCB test results are aligned with the earlier observations by Nani and collaborators. Animals with discovered ancestors (irrespective if the dam was known or unknown) realized these impacts: improved estimation of inbreeding and heterosis, more accurate parent averages and increased reliability.

On a population level, the impact was extremely contained. A.I. bulls, which typically already have full pedigrees, were the least affected.

How can we describe the difference (improvement) in accuracy when Maternal Grandsire (MGS) is known?

Correctly identifying the pedigree of an animal is essential to obtain an accurate evaluation. When the information is not available, an Unknown Parent Group which is based on population values is used. When we can connect the animal to its genomically-discovered MGS and all other actual ancestors, we can better identify the best genetics in the population and obtain more accurate evaluations for those animals.

How will the triannual evaluations be impacted?

A.I. bulls typically have complete pedigrees, so the impact will be very limited.

The animals with added, or discovered, pedigrees will obtain a more accurate parent average, compared to when the Unknown Parent Group was used. The more accurate parent average will in turn impact the genetic evaluation.

CDCB staff performed a full test run based on the August 2022 evaluation. This test run confirmed that there was more change in evaluations for the individual animals that added pedigree information, along with the related increase in reliability for those animals. The CDCB test also confirmed that negligible impact is expected for A.I. bulls and animals that currently have complete pedigrees.

How will weekly evaluations be affected?

Starting February 14, 2023, weekly evaluations will start yielding Constructed IDs for animals with discovered MGS and/or MGGS. Once the processing of the file is done (after the weekly evaluation is final), animals will fully benefit from this enhancement in the following monthly evaluations.

How will monthly evaluations be affected?

This procedure will also be gradually implemented on monthly evaluations. Animals with assigned Constructed IDs will be skipped from the discovery process, unless the discovered ancestor no longer qualifies. The exchange of pedigrees with CDDR exchange partners happens in the week preceding the monthly calculation (pre-run week), therefore, all Constructed IDs will be handled automatically. Similar to the explanation for weekly evaluations, animals will fully benefit from this enhancement in the next monthly evaluation after their pedigree has been modified.

Are there exceptions?

Since true IDs are preferred instead of Constructed IDs, animals from Italy, Great Britain, Germany and Switzerland (CDDR exchange partners) will not automatically receive a Constructed ID. A request for the correct pedigrees will be sent first. Only animals with unknown ancestors (or when no response is received) will receive a Constructed ID. This means that modification of these pedigrees will be done a few days later than the rest of the weekly animals.

What happens if the actual ancestor is identified? Can nominators change the Constructed ID?

Nominators will be allowed to replace Constructed IDs only with a true ancestor ID. Nominators can also delete the Constructed ID, if they reject the connection to the MGS or the MGGS. Nominators will not be allowed to replace Constructed IDs with alternative Constructed IDs, per the policy approved by the CDCB Board of Directors.

How do we know this methodology works?

This technology using genomics for parentage identification has been used for over a decade by CDCB and the USDA AGIL team, who have been pioneers in parentage discovery through genomics. The implementation of Constructed ID's simply allows CDCB to connect this well-tested technology to pedigrees of animals and avoid the pedigree "dead ends" with unknown ancestors. For the last four years, AGIL has been refining the discovery procedure and the protocol to incorporate this discovery into the CDCB evaluations.

Milestones leading to this implementation

2013: VanRaden et al published [Confirmation and discovery of maternal grandsires and great-grandsires in dairy cattle](#)

2020: Nani et al published [Discovering ancestors and connecting relatives in large genomic databases](#)

2021 and 2022: CDCB staff successfully implemented the inclusion of discovered MGS (maternal grandsire) and MGGS (maternal great grandsire), as sires of **known** dams and MGD (Refer to Item 2 in [this policy](#))

CDCB has already added over 370,000 discovered MGS to dams with unknown sire (where no pedigree data was submitted for the dam) and has extended this to MGGS (where no pedigree was submitted for the MGD).

References

Available at <https://uscdcb.com/library/> or the links below

Popular press article

Constructed ID's: Eliminating Pedigree Dead Ends

By José A. Carrillo, Ezequiel Nicolazzi, Lillian Bacheller and George Wiggans

Interbull Presentation and Proceedings, Montréal, Canada, May 30-June 3, 2022

Presentation: [Adding and reporting genomically discovered ancestors in U.S. evaluations](#)

Interbull Bulletin No 57: [Adding and reporting genomically discovered ancestors in U.S. evaluations](#)

J.A. Carrillo, R Mota, G.R. Wiggans, L.R. Bacheller, G. Fok, D. Null, E. Ogwo, P.M. VanRaden
Interbull

Published Papers

Nani, J.P., Bacheller, L.R., Cole, J.B., and VanRaden, P.M. [Discovering ancestors and connecting relatives in large genomic databases](#). J. Dairy Sci. 103(2):1729–1734. 2020.

VanRaden, P.M., Cooper, T.A., Wiggans, G.R., O'Connell, J.R., and Bacheller, L.R. [Confirmation and discovery of maternal grandsires and great-grandsires in dairy cattle](#). J. Dairy Sci. 96(3):1874–1879. 2013.