Animal IDs

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CDCB Genomic Nominator and Laboratory Workshop

May 21st, 2026

Preface

- Within the National Cooperator Database, identifying and filling IDs, correcting IDs, and resolving ID conflicts can be an obstacle to getting evaluations for legitimate animals
- In this presentation, I will:
  - Discuss some categories of IDs within the system
  - Speak to some ID solutions that have been implemented for nominators to help process animals with ID challenges

Overview

- ID Structure within the database
- Domestic IDs – 840s and USA
- Manufacturer IDs
- International IDs
- Embryo IDs
- CDCB Constructed IDs

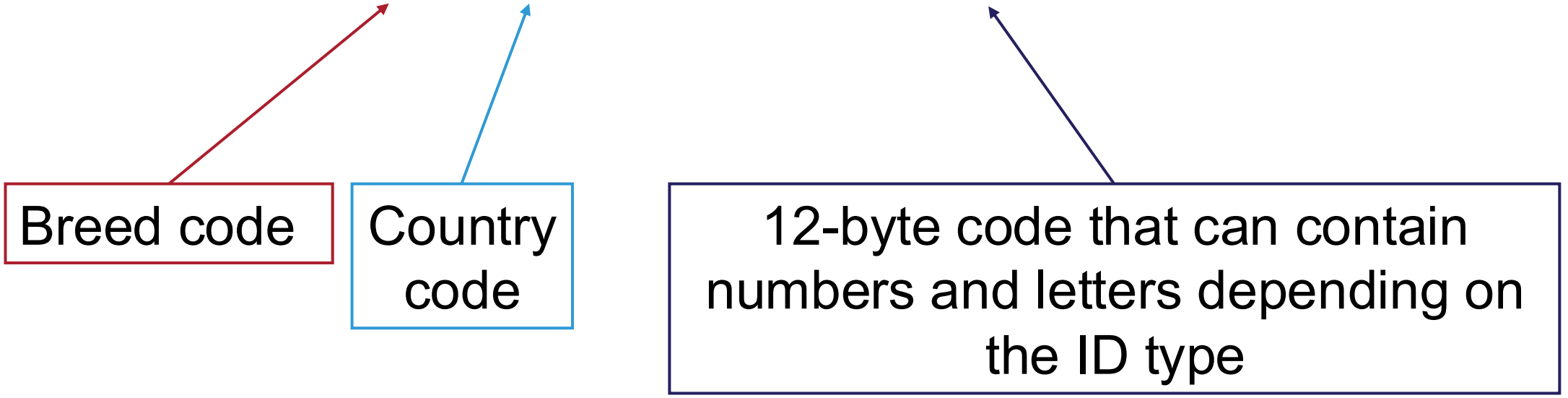
CDCB Redmine Collaborator Portal

- The Redmine/Collaborator portal
- Documentation, policies, support ticket creation
- The wiki and documentation tabs are accessible to unregistered users
- Must be logged in to create support tickets from the portal
- To request new accounts if your organization is already a collaborator, a current account holder must submit a request via Redmine

Unique IDs in the CDCB System

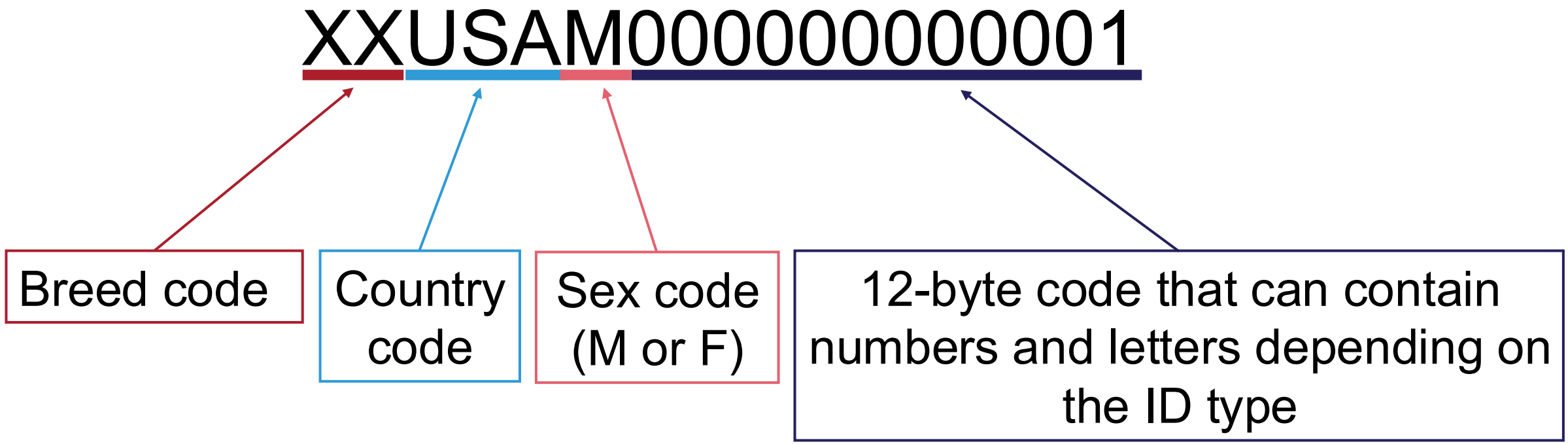
- CDCB traditionally reports IDs in 17-byte format:

XXUSA000000000001



Unique IDs in the CDCB System

- IDs can also be reported in 18-byte, containing the sex code:



Unique IDs in the CDCB System

- Depending on the ID system, the IDs can be unique across:
  - Breed, country code, sex, and 12-byte code

    HO840F003132006189
  - Breed, country code, and 12-byte code (- Sex)

    HOUSA000000000001 and HOUSAF000000000001
  - Country code and 12-byte code (- Sex and Breed)

    HOUSAM000000000001, HOUSAF000000000001 and MSUSAM000000000001

Unique IDs in the CDCB System

- Every time an ID enters the system on a record, it is checked internally against IDs in the system
- IDs must be unique so that incoming data is checked against the current animal information – pedigree, siblings, lactation data, etc.

Cross-References Exist

- Animals can be referred to by multiple IDs over their lifetimes
- Entering cross-references connects all of the IDs to a single key within the National Cooperator Database
- There can only be 1 preferred ID, and they are prioritized:
  - By specific ID types
  - By chronological order of submission
  - By the source code of submission
  - By the ID primary ID position of the submitted record

Domestic IDs

- 840 electronic IDs (EIDs)
- USA country code IDs

Domestic IDs – 840s

- 840 IDs are the standardized official EID system, central to USDA's Animal Disease Traceability system
- Introduced to standardize national identification and replace older ID systems, such as metal tags
- Each EID contains a 15-digit series starting with "840" followed by 12 unique digits
- These IDs must be unique across all fields: Breed, country code, sex, and 12-byte code

Domestic IDs – USA

- Before the use of 840 IDs, animals were submitted with USA country code, managed by breed registrations, or based on metal tags
- Exist in the system as unique across country code and 12-byte only:

  HOUSAM000000000001, HOUSAF000000000001 and MSUSAM000000000001

- USA IDs are still regularly distributed by some breed associations as registered IDs

Domestic IDs – USA

- IDs with a 12-byte value higher than **003001000002** should contain a country code of 840
- IDs with a 12-byte value between **003000000000** and **003001000002** could have either USA or 840 as the country code
  - CDCB does have some internal checks to make sure that the ID fits into the appropriate change, and may update the ID country code to do so
- 840/USA must be accurately indicated in the animal ID, as those IDs are the standards shared nationally and internationally
- More on USA IDs later…

Manufacturer IDs

- Some RFID tag manufacturers maintain their own line of tags with a unique number series starting with their manufacturer code
- These IDs would be considered unique across breed, sex, country code, and 12-digit series
- These IDs are not limited to use in one country

Manufacturer IDs

- The beginning of the 15-series ID for these RFIDS is the manufacturer code
- It is important to note that if another ID-type is available, this ID-type will never be the preferred ID
- If nominating animals with this ID-type, please include the country code of origin in the group ID of the nomination

942	ZTags
949	Y-Tex
951	Leader
953	Cromasa
954	Reyflex
964	Datamars
969	Caisley
971	DeLaval
977	Avid ID
982	Allflex
984	Nedap
985	Destron Fearing
991	WUXI FOFIA Tech

International IDs

CDCB is not responsible for upholding international ID standards. If we are aware of the rule standards, we may implement them or document them.

A list of country codes and ISO EID codes active in the CDCB system is available here: Accepted International IDs

International IDs

- Specific ID systems with internal checks exist for:
  - Australia (AUS)
  - Canada (CAN)
  - Spain (ESP)
  - Mexico (MEX)
- These internal checks are used to resolve ID format and cross-reference issues so that the most accurate ID is used as the preferred ID

Accepted International IDs

International IDs

- Additional ID systems that we have documentation for:
  - China
  - Denmark
  - Finland
  - Great Britain
  - Japan
  - New Zealand
  - Switzerland

Accepted International IDs

International IDs

- These ID systems have additional rules for sex and/or breed uniqueness:
  - CAN IDs must be unique across sex and breed
  - AUS IDs may be similar between registered and unregistered animals
  - DNK IDs specific ID ranges that vary across sex and breed
  - JPN IDs must be unique across sex and breed

Accepted International IDs

International IDs

- We recognize that some countries do not have ID systems that fit neatly into the 17-byte system
  - For cases such as this, any documentation you can provide about the ID standards of the country can help us make a general suggestion for formatting
  - Examples of documentation: AUS, NZL

Accepted International IDs

International IDs

- We recognize that some countries do not have official ID systems, or that official ID systems may not be widely adopted in some countries
- This is an area of opportunity!
- Some nominators have proposed nominator-constructed ID systems that they discuss with CDCB before implementation

International IDs

- By contacting CDCB to approve a nominator-constructed ID system, we can:
  - Ensure that the IDs that would be constructed meet our ID standards
  - Help identify a system that will keep the IDs unique
  - Raise awareness so that we can assist in troubleshooting if conflicts arise
- Nominators then have an ID system that they manage and are responsible for the uniqueness and for use in problem regions

International IDs

- Important to keep in mind:
  - Lowercase letters should not be used in IDs if possible
  - Because we acknowledge that these IDs are constructed and are not shared between nominators, there is always a risk of duplicate genotype conflicts occurring
  - Preferred IDs for constructed IDs will be based on the ID entry in the records – CDCB will not implement rules to prefer one nominator's IDs over another

International IDs

- Important to keep in mind:
  - If an ID meeting country code standards for an ID is identified, that ID should be used in place of a constructed ID
  - If a country code has a well-established ID system (ex. USA), nominator-constructed IDs should not be used and may be blocked

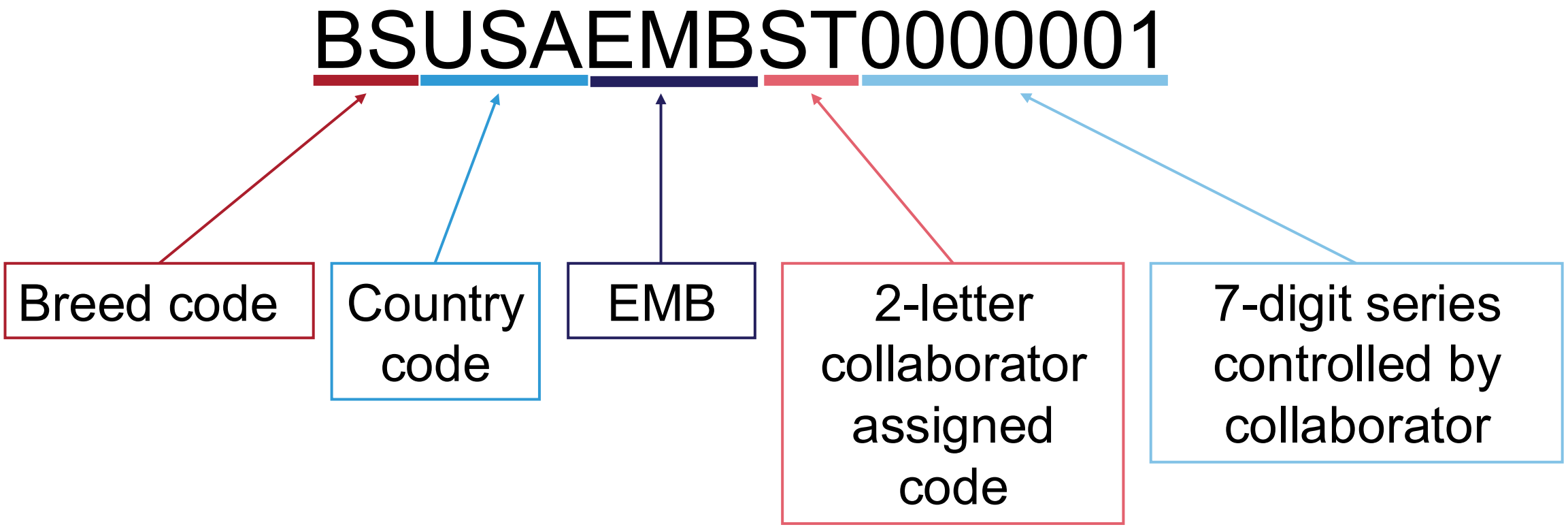
Embryo IDs

- Since embryos are not live animals, there is no ear tag associated with them…. Collaborators had to maintain IDs on a limited system
- Opportunity!

Embryo IDs

- In late 2024, CDCB implemented a system after working with nominators to create an ID system that could be utilized for embryos
- This ID system allowed nominators to nominate embryo genotypes with an ID system that they oversee

Embryo IDs



Embryo IDs

Embryo IDs

- If you are planning on submitting embryo genotypes, please let us know so that we can assign your organization a 2-letter collaborator code
- Embryo nominations can only be submitted with a multi-birth code (MBC) = 6

Multiple birth code	
Code	**Description**
1	Single
2	Multiple birth (Fraternal or identical twins, not from embryo transfer. Twins share the same genomic and gestational dam)
3	Birth from embryo transfer
4	Split embryo (artificially or naturally after embryo implantation)
5	Clone from nuclear transfer
6	Embryo pedigree (implantation date stored as birth date)

Embryo IDs

- Currently, there are 13 organizations with registered collaborator codes
- The country codes we currently accept embryo IDs from are:
  - USA
  - CAN
  - GBR
  - CHN
- CDCB Accepted Embryo IDs

Embryo IDs

Embryo genotypes automatically merge with the live calf once the genotype of the live calf arrives at CDCB if it meets the following conditions:

1. Pedigrees have the same sex and parentage
2. Birth dates are within 1400 days of each other, and
3. One pedigree contains an MBC=6, and the other contains an MBC ≠ 6
4. Genotypes match each other

Embryo and live animal merging process

Embryo IDs

- Other considerations for submitting embryo IDs:
  - Embryo genotypes are routinely withdrawn during the merging process with the live animal
  - Embryos that have existed in the system for >2 years after their load date are withdrawn

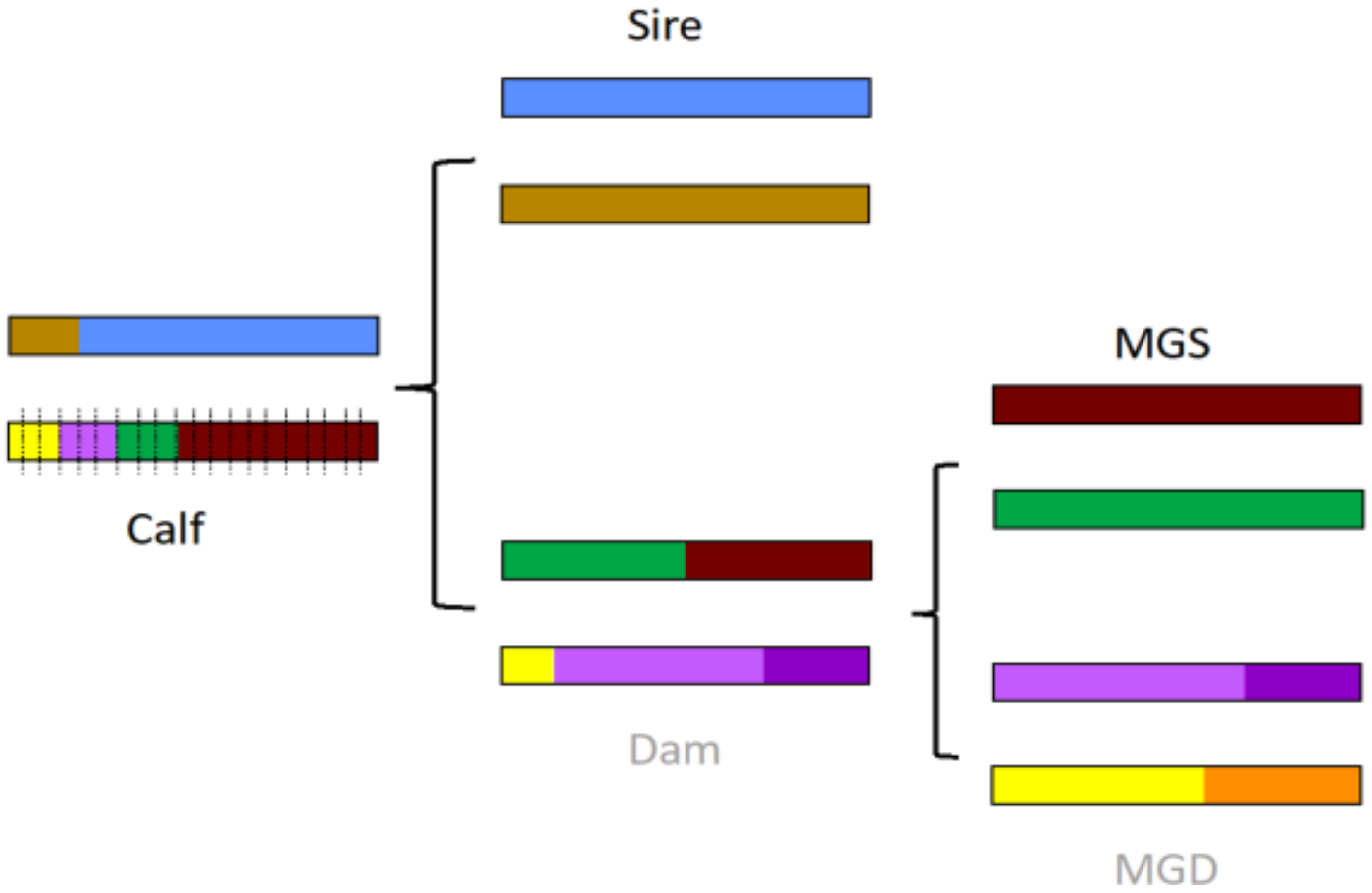
Embryo IDs

- If the embryo and live animal genotypes do not merge, contact CDCB to assist in the merging process!
- Typically, the steps will involve:
  1. Consolidating the two genotypes under one animal key and withdrawing the embryo genotype (this step may have to be handled by CDCB)
  2. Updating the pedigrees of the live ID and embryo ID to match
  3. Submitting a cross-reference for the live ID and embryo ID

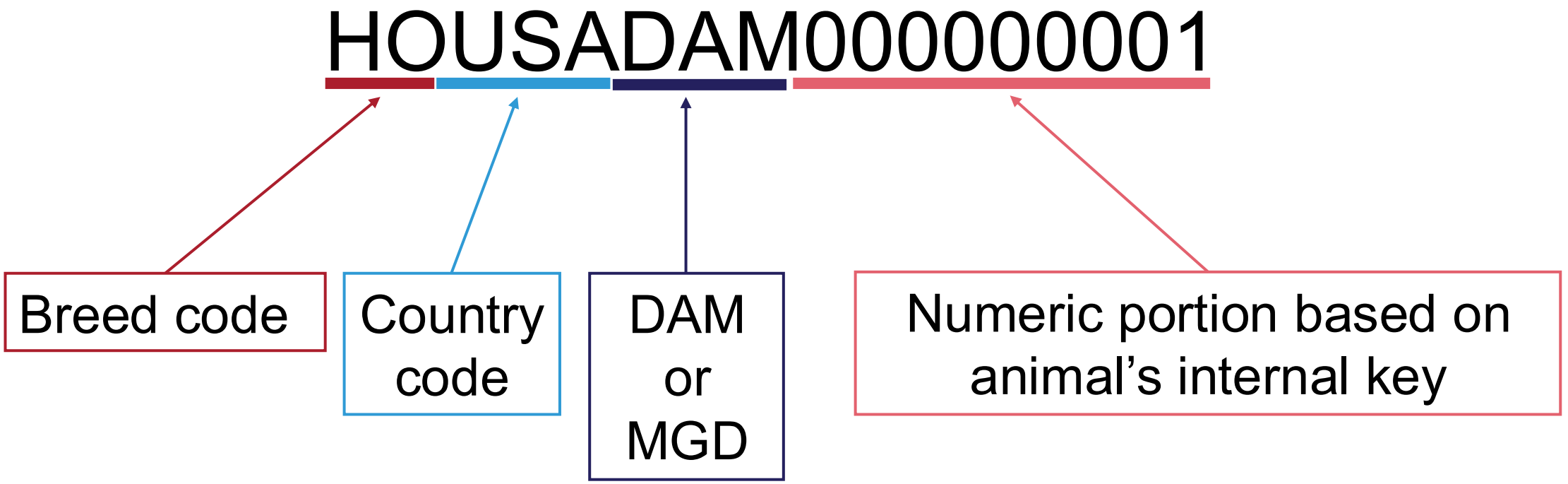
Embryo and live animal merging process

Constructed IDs

- The CDCB constructed ID system was introduced in 2023 to connect animals lacking dam information to their MGS and MGGS
- Increased reliability for animals with added pedigree information



Constructed IDs

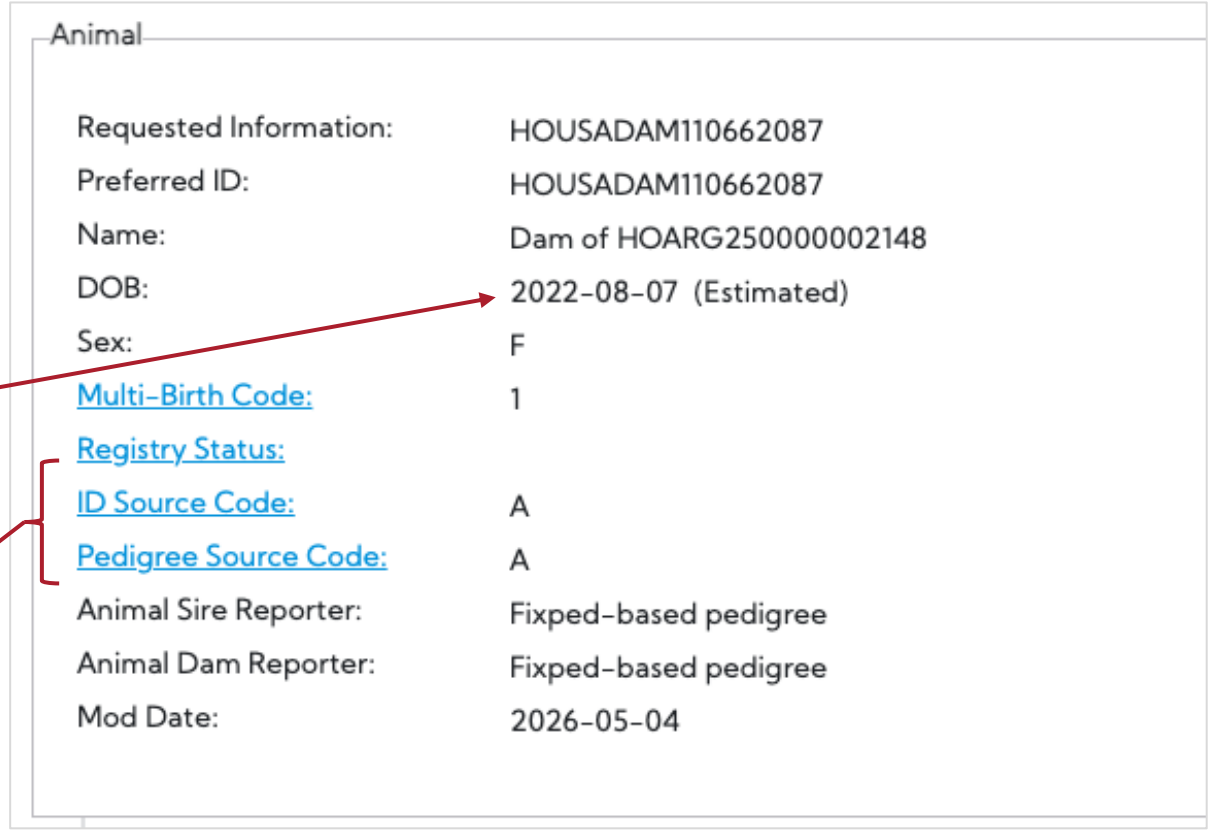


Constructed IDs

- Unique to the pedigree and only used to link the source animals to their ancestors
- Traceable based on the included animal key to the source animal that generated them
- Recognizable as place holders — they are not considered real IDs and would be readily updated if the true ancestor is identified

Constructed IDs

- Constructed IDs can only be generated by CDCB
- Birth dates of constructed dams are estimated to be 3-years older than the birth date of the progeny
- Pedigrees and IDs will have source code “A”



Constructed IDs

- Collaborators can replace constructed IDs with a true ancestor ID or delete the constructed ID if they reject the connection to the MGS or the MGGS
- Constructed dams can be removed permanently from the animal's pedigree using pedigree verification code 3 (position 89 on Format 1s)
- Removing the dam any other way may cause it to regenerate

Constructed IDs

- The twin conundrum:
  - During the comparison of genotypes to establish relationships, CDCB uses the pedigree to check expected closeness between full-siblings and half-siblings

Relationship	% Conflicts from 4K (95% CI)
Full-Siblings	1.14-3.75
Half-Siblings	3.20-6.90

Constructed IDs

In the case that two twins (A and B) enter the database with blank dams on their pedigrees:

1. Based on their pedigrees, these animals would be considered half-siblings without a dam
2. Genotype A is loaded and presents with no conflicts; Use = Y
3. Genotype B is loaded and has a P2 “Unreported Close Relative” conflict generated because it has fewer conflicts than expected with a half-sibling in genotype A (<3.2%); Use = N

Constructed IDs

In the case that two twins (A and B) enter the database with blank dams on their pedigrees:

- Because genotype A is Use = Y, and the dam is blank, it will be included in the constructed dam processing, gaining a constructed dam ID on the pedigree
- Constructed dam policy prevents nominators from adding constructed IDs to pedigrees
- Opportunity!

Constructed IDs

- Contact CDCB to have the constructed dam of twin A added to twin B's pedigree! We will:
  - Check the MGS relationships to make sure that new conflicts are not introduced
  - Add the constructed dam, maintaining its internal key relationship with twin A
  - After processing, make sure that the P2 conflict was resolved so that both animals have Use = Y genotypes

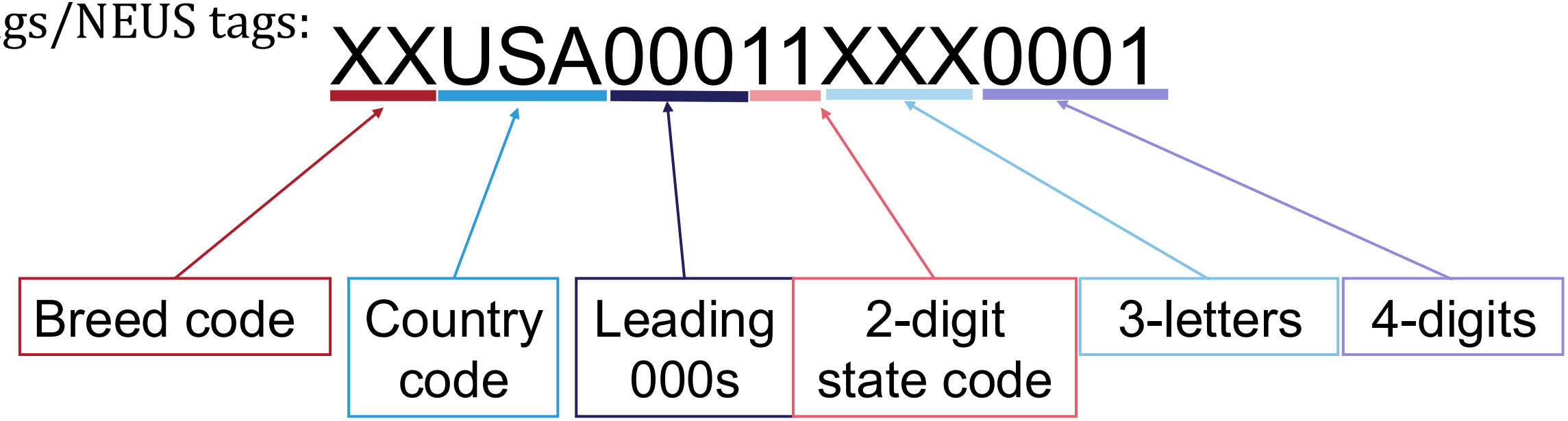
Summary

- While IDs will likely always be an industry challenge, CDCB is willing to hear out and address problems that prevent animals from being nominated
- Solutions for challenging international ID systems, embryo IDs, and constructed dam ID have been implemented because of discussion and collaboration between CDCB and nominators
- Please contact CDCB via the Redmine collaborator portal to start the conversation for ID-related challenges

DISCUSSION

Domestic IDs - USA

- Historically, USA IDs have also been derived from vaccination tags/NEUS tags:



Domestic IDs - USA

- These IDs are not unique; the series can be reused
- If the IDs already exist in the system with a different birth date and pedigree, a new animal entering the system will be blocked
- Additionally, if the ID contains 3 letters “UNK,” it is automatically rejected
- Opportunity?

Discussion Questions

- How often are herds using these ID systems encountered?
- What are some reasons that producers push back against adopting 840 or manufacturer IDs?
- How could this system be approached since the IDs are not unique?