Breeding for health traits
- a brief international overview

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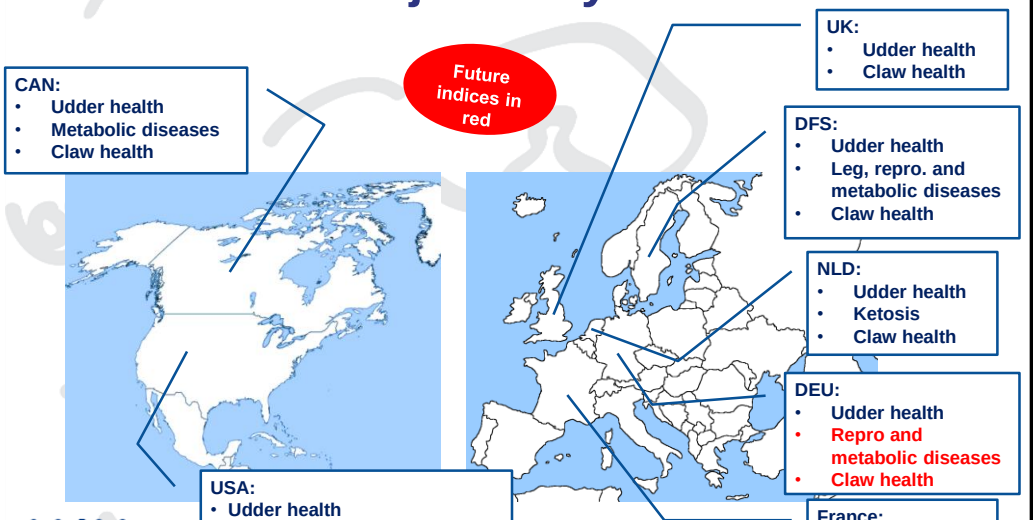
NAV
Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

Overview - major dairy countries



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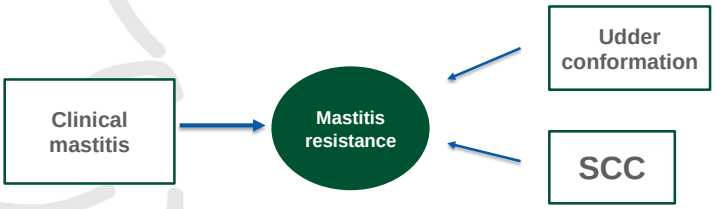
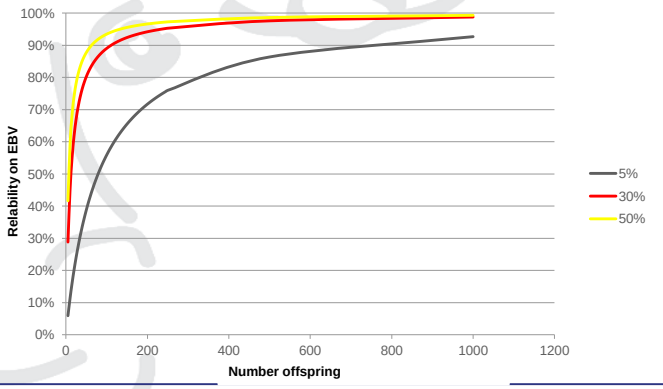
Direct or indicator traits

- Information from indirect traits depends on correlation
  - Mastitis and SCC: 0.6
  - Max reliability: 0.36 (in case mastitis diagnoses are the true trait)
- Higher correlation -> higher reliability



Reliability – traditional breeding value estimation

- Increased number of records will increase reliability - especially for low heritability traits
- Still important with genomic information



Udder health - Status

Country	Start reg. mastitis	Index SCC + mastitis
DFS	< 1990	<1990
CAN	2007	2014
USA	>2010	2018
NLD	2016	2016
FRA	2008	2010
DEU	2014	2018-2019
UK	2008	2017

SCC introduced in all countries in the 1990'ies and indices published <2000

Udder health – measures

Country	Direct measures	Indirect measures
DFS	Veterinary/farmer records • Clinical mastitis	Milk recording systems - SCC Classifiers - Udder Conformation
CAN	Farmer records • Clinical mastitis	Milk recording systems • SCC
USA	Farmer records • Clinical mastitis	Milk recording systems • SCC
NLD	Farmer records • Clinical mastitis	Milk recording systems • SCC
FRA	Farmer records • Clinical mastitis	Milk recording systems • SCC
DEU	Veterinary/farmer records • Clinical mastitis	Milk recording systems • SCC
UK	Farmer records • Clinical mastitis	Milk recording systems • SCC

Udder health – heritability for Holstein

Type	DFS	CAN	USA	NLD	FRA	DEU	UK
Mastitis	**0.06**	0.03	0.03	0.09	0.02	0.03	0.04

Better registrations improve heritability:
- Precise/accurate registrations – *can you find sick cows?*
- Completeness of registration – *do you register all sick cows?*

Other diseases than mastitis - status

Country	Start registration	No. cows with record[1] Millions	Index
DFS	<1990	65	<2000
CAN	2007	1,6	2016
USA	>2010	1,2	2018
NLD	2012	<0,1[2]	2014
FRA	>2010	<0,1[2]	2017
DEU	2014	1,1	2018-2019
UK	-	-	-

[1]Holstein
[2]Not used in index

Other diseases than mastitis – measures

Country	Direct measures	Indirect measures
DFS	Veterinary/farmer records • ERP, LRP, Other metabolic disorders, Ketosis, feet and leg disorders	• BHB and acetone milk level • Clinical mastitis
CAN	Farmer and veterinary records • Ketosis, Displaced abomasum	• BHB • Fat:Protein • BCS 1st lact. • Immunity+
USA	Farmer records • Hypocalcemia, Displaced abomasum, Ketosis, Metritis, Retained Placenta	
NLD	-	• BHB and acetone milk level • Fat:Protein
FRA	-	• BHB and acetone milk level
DEU	Farmer and veterinary records • Reproduction diseases: 4 traits • Metabolic diseases: 3 traits	
UK	-	-

Other diseases than mastitis

– heritability for Holstein

Type	DFS	CAN	USA	NLD	FRA	DEU	UK
Retained placenta	0.02		0.01			0.03	
Metritis			0.01			0.03	
Clinical ketosis	0.01	0.03	0.01			0.04	
Milk Fever			0.01			0.03	
Displaced abomasum		0.04	0.01				

Claw health - status

Country	Start registration	No. cows with record[1] Millions	Available index
DFS	2003 (FIN + SWE) - 2010 (DK)	0,7	2010 (SWE: 2006)
CAN	2008	0,2	2017
USA	-	-	-
NLD	2006	0,3	2010
FRA	2014	<0,1	2017
DEU	2014	0,3	2018-2019
UK	2011[2]	0,4[2]	2018

[1]Holstein
[2]Not claw trimmer data

Claw health – measures

Country	Direct measures	Indirect measures
DFS	Claw trimmers • Digital dermatitis, Heel horn erosion, Interdigital hyperplasia, sole hemorrhage, Sole ulcer, White line separation, Cork screw claw	
CAN	Claw trimmers • Digital dermatitis	
USA		
NLD	Claw trimmers • Digital dermatitis, Interdigital hyperplasia, Sole hemorrhage, Sole ulcer, Interdigital dermatitis, White line separation,	
FRA	Claw trimmers • Digital dermatitis, Heel horn erosion, Interdigital hyperplasia, Sole hemorrhage, Sole ulcer, White line separation	
DEU	Claw trimmers • Interdigital Hyperplasia, Laminitis, White line disease, Claw ulcers, Digital phlegmona, Digital dermatitis	
UK		Classifiers • Digital dermatitis Farmer • Lameness

Claw health – heritability for Holstein

Type	DFS	CAN	NLD	FRA	DEU	UK
Digital dermatitis	**0.05**	0.08	0.09	0.08	0.12	
Heel horn erosion	**0.04**			0.04		
Interdigital hyperplasia	**0.07**		0.11	0.08	0.11	
Sole hemorrhage	**0.02**		0.06	0.02	0.03	
Sole Ulcer	**0.04**		0.10	0.05	0.11	
White line separation	**0.02**		0.03	0.06	0.06	
Cork screw claw	**0.005**					

Status on health traits

Nordic countries have been far ahead - other countries are “catching up”

How can we keep our leading position?

Future focus areas

Existing data on national databases

- Improve present genetic evaluation (trait definition, models, etc.) – for instance general health
- Keep up high quality and amount of recording in all herds

Existing data – currently not on national database

- AMS has huge amounts of data
- Sensors in barns is a growing business
- Be proactive in collecting data to national database - little has happened in DFS during the last 5 years!

Future focus areas continued

- New data (direct and indicator traits)
  - Which traits gives most value?
  - More frequent registrations – e.g. every day
  - More precise registrations – e.g. which bacteria
  - The above tend to be expensive registrations
    - Contract herds could be considered

Most relevant if quality and amount are decreasing

Goal: higher reliability -> more genetic progress