

**VikingGenetics -  
innovative breeding**

# The unique registration system in NAV

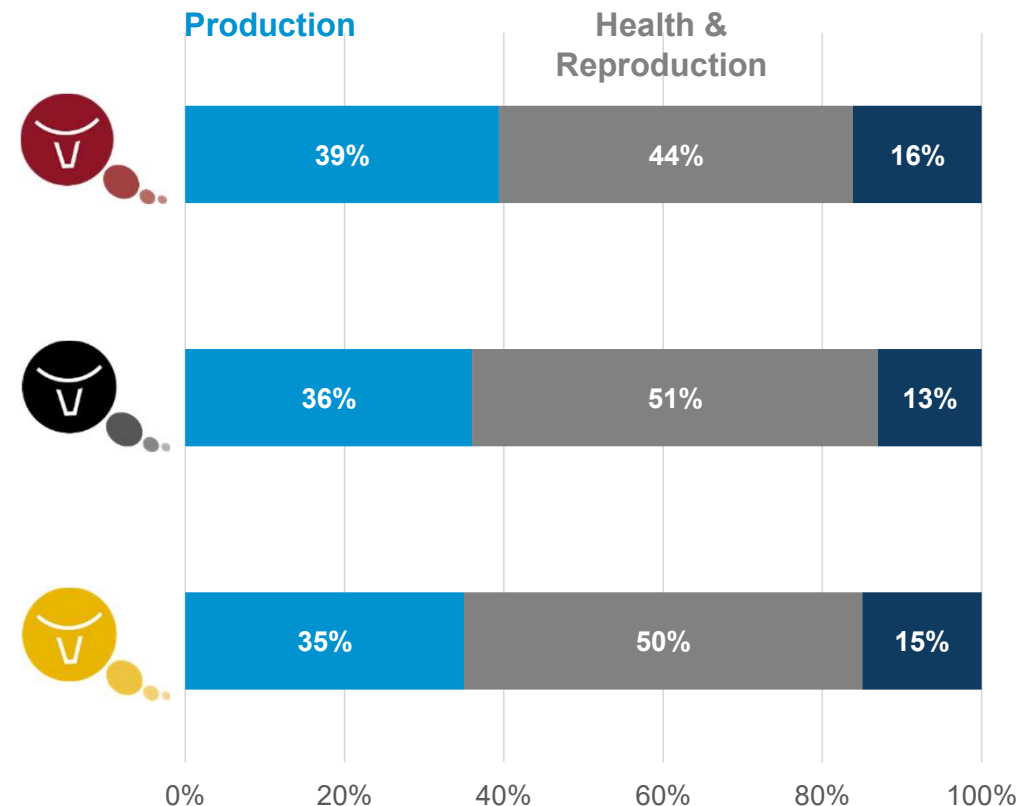
Claus Langdahl

Senior Breeding Manager VikingHolstein



# NTM - Nordic Total Merit

- The most complete index in the world
- Combining 90 sub-indices into 14 main traits
- All traits in NTM are economically important
- Weights in NTM are scientifically based
- Direct selection for clinical mastitis and other health traits based on veterinary registrations
- Unique index for hoof health
- Functional conformation that works for milk production



# Dairy cattle production in the Nordic countries



90% of dairy cows in registration system



Large focus on health traits in breeding



High management level



Strict regulations regarding use of antibiotics and hormones



Very high production per cow



Sustainability, food safety & animal welfare in the whole value chain

# Average yield, 305 days, 2019

Average for the first 3 lactations	Milk kg	Fat kg	Fat %	Prot. kg	Prot. %	Kg ECM
VikingHolstein	11,011	440	4.00	373	3.39	10,993
VikingRed	9,627	419	4.35	338	3.51	10,121
VikingJersey	7,407	439	5.93	310	4.19	9,595

Source: NAV





# High quality data



Each cow has a unique ID



90% of Nordic cows recorded



All data recorded in  
one database



Data available from different  
production systems at all  
management levels

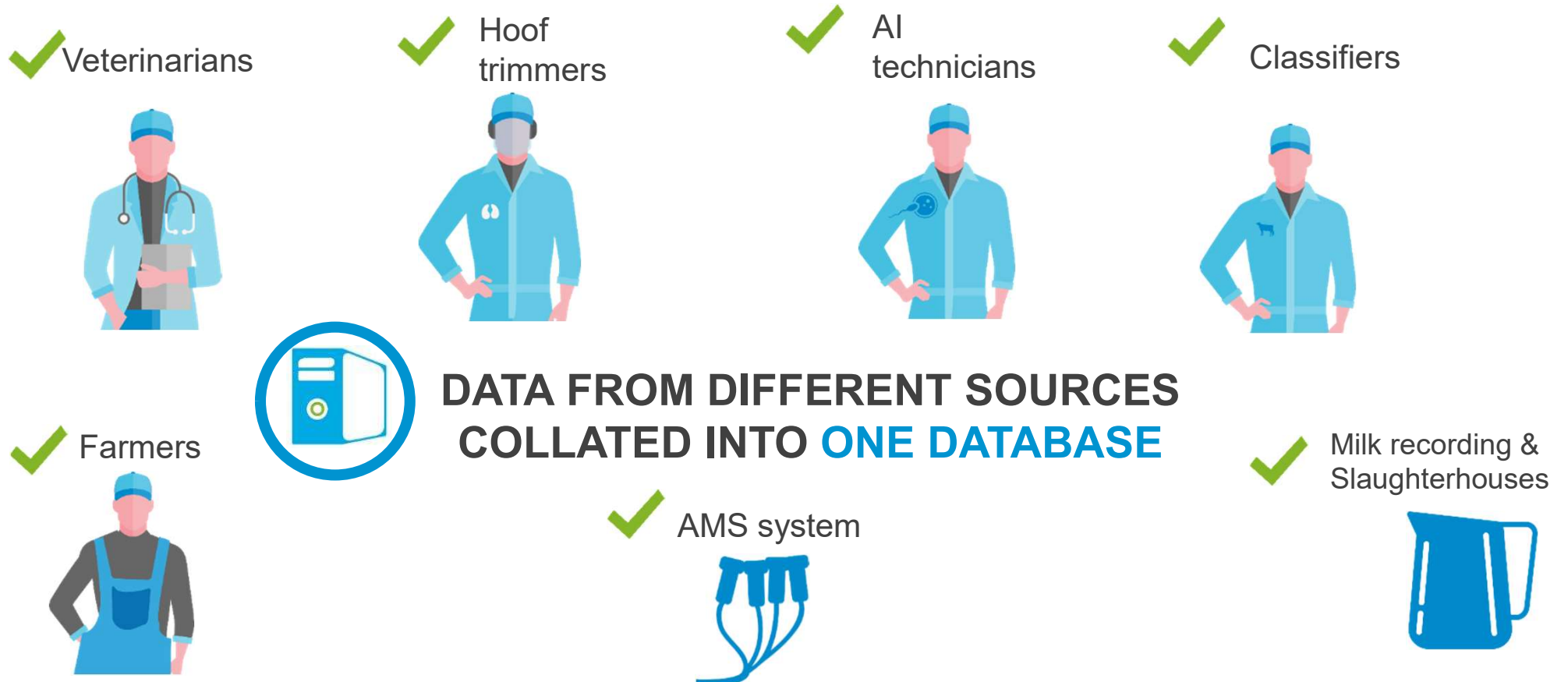


Strict veterinary rules



Continuous improvement and  
development of data collection  
system

# Registration system in the Nordic countries

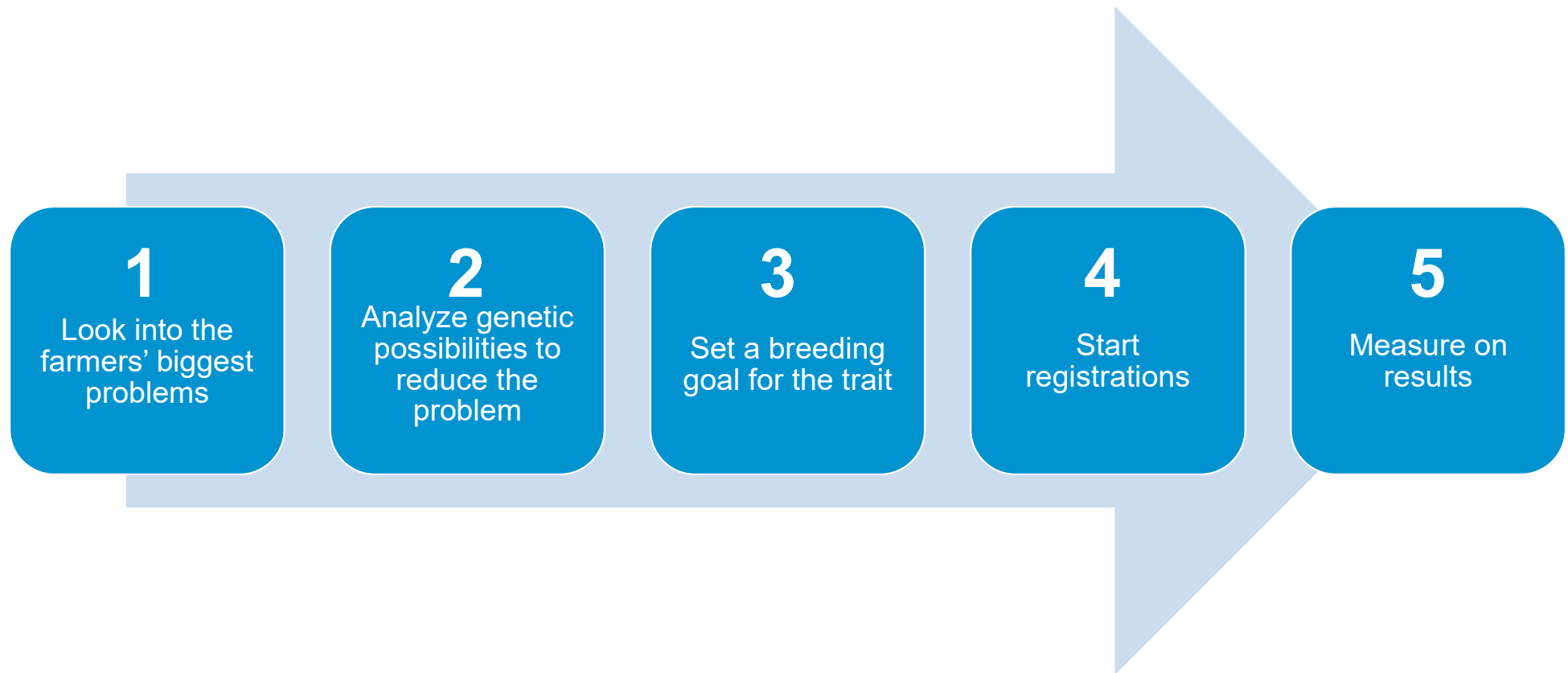


# In breeding you get what you go for!

- If you want to improve **mastitis resistance**, you need to register Clinical mastitis.
- If you want to improve **hoof health**, you need to register hoof diseases.
- If you want to improve **health in general**, you need to register the actual diseases.



# Going straight and directly for the trait





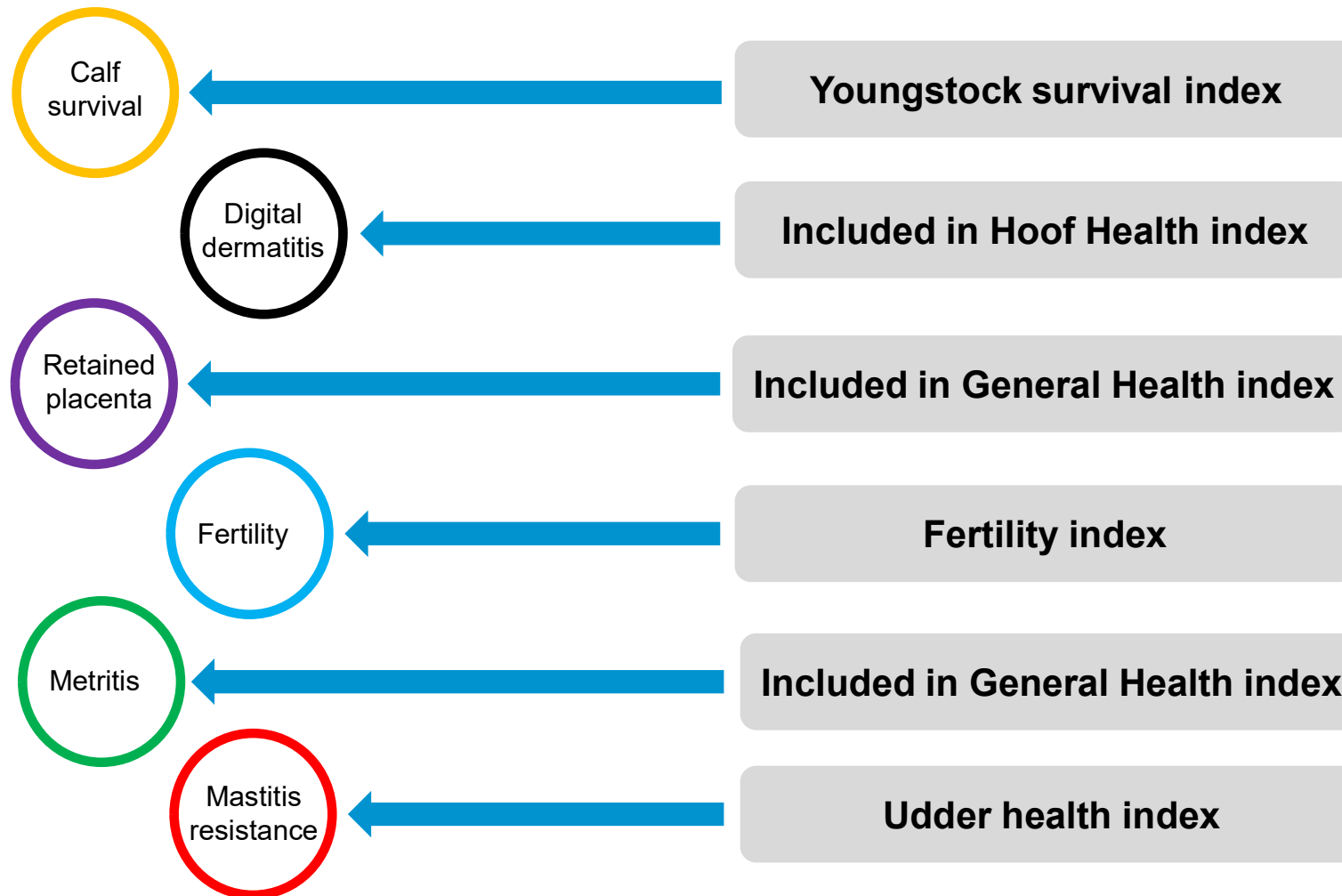
# Direct selection is more reliable

- The correlation between somatic cell count (SCC) and clinical mastitis is 0.6.
- However, it is not the same trait.
- The correlation between the "feet & leg" conformation index and hoof health is only 0.16 (Holstein)
- However, it is not the same trait



Source: NAV, Nordic Cattle Genetic Evaluation

# Direct selection for several traits





# Hoof health

Powered by VikingGenetics



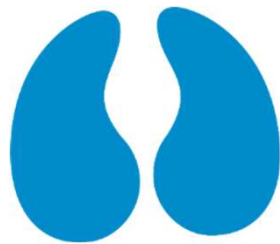


# Unique Hoof health index

- Hoof health index describes bull's daughters genetic ability to **resist hoof diseases**
- Hoof trimmers are organized and registrations are provided to the **central cow database**
- Index includes hoof health records in the first three lactations
- First Hoof Health index in the world

first Hoof Health index

**2011**



Registrations since

**2003**



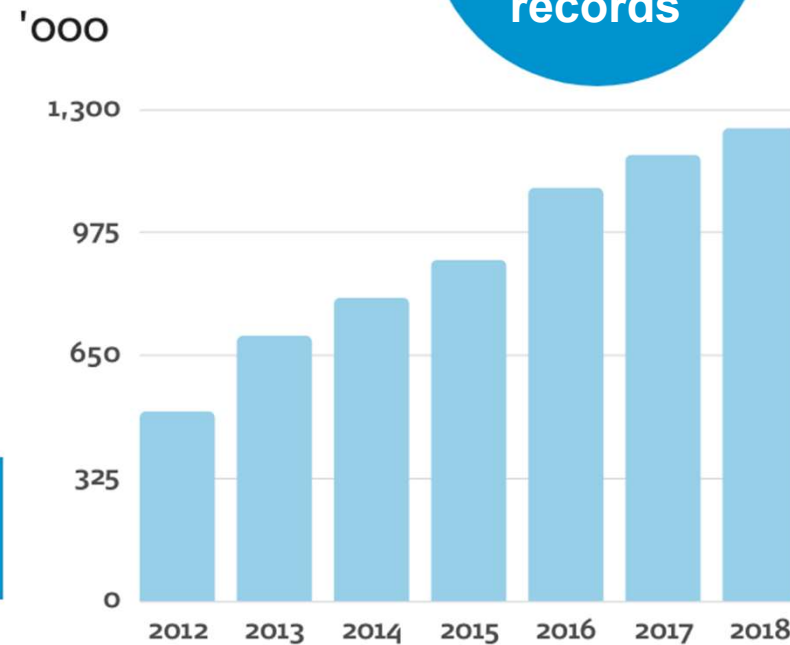
# Huge amount of reliable data

Reliable registrations from hoof trimmers



**ELECTRONIC  
REGISTRATIONS**

**6**  
million  
records





# Unique Hoof health index

Sole ulcer

Sole Hemorrhage

Heel Horn Erosion





Digital dermatitis + Interdigital Dermatitis

Verrucose dermatitis + Interdigital Hyperplasia

Double sole + White line separation

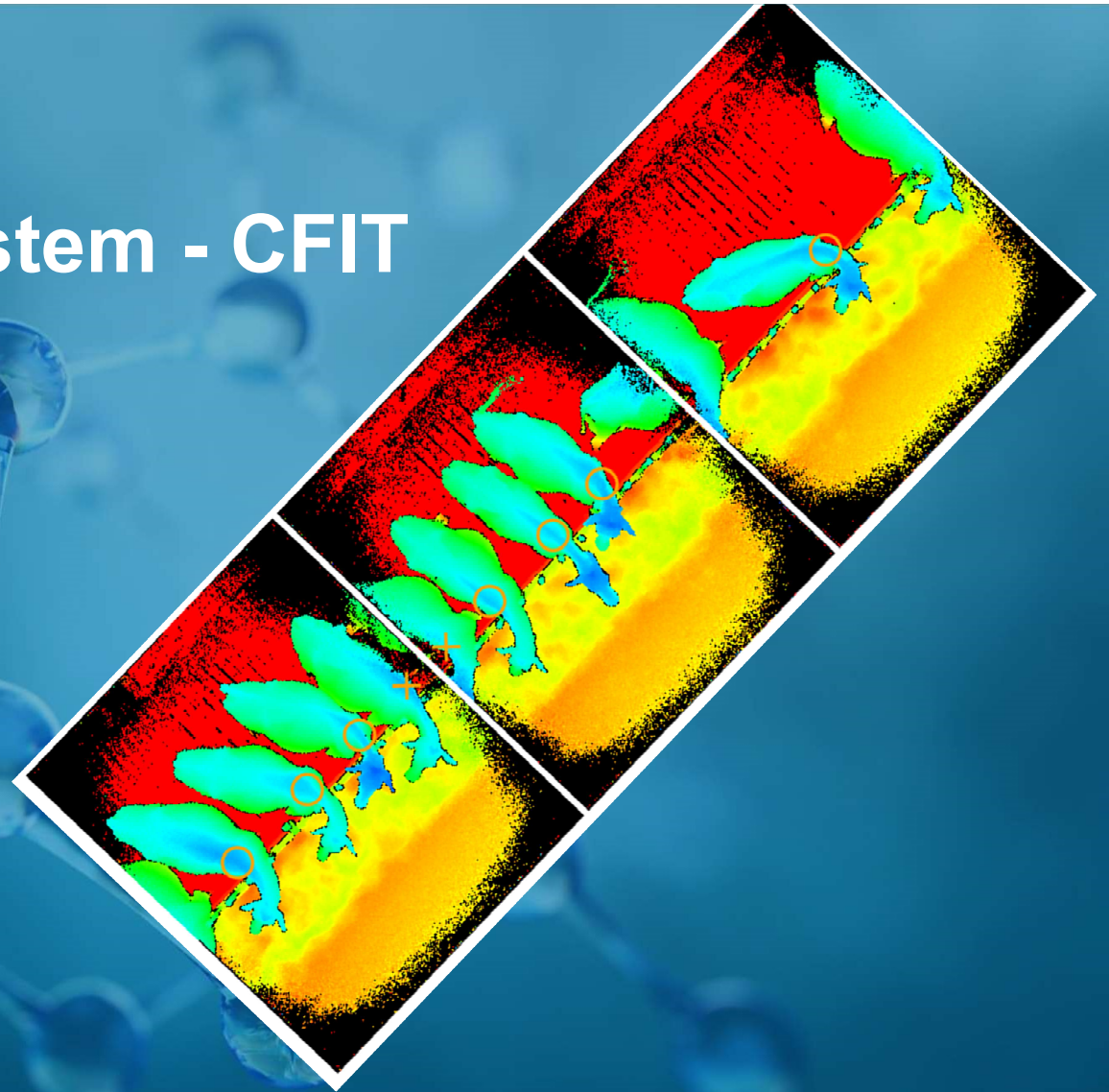
Cork screw claw

# Improve hoof health

Hoof disorders	Bull with EBV 110 % Difference from population average		Bull with EBV 120% Difference from population average	
				
Sole Ulcer	-38%	-33%	-77%	-66%
Sole Hemorrhage	-10%	-20%	-20%	-40%
Heel horn erosion	-16%	-23%	-33%	-45%
Digital dermatitis + Interdigital dermatitis	-14%	-15%	-27%	-31%
Verrucose dermatitis + Interdigital Hyperplasia	-35%	-38%	-70%	-76%
Double sole + white line	-12%	-14%	-24%	-29%
Cork screw claw	-25%	-33%	-50%	-67%

# Cattle Feed Intake System - CFIT

measuring individual feed intake  
in commercial herds using 3D  
camera technology



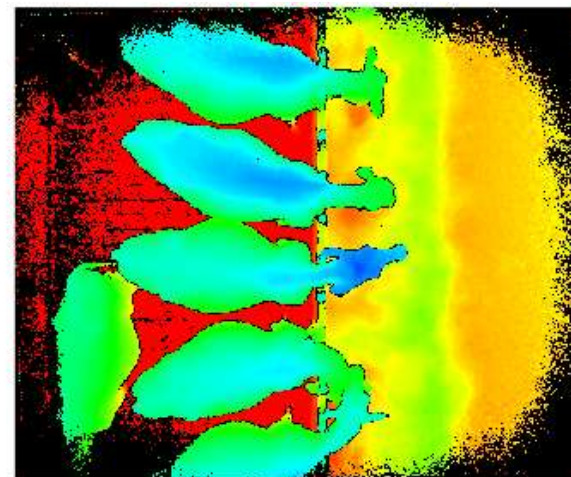
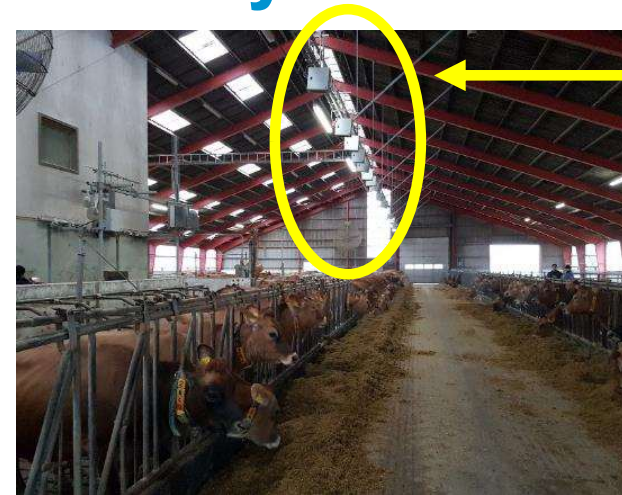
## 3D system for feed intake in dairy cattle

- Identification

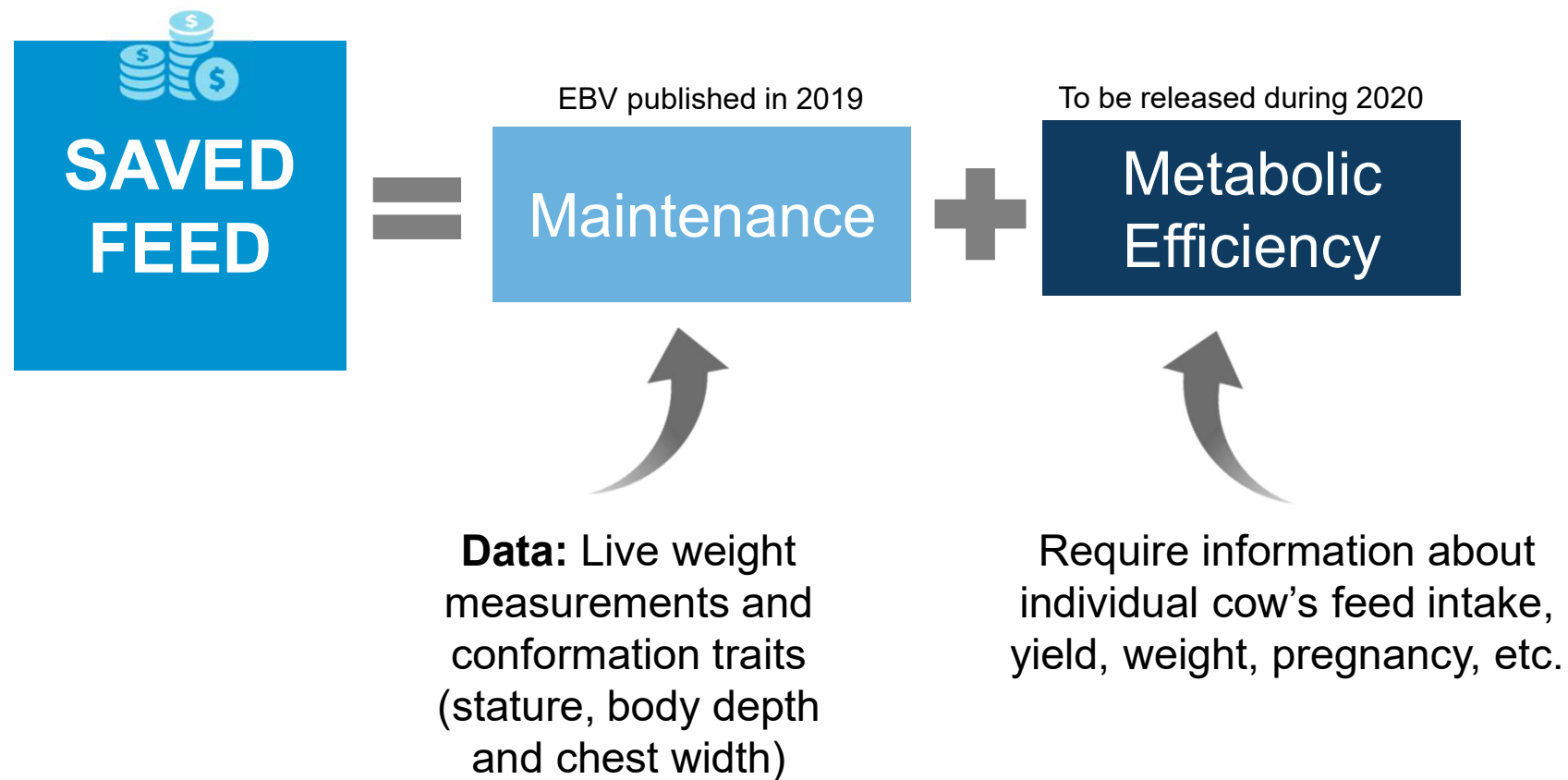
Contours of the back are used to identify cows

- Feed intake

Changes in volume during visits are used



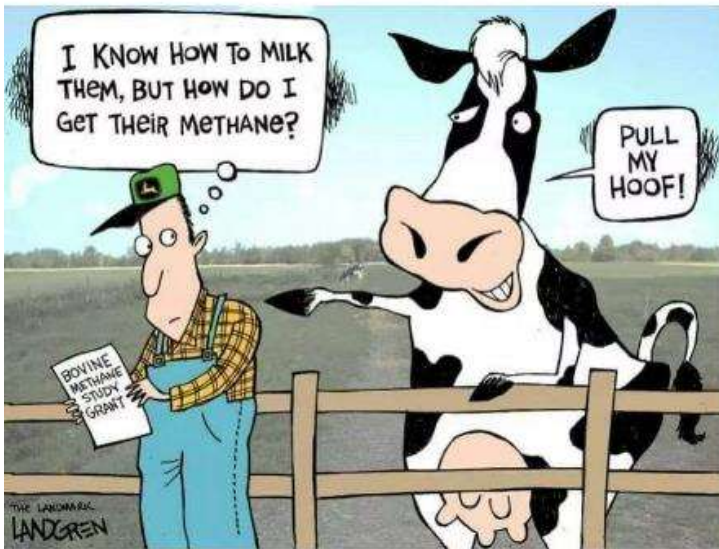
# Saved feed index





# Methane

- Largest world-wide amount of **data**



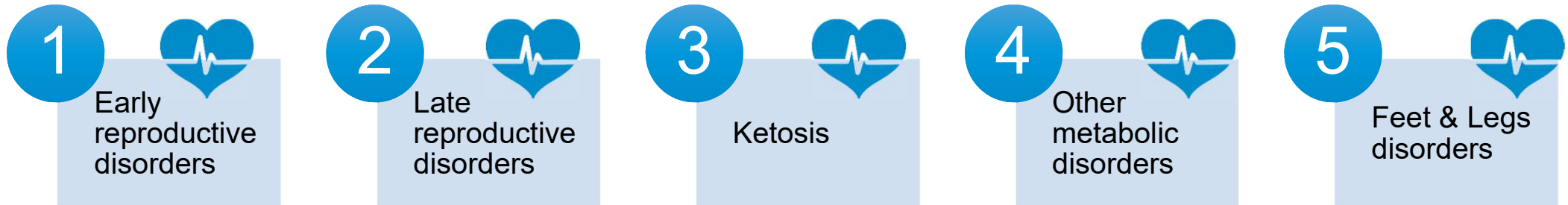
## Unique Udder health index

- Our unique udder health index is based on extensive **veterinarian** registrations of **clinical mastitis**
- Using data on Somatic Cell Count (SCC) alone is not a good enough predictor for improving mastitis resistance. Registrations of Clinical mastitis are more efficient (correlation SCC and Clinical mastitis ranges from 0.45 to 0.70)
- Official registrations are done for all cows on all farms
- The index mastitis resistance consists of:
  - Clinical mastitis 1st to 3rd lactation
  - SCC 1st to 3rd lactation (indicator)
  - Fore udder attachment (indicator)
  - Udder depth (indicator)



# Unique General health index

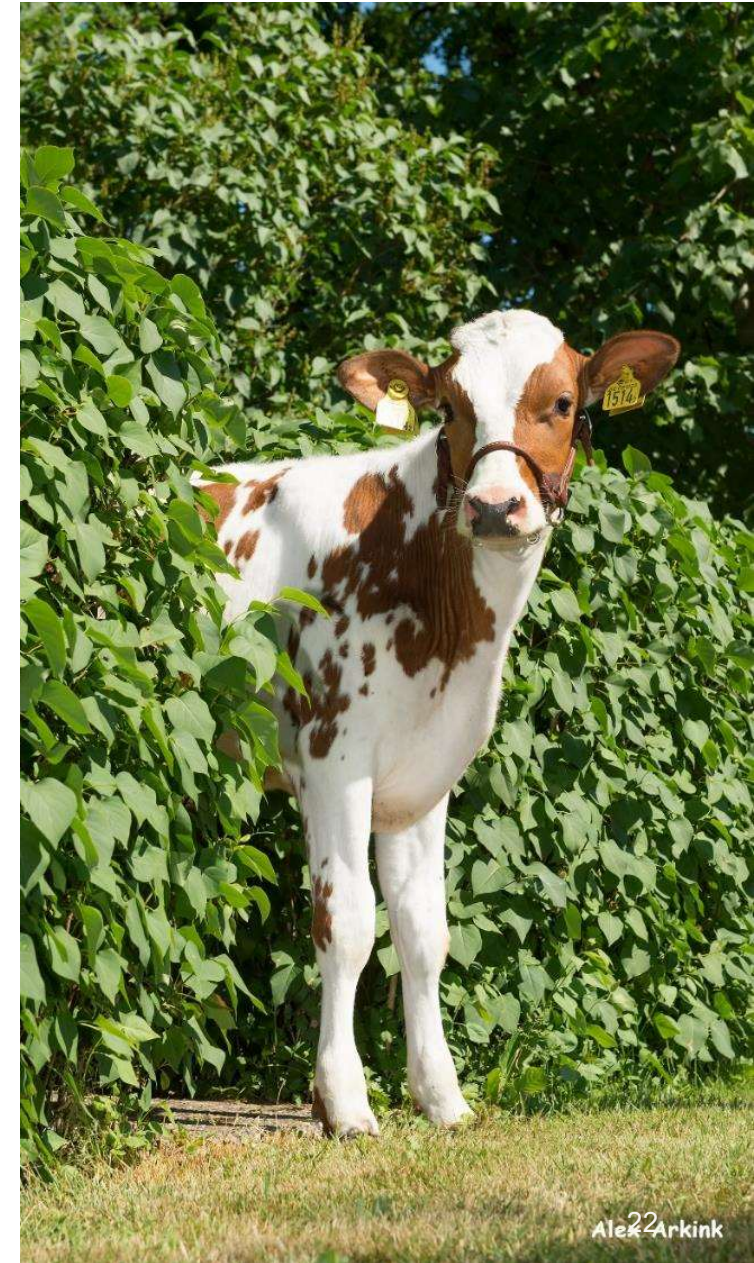
- The index describes the bulls daughters' ability to resist reproductive, metabolic and feet-and-leg-diseases with **>80 diagnoses covered**
- The index is based on registrations from **veterinary treatments** and includes records from 1st to 3rd lactation for these 5 sub-traits:





# Unique Youngstock survival index

- Youngstock survival is the newest index in NTM - introduced in 2016
- The index describes the genetic potential for survival in youngstock
- YSS includes breeding values registered separately for male and heifer calves for:
  - early rearing period (first month)
  - late rearing period (up to six months for male calves and 15 months for heifers)



# Pioneers in breeding for health traits

Production  
Calving  
Daughter fertility  
Body, Feet & Legs, Udder  
Milkability

**1980**



General Health

**1987**



Hoof health

**2011**

Saved feed

**2019**

**1982**

Udder health



**2005**

Longevity  
Calving direct

**2016**

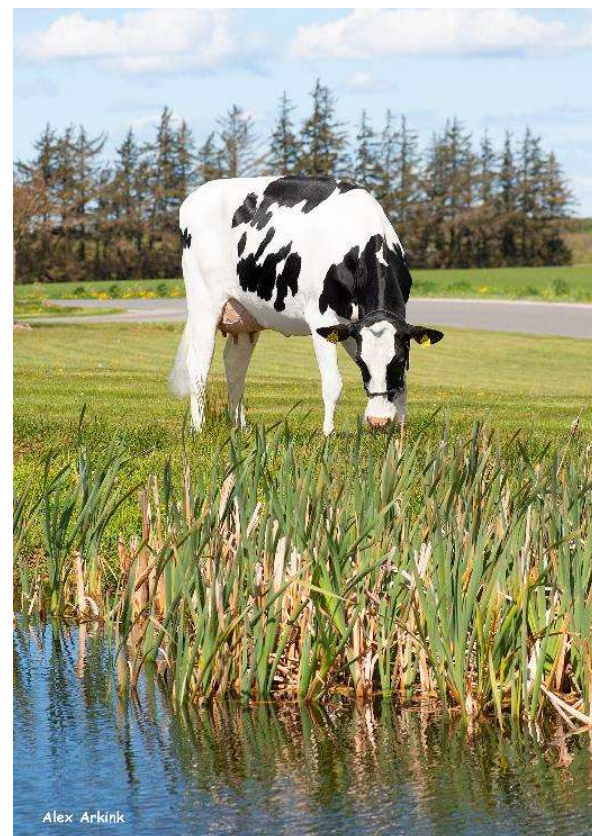
Youngstock  
Survival





## Reliability on genomic tested bulls born in 2016

Trait	VikingHolstein	VikingRed
Production	78	75
Growth	70	58
Female fertility	74	65
Calving direct	74	67
Calving maternal	71	60
Udder health	76	70
General health	62	56
Hoof health	59	52
Longevity	70	55
Body capacity	72	59
Feet & Legs	64	64
Udders	73	64
Milking speed	75	75
Temperament	68	60





# VikingHolstein

Healthy, efficient cows







## Healthy, efficient cows

- VikingHolsteins are **medium-sized cows** that are **feed-efficient** and produce **high levels of milk and solids**
- Because of their **natural health**, VikingHolstein cows have **excellent fertility**. They also **calve easily**
- VikingHolsteins are **resilient cows** that are easy to manage and with **great genetic diversity**



# VikingHolstein

Give you **high lifetime production** and **daily profit per cow**

Makes your dairy business **profitable**, **sustainable** and **enjoyable**



## Healthy

Excellent health and reproduction



## High producing

High lifetime production of milk and solids



## Resilient

Great genetic diversity – long-lasting cows



## Efficient

Medium-sized cows – easy to manage

# VikingHolstein

## VikingHolstein 2020

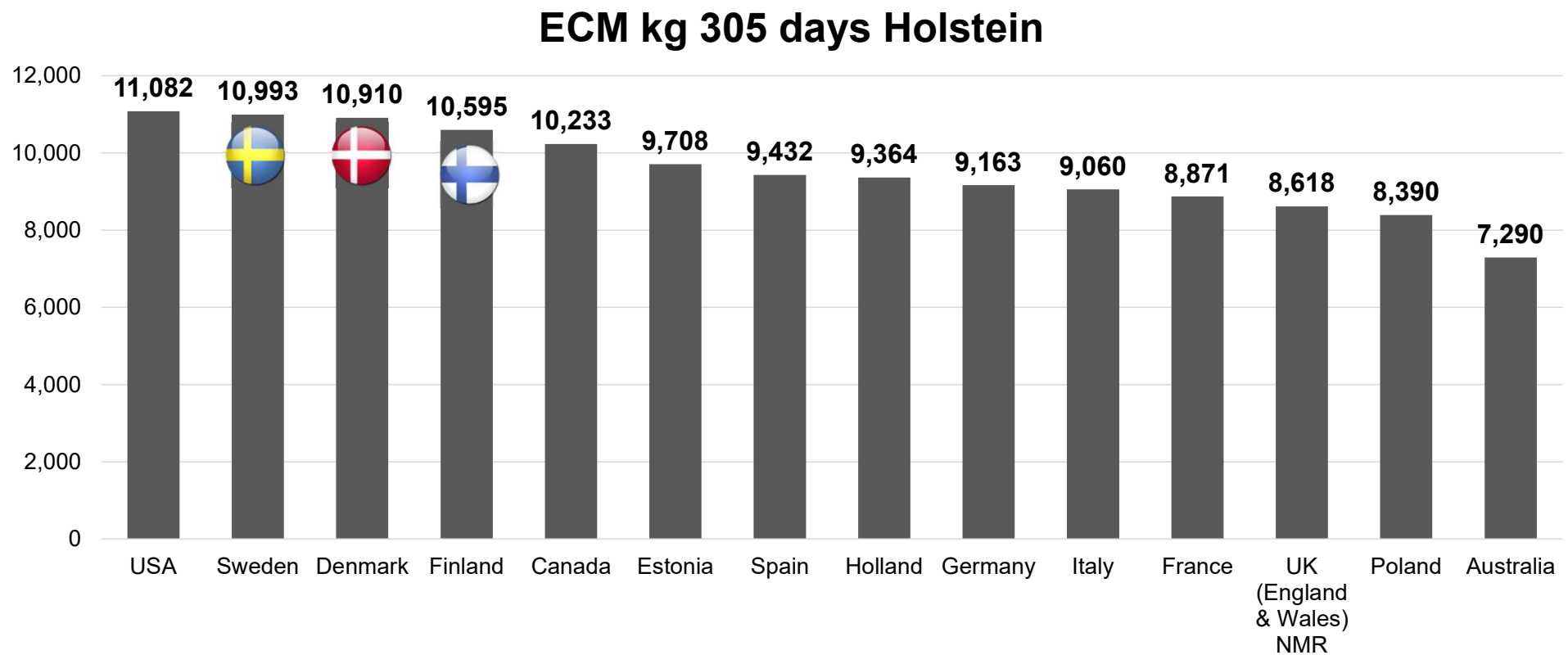
No. cows	<b>596,000</b> (DNK, SWE, FIN)
Milk (305 days)	<b>11,011 kg</b> / 10,993 kg ECM
Fat kg	<b>440 kg</b>
Fat %	<b>4.00 %</b>
Protein kg	<b>373 kg</b>
Protein %	<b>3.39 %</b>
Fat + Protein kg	<b>813 kg</b>

NAV January 2020





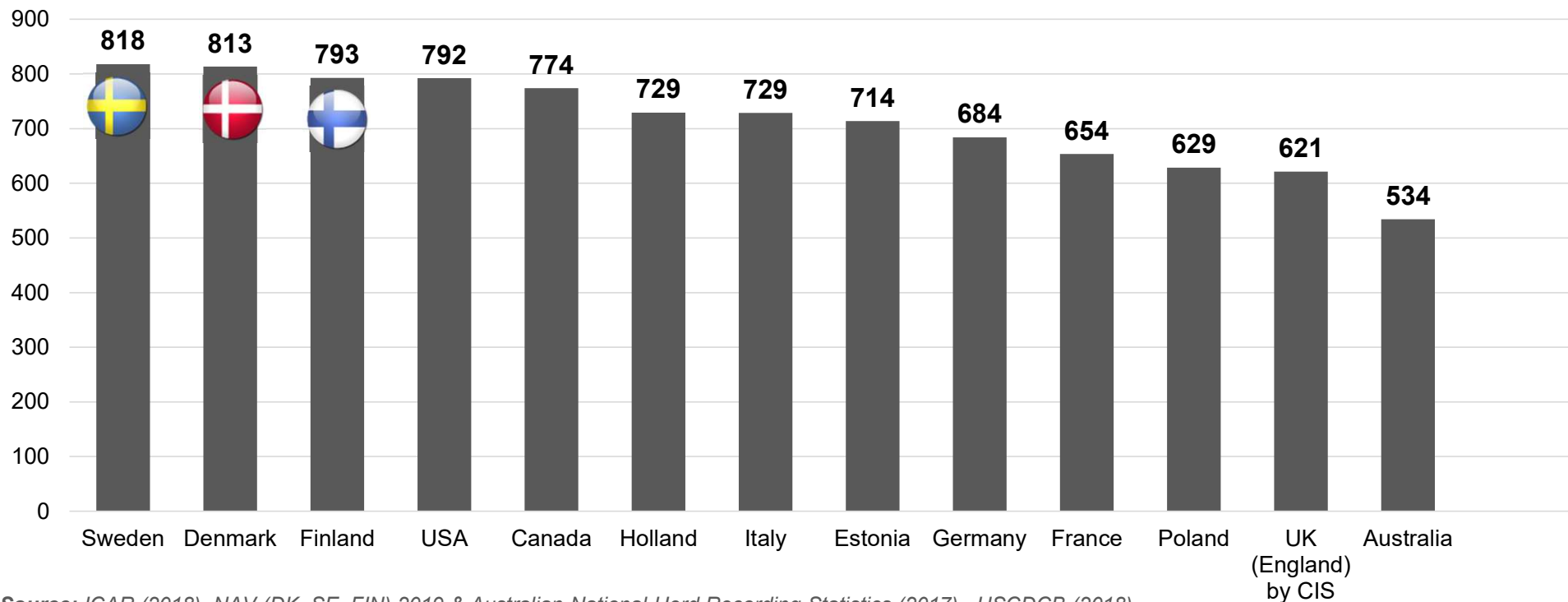
# ECM per cow, 305 days - Holstein



Source: ICAR (2018), NAV (DK, SE, FIN) 2019 & USCDCB (2018)

# Kg fat + protein, 305 days - Holstein

fat + protein kg - Holstein 305 days, all registered cows



Source: ICAR (2018), NAV (DK, SE, FIN) 2019 & Australian National Herd Recording Statistics (2017), USCDCB (2018)

## 5 most common reasons for culling

Holstein, Denmark

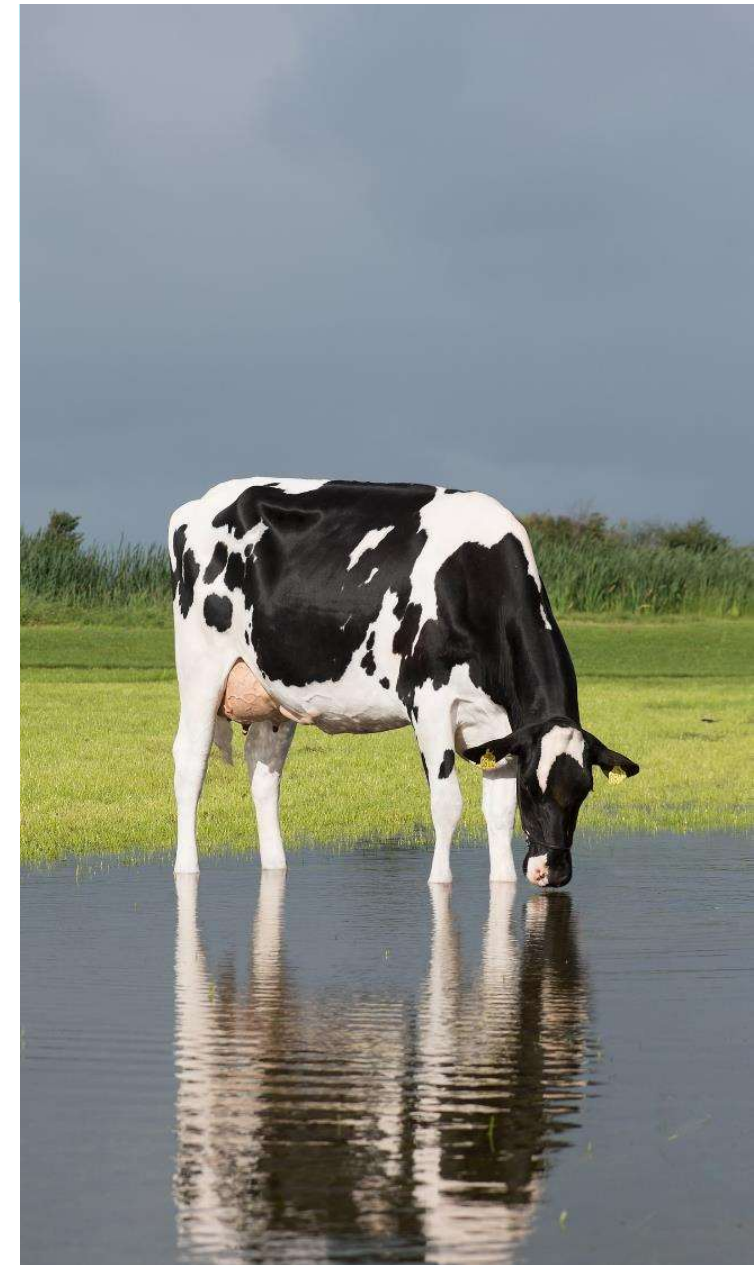
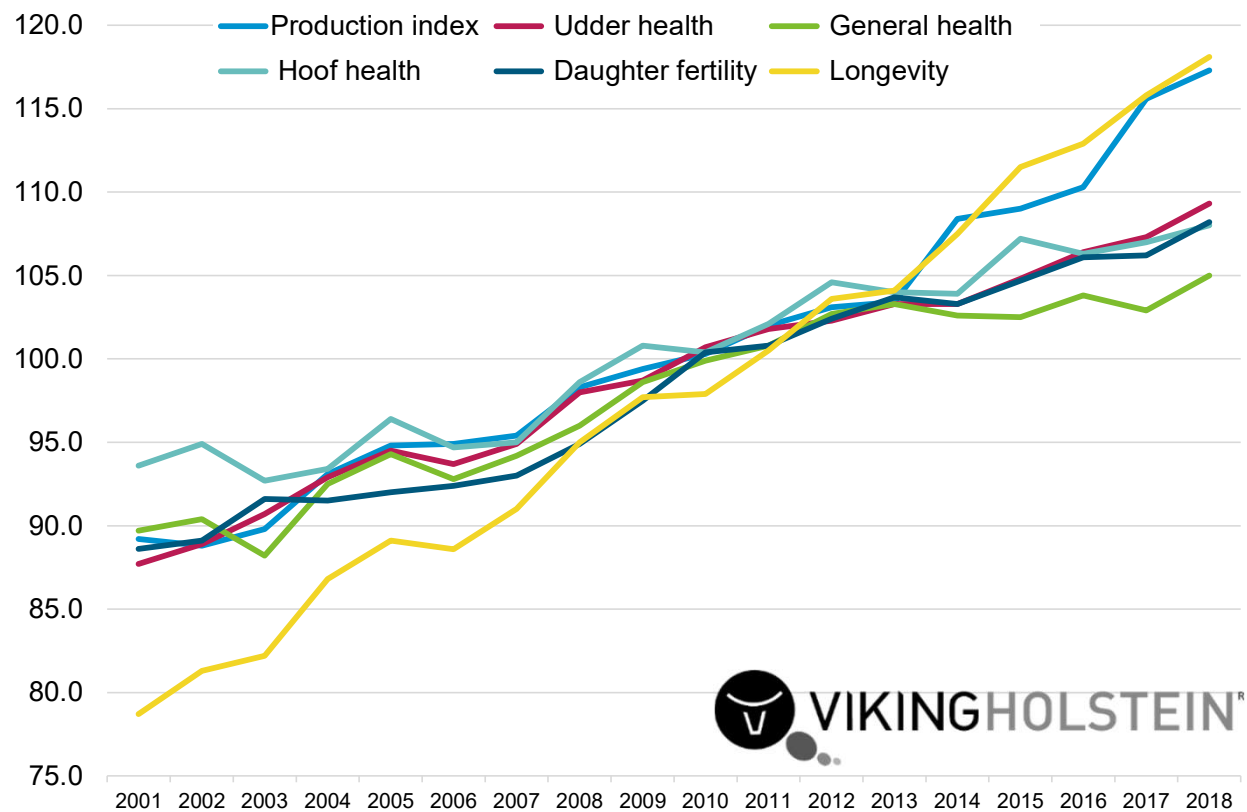
Reason for culling	% from culled per year
Poor fertility	20.9%
Low yield	19.3%
Hoof, F&L problems	13.6%
Too high SCC	11.1%
Udder and teats characteristics	6.6%

Source: SEGES Denmark (2018)





## Genetic trends – VikingHolstein bulls



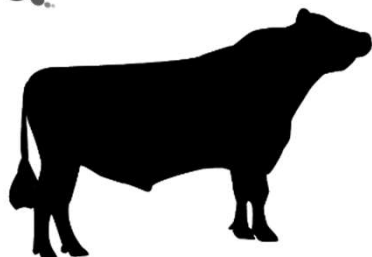
# Correlations to NTM

Trait	Correlation
Production	0.58
Growth	0.08
Daughter fertility	0.45
Calving direct	0.25
Calving maternal	0.33
Udder health	0.39
General health	0.35
Hoof health	0.24
Longevity	0.52
Youngstock survival	0.23
Frame	0.02
Feet & legs	0.19
Udder	0.28
Milkability	0.08
Temperament	0.09



## VikingHolstein breeding & female programs

 **VIKINGHOLSTEIN**



**3,000**

Genomically  
tested

**100**

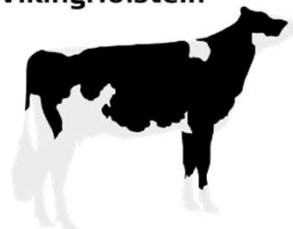
bought

**90**

in production

 **VIKINGEMBRYO**

**VikingHolstein**



**450**

Heifers contracted  
for flushing















**40**

Heifers purchased

**4,300**

Embryos per year















# Interbull ranking - Holstein

	Production index 	Fat index 	Protein index 	Frame 
  	<b>106</b>	<b>105</b>	<b>106</b>	<b>103</b>
	<b>108</b>	<b>110</b>	<b>106</b>	<b>113</b>
	<b>107</b>	<b>109</b>	<b>106</b>	<b>117</b>
	<b>104</b>	<b>105</b>	<b>104</b>	<b>110</b>
	<b>107</b>	<b>107</b>	<b>107</b>	<b>112</b>
	<b>103</b>	<b>103</b>	<b>103</b>	<b>116</b>
	<b>104</b>	<b>107</b>	<b>102</b>	<b>113</b>
	<b>98</b>	<b>100</b>	<b>96</b>	<b>110</b>

VikingHolsteins are  
**medium-sized cows**  
 that are **feed-efficient**  
 and produce **high levels**  
**of milk and solids**



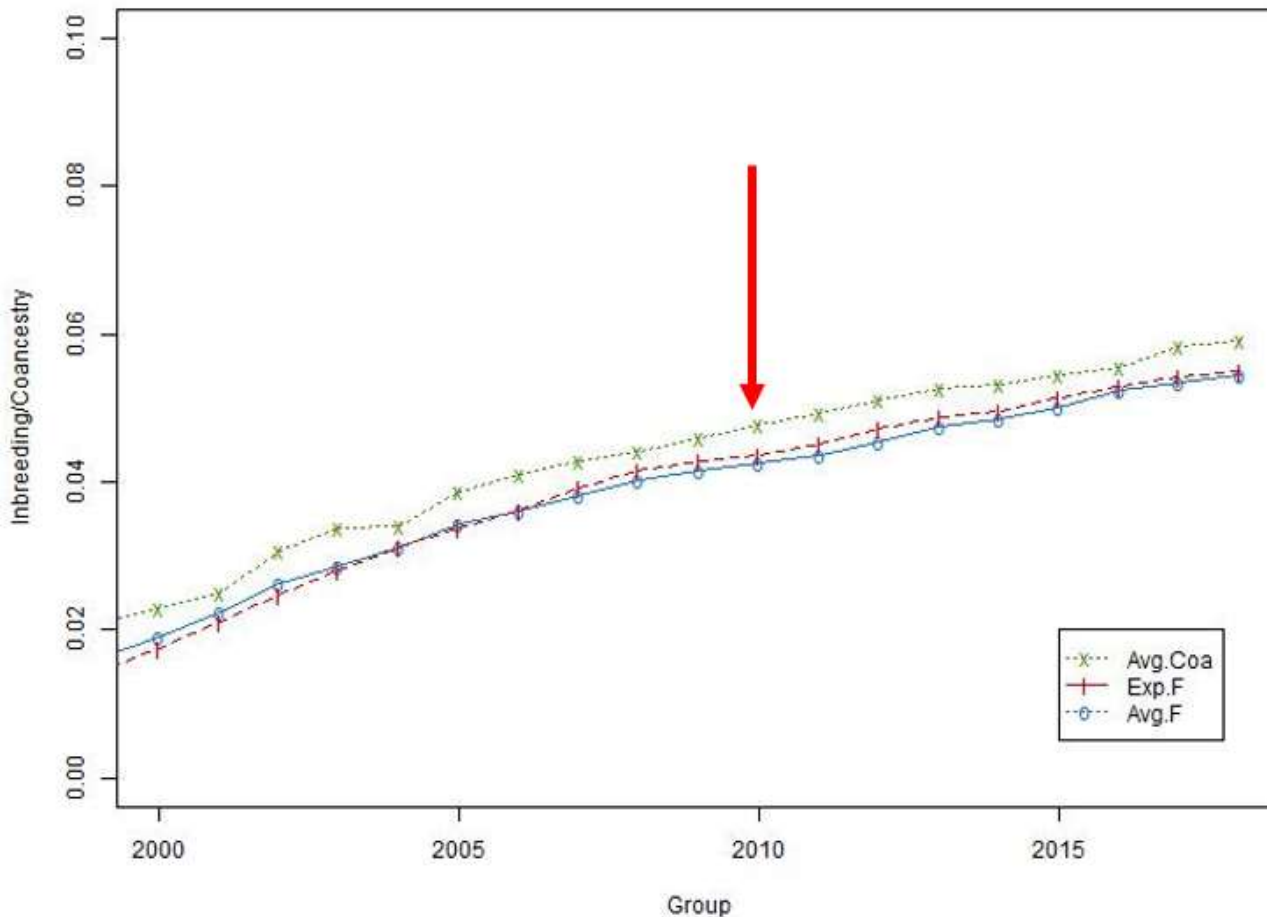
# Interbull ranking - Holstein

	 Udder health	 Daughter Fertility	 <sup>D</sup> Calving direct	 <sup>M</sup> Calving maternal
  	102	102	102	103
	100	98	99	102
	98	95	98	100
	99	96	99	98
	99	94	99	99
	99	95	99	103
	98	97	98	100
	95	91	95	92

Because of their **natural health**, VikingHolstein cows have **excellent fertility**. They also **calve easily**

# Resilient cows

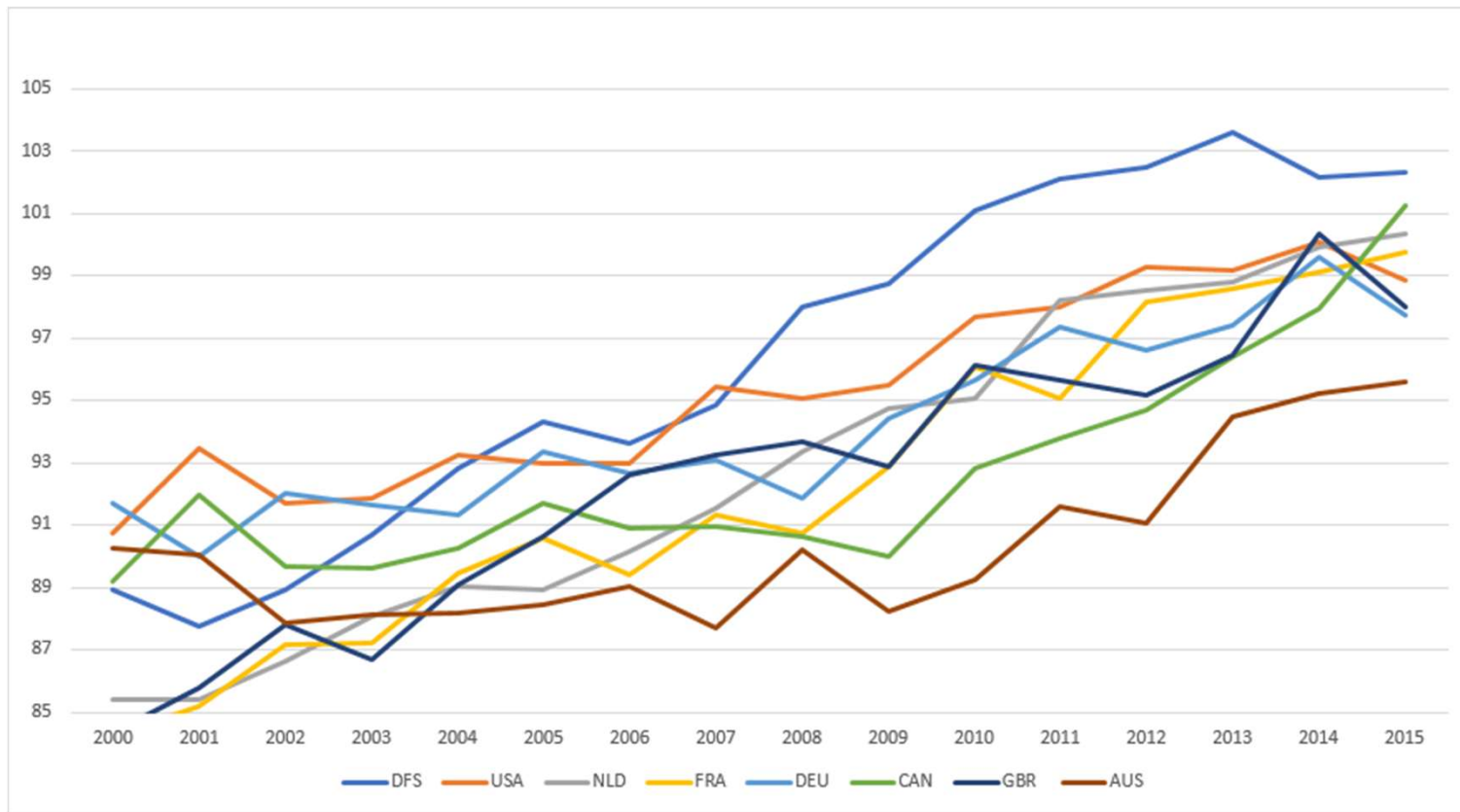
Holstein coancestry, average and observed inbreeding over the time



VikingHolsteins are  
**resilient cows** that are  
easy to manage and with  
**great genetic diversity**



## Udder health – genetic trend



# Improve udder health

Bull with EBV 100 equals  
population average for the  
breed



Daughters of the bull

**EBV 100**

**23%**

less  
mastitis\*

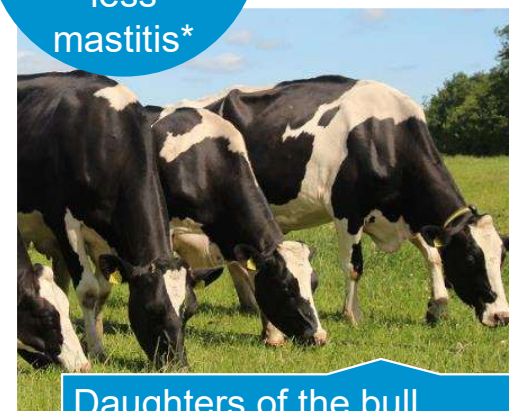


Daughters of the bull

**EBV 110**

**46%**

less  
mastitis\*



Daughters of the bull

**EBV 120**

**Note:** Calculated based on phenotypic values (NAV 2019)

\*Compared to population average



# Improve hoof health

- Sole ulcer
- Verrucose dermatitis
- Interdigital Hyperplasia
- Cork screw claw



Daughters of the bull  
**EBV 100**



Daughters of the bull  
**EBV 110**

**25-38%**  
less



Daughters of the bull  
**EBV 120**

**50-77%**  
less

**Note:** Bull with EBV 100 equals population average for the breed  
Calculated based on phenotypic values for VikingHolstein (NAV 2019)

# Improve general health - VikingHolstein



Relative to population average / bull  
with EBV100

## Population average

Early reproductive  
disorders **6.7%**

Late reproductive  
disorders **5.6% resp.**

Ketosis  
**2%**

Other metabolic  
disorders **5.3%**

## EBV 110

**-13%**

**-10%**

**-9%**

**-12%**

## EBV 120

**-26%**

**-20%**

**-19%**

**-25%**

# VikingHolstein conception rate

- VikingHolsteins have high conception rate.



heifers

**63%**

VikingHolstein



cows

**50%**

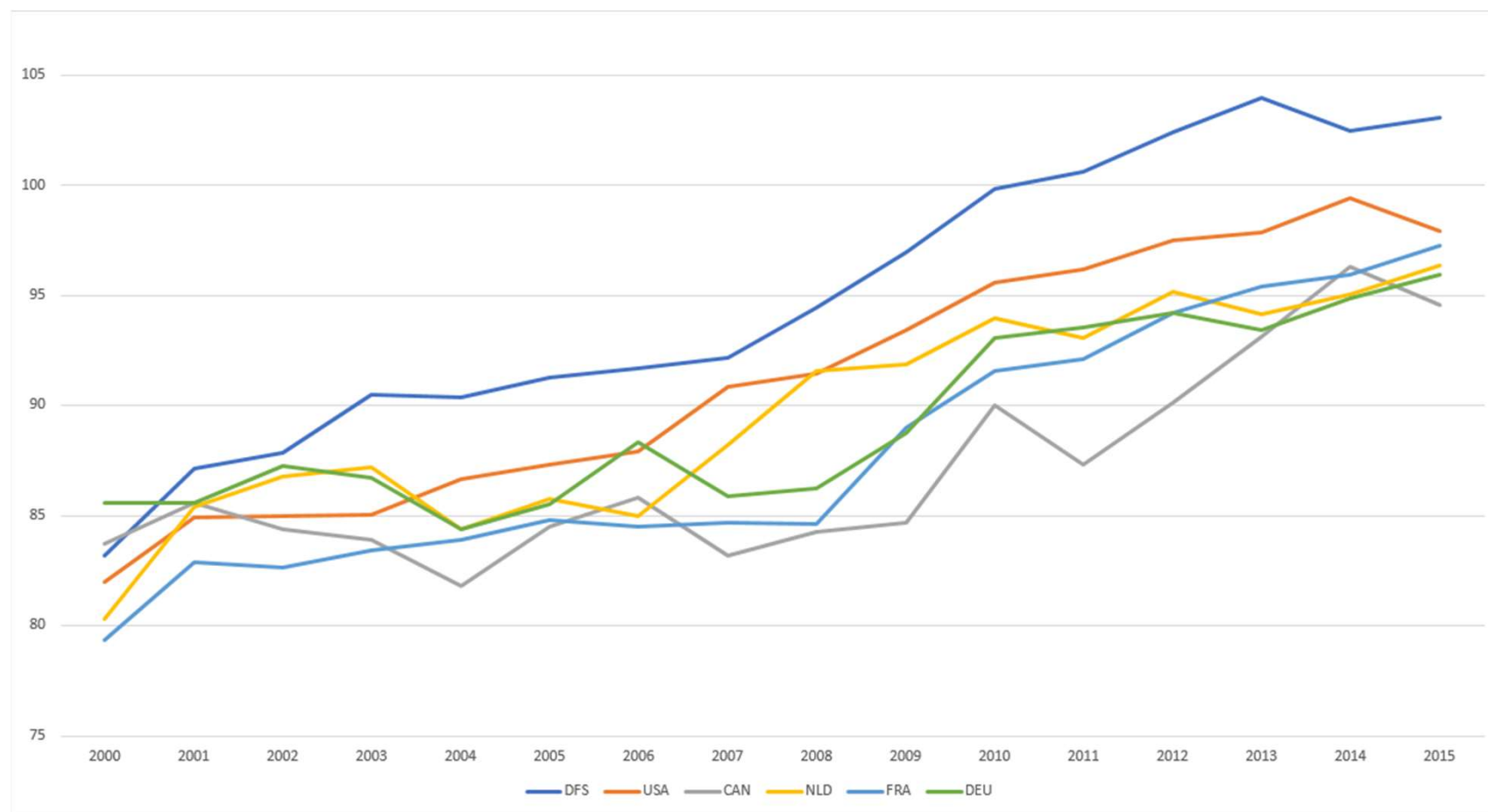
VikingHolstein







## Female fertility – from 1. to last insemination, cows



# Improve daughter fertility - VikingHolstein



## Population average

Interval from calving to 1st insemination  
**81 days**

Interval from 1st to last insemin., heifers **24 days**

Interval from 1st to last insemin., cows **50 days**

Number of insemin., heifers **1.6**

Number of insemin., cows **2.0**

## EBV 110

**- 3 days**

**- 2 days**

**- 4 days**

**- 0.05**

**- 0.07**

## EBV 120

**- 6 days**

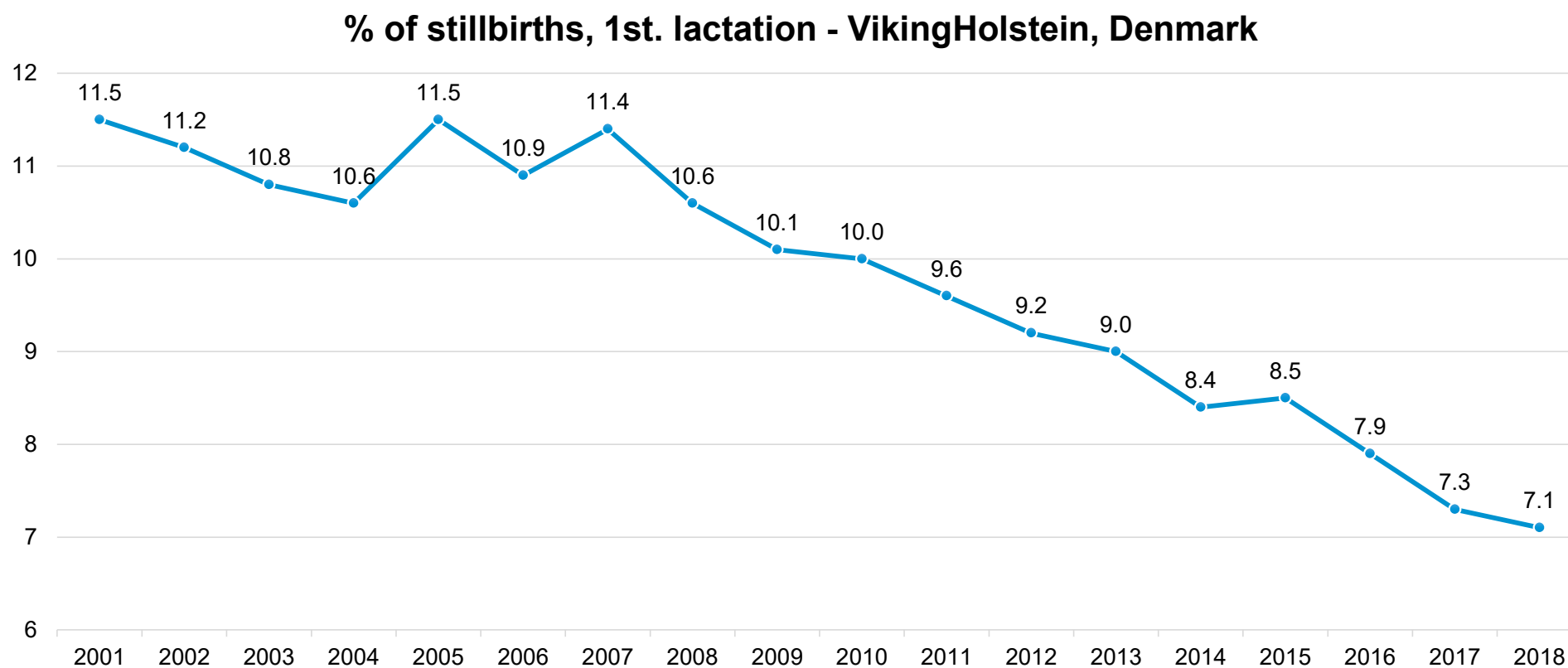
**- 4 days**

**- 8 days**

**- 0.10**

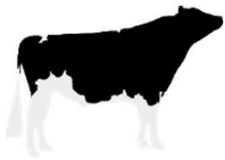
**- 0.14**

# Stillborn calves from heifers



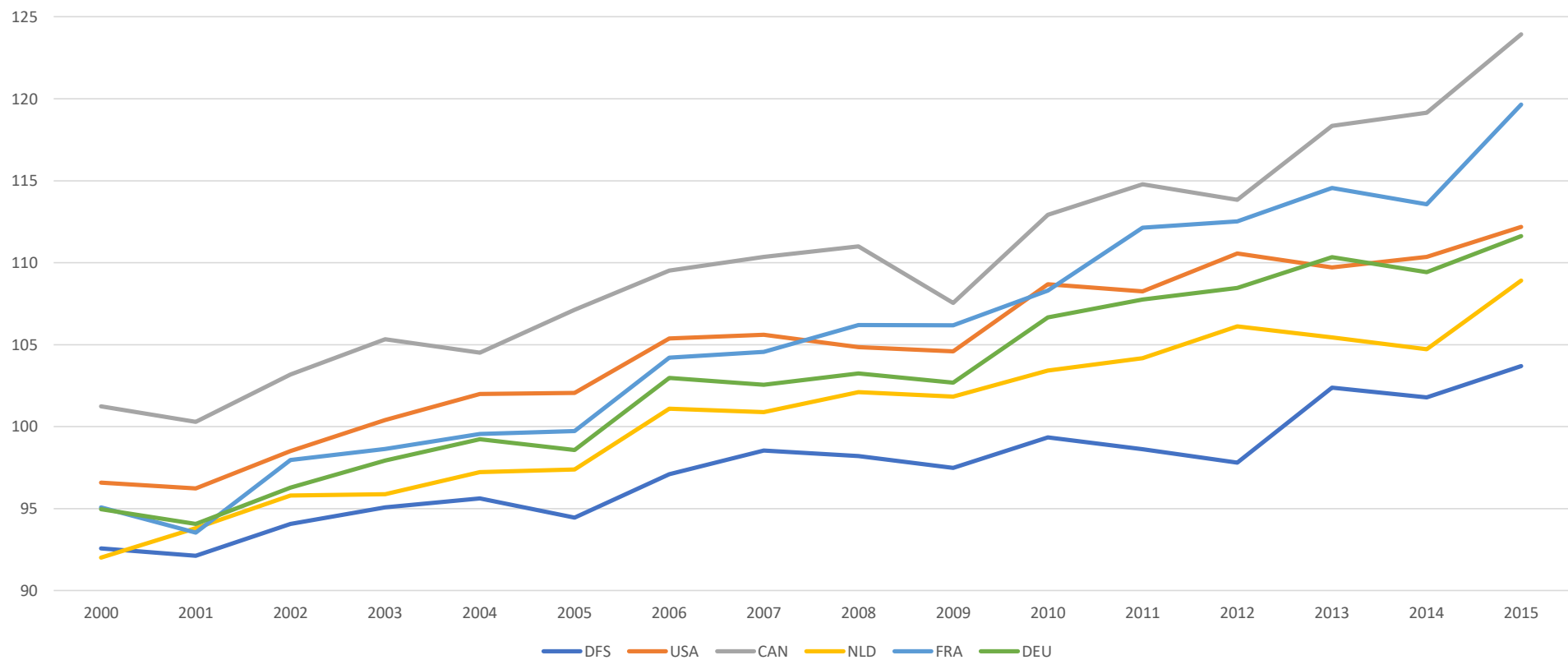
Source: SEGES (2019)





# Size – genetic trend

100 = 149 cm



Source: Interbull data, April 2018

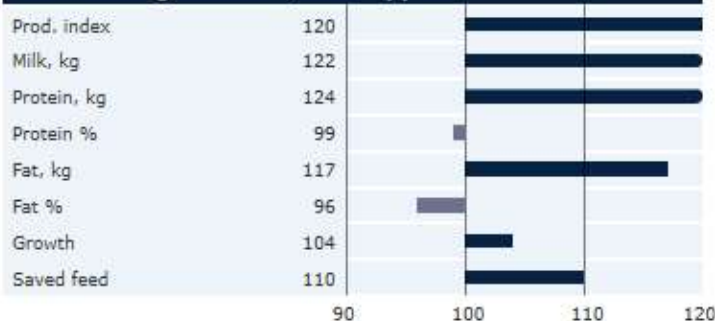
# VH Bernell

NTM +33, PCRs 589, PCRI 592  
Bube x VH Salomon x Mascol



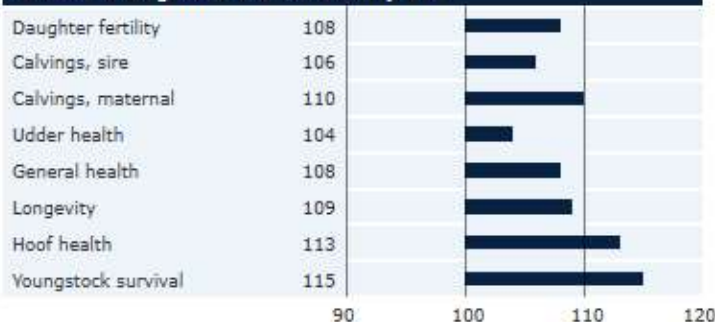
## PRODUCTION TRAITS

Number of daughters: 4586 , Reliability prod. 99%



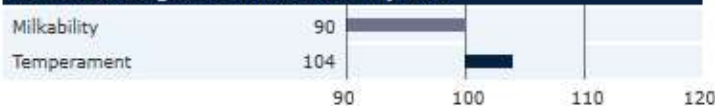
## HEALTH TRAITS

Number of daughters: 4557 , Reliability 99%



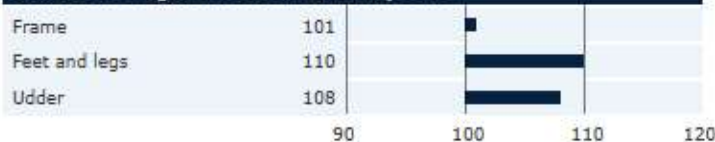
## FUNCTIONAL TRAITS

Number of daughters: 2072 , Reliability 99%



## CONFORMATION TRAITS

Number of daughters: 2072 , Reliability 99%



# VH Sparky

NTM +23, PCR<sub>s</sub> 566, PCRI 521

VH Suarez x VH Salomon x T Funkis



Alex Arlink



Alex Arlink

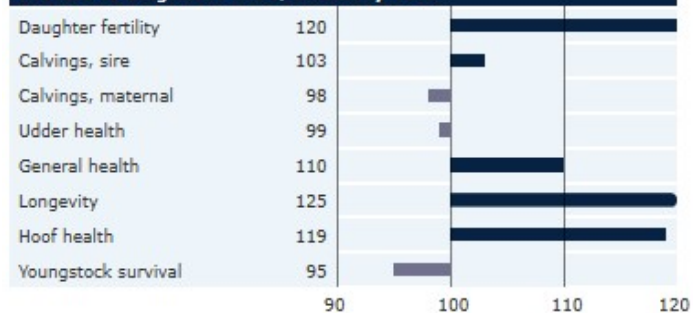
## PRODUCTION TRAITS

Number of daughters: 4059 , Reliability prod. 99%



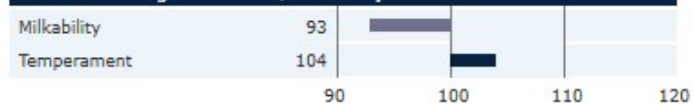
## HEALTH TRAITS

Number of daughters: 4025 , Reliability 99%



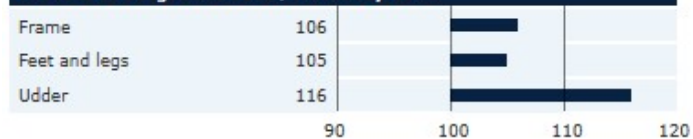
## FUNCTIONAL TRAITS

Number of daughters: 1838 , Reliability 99%



## CONFORMATION TRAITS

Number of daughters: 1838 , Reliability 99%





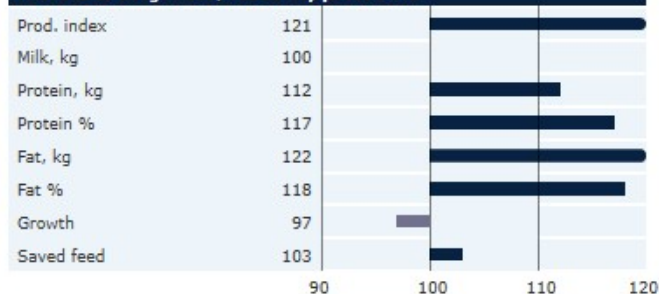
# VH Burzaco

gNTM +34, PCR<sub>s</sub> 594, PCRI 543  
VH Bahrain x Checkers x Sundance



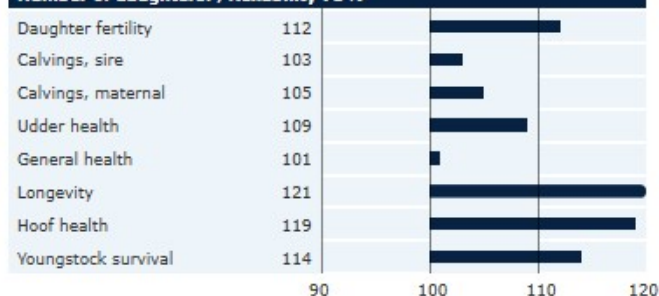
## PRODUCTION TRAITS

Number of daughters: , Reliability prod. 74%



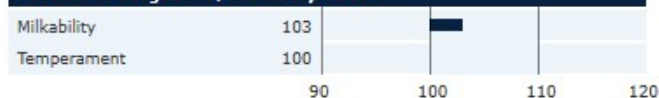
## HEALTH TRAITS

Number of daughters: , Reliability 73%



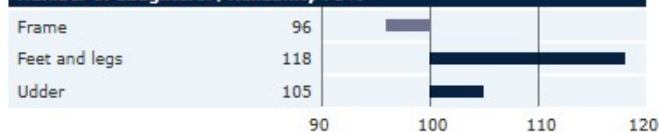
## FUNCTIONAL TRAITS

Number of daughters: , Reliability 71%



## CONFORMATION TRAITS

Number of daughters: , Reliability 71%

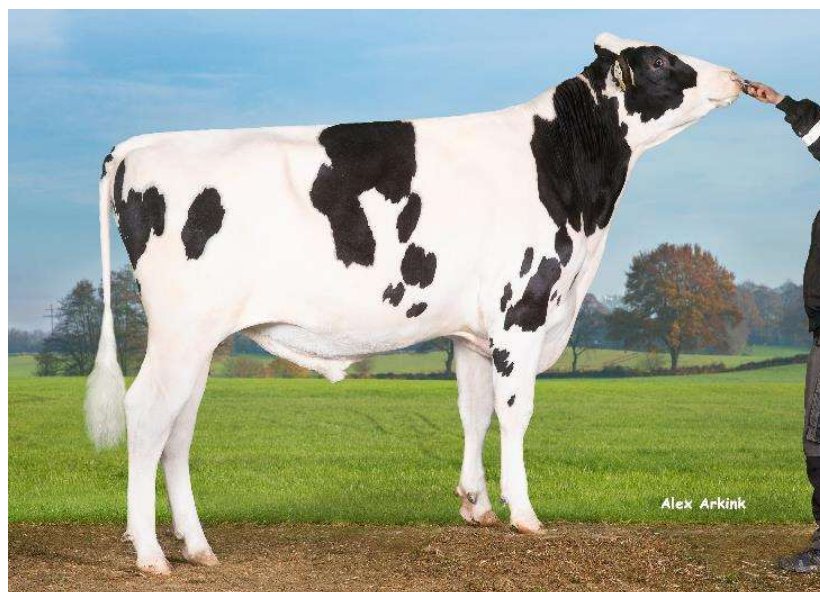




# VH Mint PP

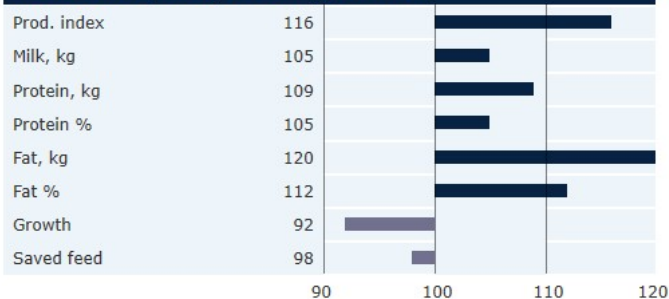
gNTM +23, PCR<sub>s</sub> 561, PCRI 531

VH Monty P x Chipper x D Sol



## PRODUCTION TRAITS

Number of daughters: , Reliability prod. 73%



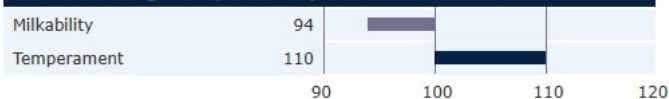
## HEALTH TRAITS

Number of daughters: , Reliability 75%



## FUNCTIONAL TRAITS

Number of daughters: , Reliability 73%



## CONFORMATION TRAITS

Number of daughters: , Reliability 73%

