

# **Genetic Evaluation of Mastitis Resistance in Canada**

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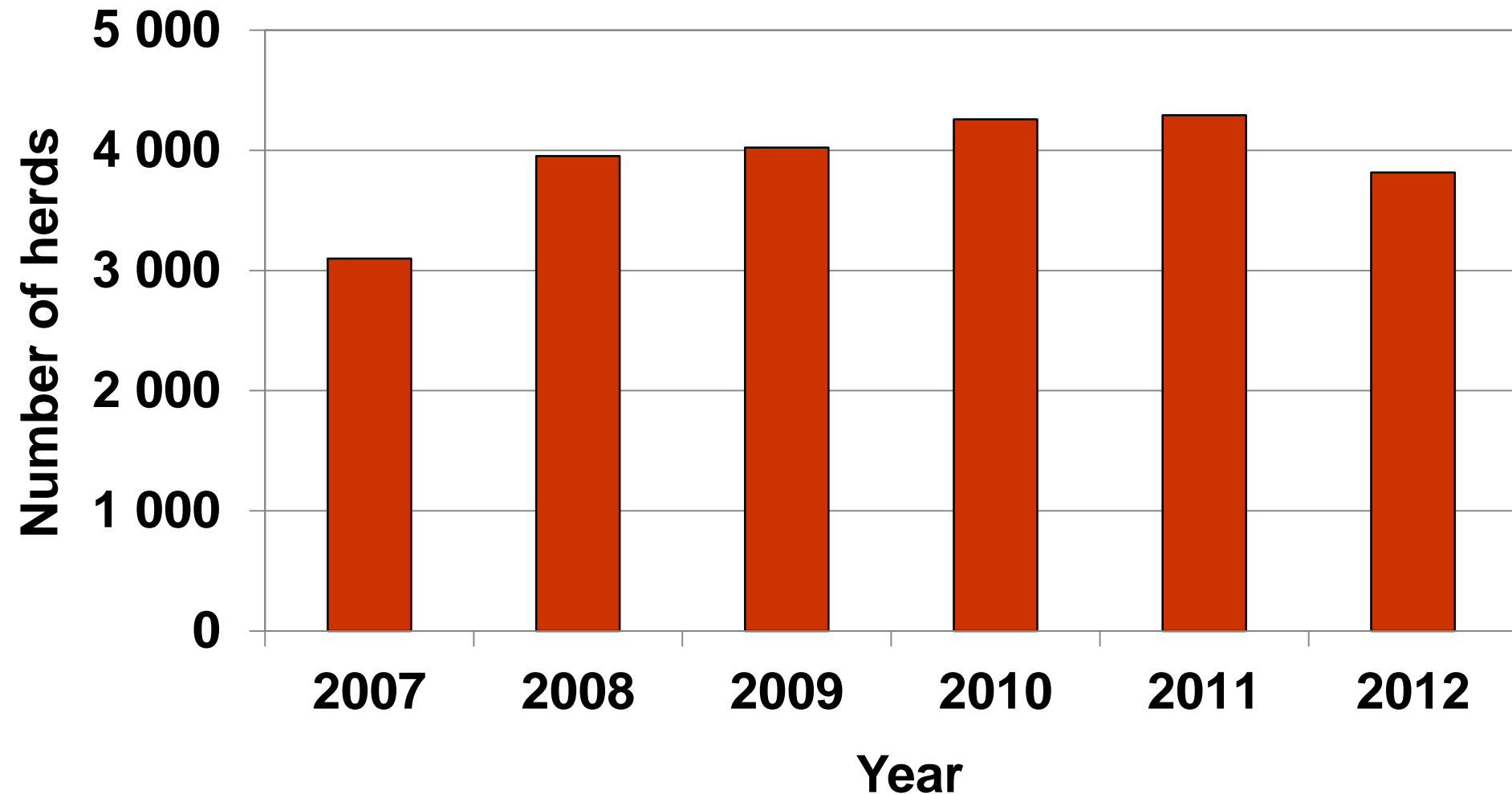
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Canada (AAFC), 3 – CDN, 4 – U. of Guelph (Pop'n Med.)**

# Health Recording in Canada

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- **National health recording system since April 2007**
  - Aim: Herd management and genetic improvement
- **Voluntary recording by dairy producers**
- **Eight diseases:**
  - Mastitis, Displaced Abomasum, Ketosis, Milk Fever, Retained Placenta, Metritis, Cystic Ovaries, Lameness
- **Overall goal is to develop a genetic evaluation system for resistance to mastitis and to other diseases in Canadian dairy cattle**

# Number of Herds Recording Health Data



# Data Quality

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- **To obtain reliable and accurate evaluations, recording of disease cases should be as complete as possible on all participating farms**
- **However, data quality can vary among farms and even for a given farm over time**
- **Under-reporting of diseases in general, and for specific diseases is possible**

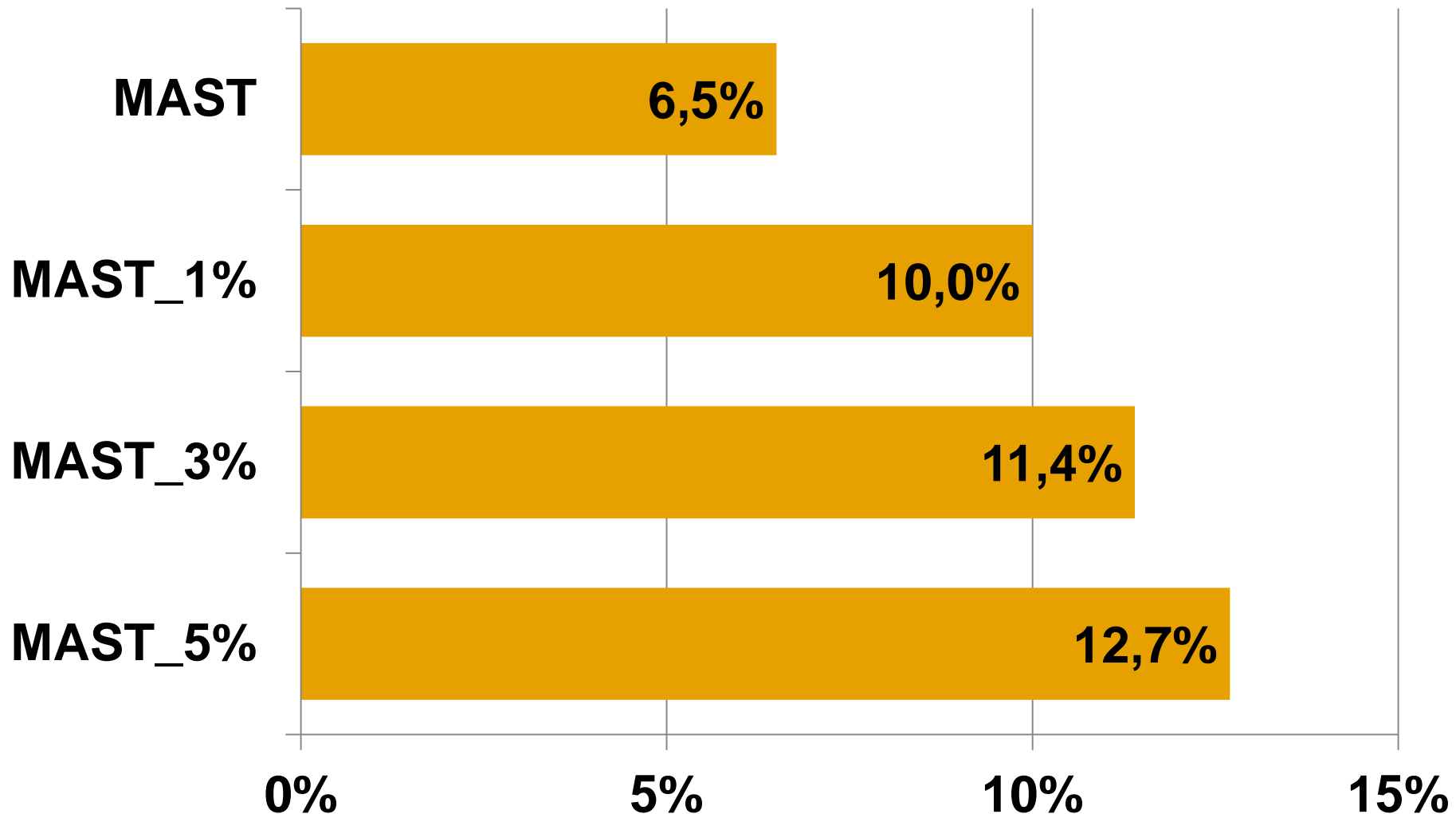
# Data Validation

## *Herds with Reliable Recording*

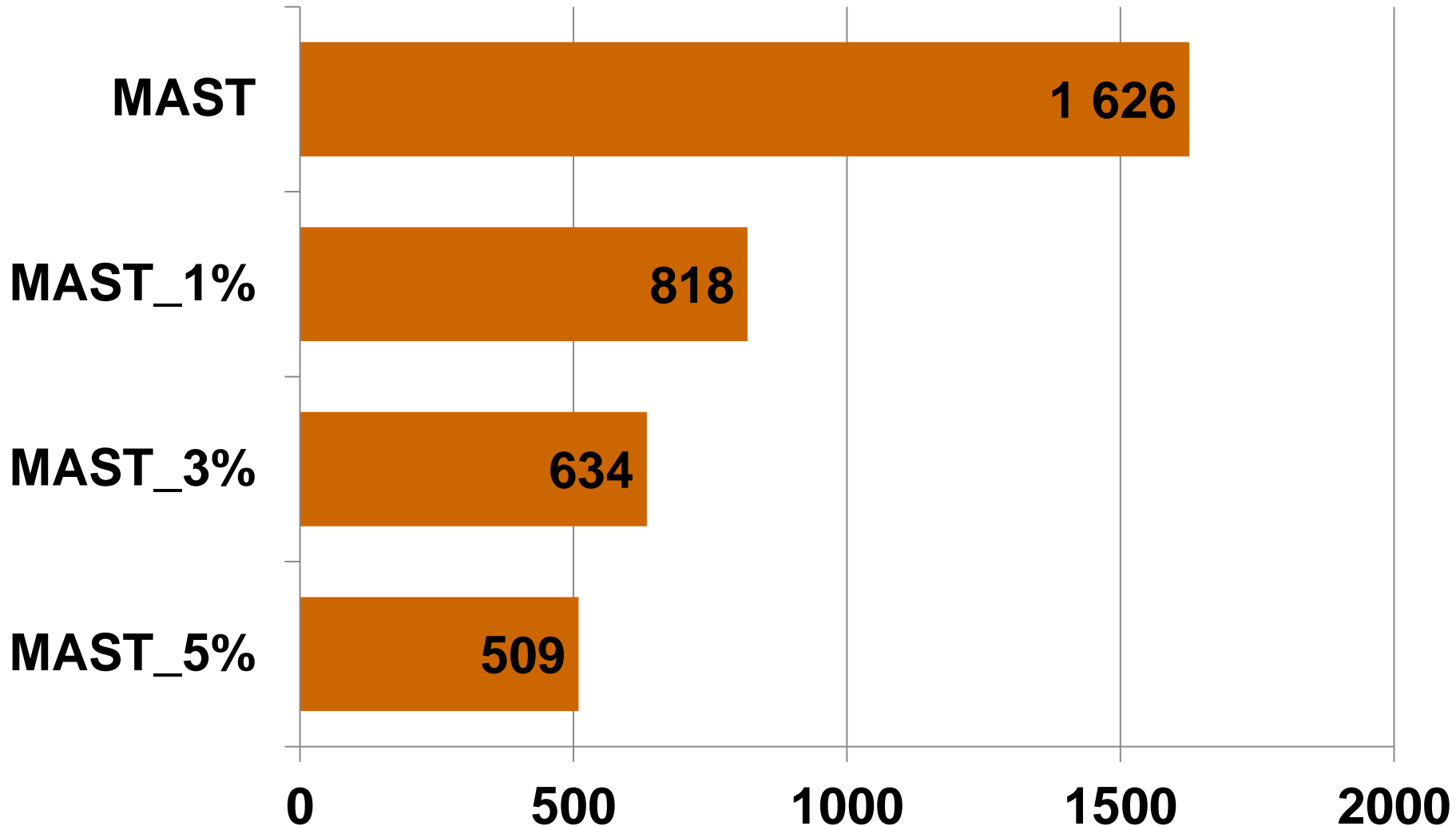
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- At least 1 recorded mastitis case + minimum mastitis frequency of **5%** per herd and year (**MAST\_5%**)
- At least 1 recorded mastitis case + minimum mastitis frequency of **3%** per herd and year (**MAST\_3%**)
- At least 1 recorded mastitis case + minimum mastitis frequency of **1%** per herd and year (**MAST\_1%**)
- At least **1** recorded mastitis **case** (**MAST**)

# Frequency of Mastitis by Editing Criteria



# No. Sires with $\geq 30$ Daughters by Editing Criteria



# Correlations Among EBV for Mastitis Resistance

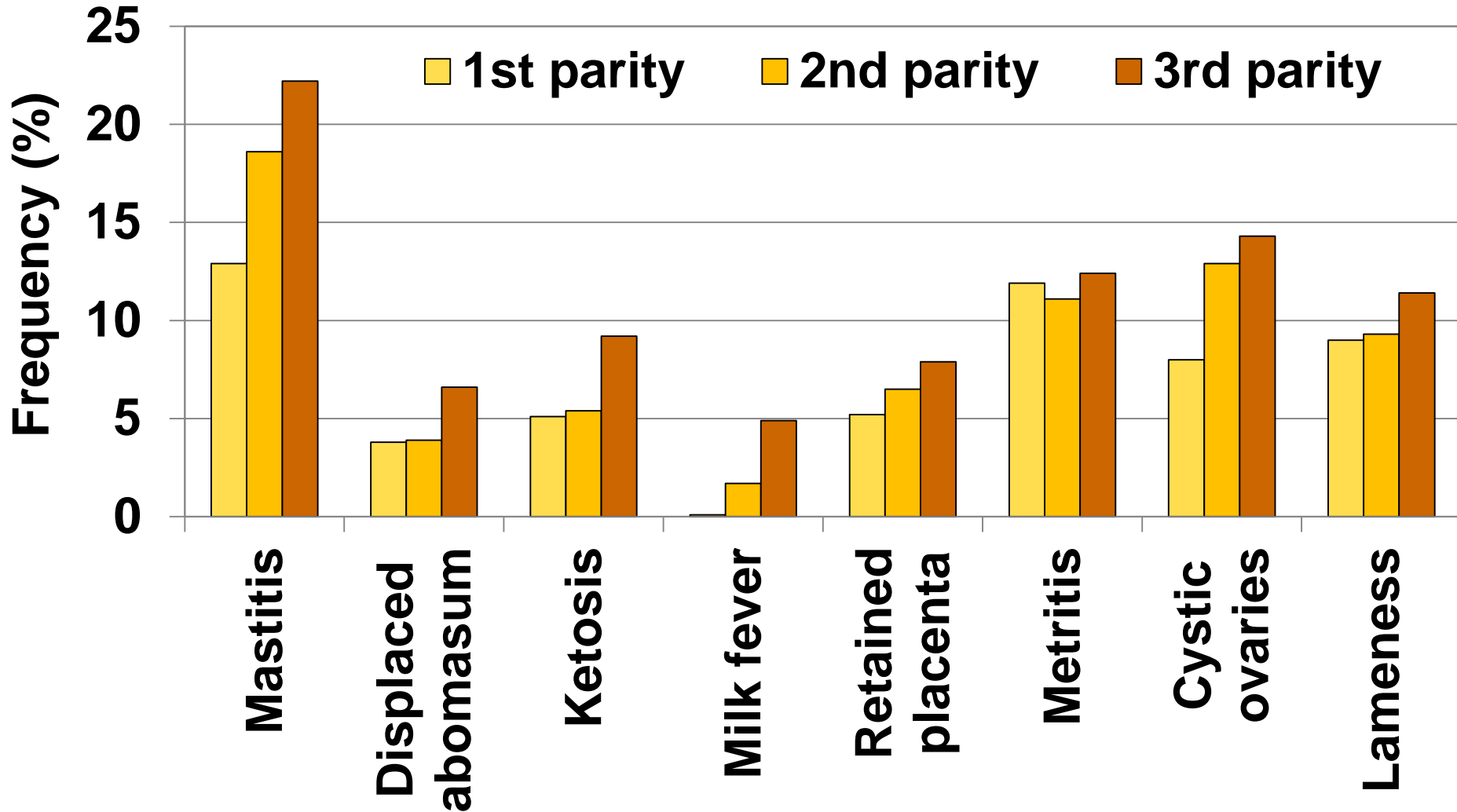
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Data Validation Method	MAST_3%	MAST_1%	MAST
MAST_5%	0.986	0.976	0.957
MAST_3%		0.990	0.972
MAST_1%			0.984

**Based on 509 sires with at least 30 daughters in  
all data sets**



# Disease Frequencies



# Multi-Trait Animal Model

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## ■ First parities vs. later parities

- Mastitis: scored as 0 (no case) or 1 (at least one case) in the period from calving to 150 days after calving
- Average SCS in early lactation (<150 d)
- Standard deviation of SCS in early lactation (<150 d)
- At least one SCC TD record over 500,000 in early lactation (<150 d)

## ■ First parity cows

- Udder depth
- Fore udder attachment
- Body condition score

# Model for Mastitis and SCS Traits

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$$y = H + YS + ASP + hy + a + pe + e$$

where the fixed effects are:

**H:** herd

**YS:** year – season

**ASP:** age – season – parity

and the random effects are:

**hy:** herd – year

**a:** animal additive genetic

**pe:** permanent environmental

**e:** residual

# Model for Type Traits

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$$y = \text{HRC} + \text{AST} + a + pe + e$$

where the fixed effects are:

**HRC:** herd – round – classifier

**AST:** age – stage of lactation – time of classification

and the random effects are:

**a:** animal additive genetic

**pe:** permanent environmental

**e:** residuals

# Estimates of Heritability

## (MAST\_5% Data)

Lactation	Trait	$h^2$
First	Mastitis	0.03
	SCS <sub>150</sub>	0.13
	SCS <sub>SD</sub>	0.02
	SCS <sub>500</sub>	0.04
Later	Mastitis	0.05
	SCS <sub>150</sub>	0.17
	SCS <sub>SD</sub>	0.03
	SCS <sub>500</sub>	0.09

# Data for Genetic Evaluation

Cow Population	Mastitis	Somatic Cell	Type
Recent	Yes	Yes	Yes
	No	Yes	Yes
Historical	No	Yes	Yes

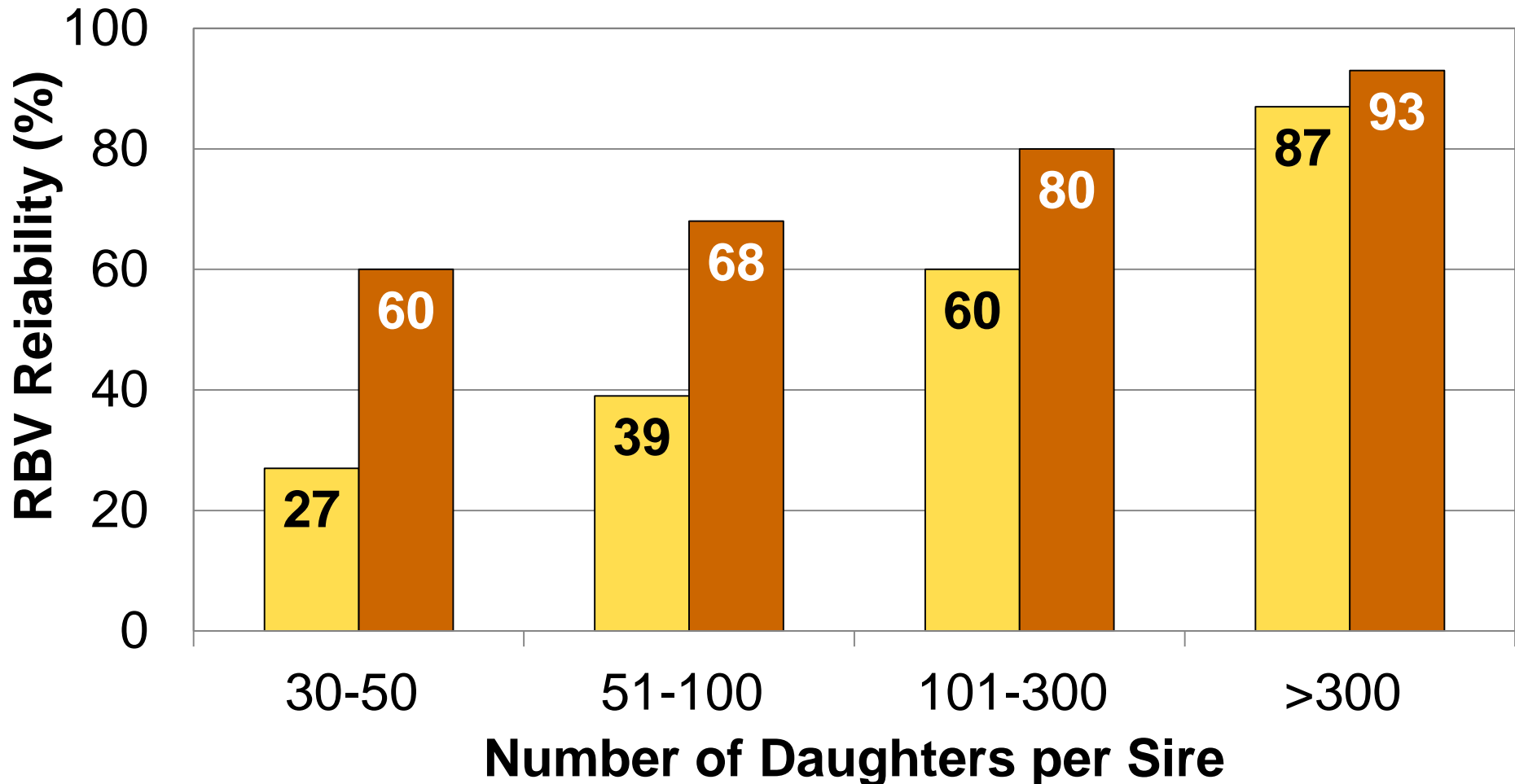


# Records Included

	Trait	Records	Average
<b>First Lactation</b>	<b>MAST, %</b>	174,142	8.92
	<b>SCS150</b>	3,408,360	2.07
	<b>SCSSD</b>	3,408,360	1.00
	<b>TD&gt;500, %</b>	3,408,360	14.94
<b>Later Lactations</b>	<b>MAST, %</b>	314,253	14.91
	<b>SCS150</b>	5,539,425	2.38
	<b>SCSSD</b>	5,539,425	1.13
	<b>TD&gt;500, %</b>	5,539,425	24.71
<b>Type</b>	<b>Udder Depth</b>	2,509,631	10.57
	<b>Fore Udder Attachment</b>	2,509,631	5.09
	<b>Body Condition Score</b>	1,016,945	2.79

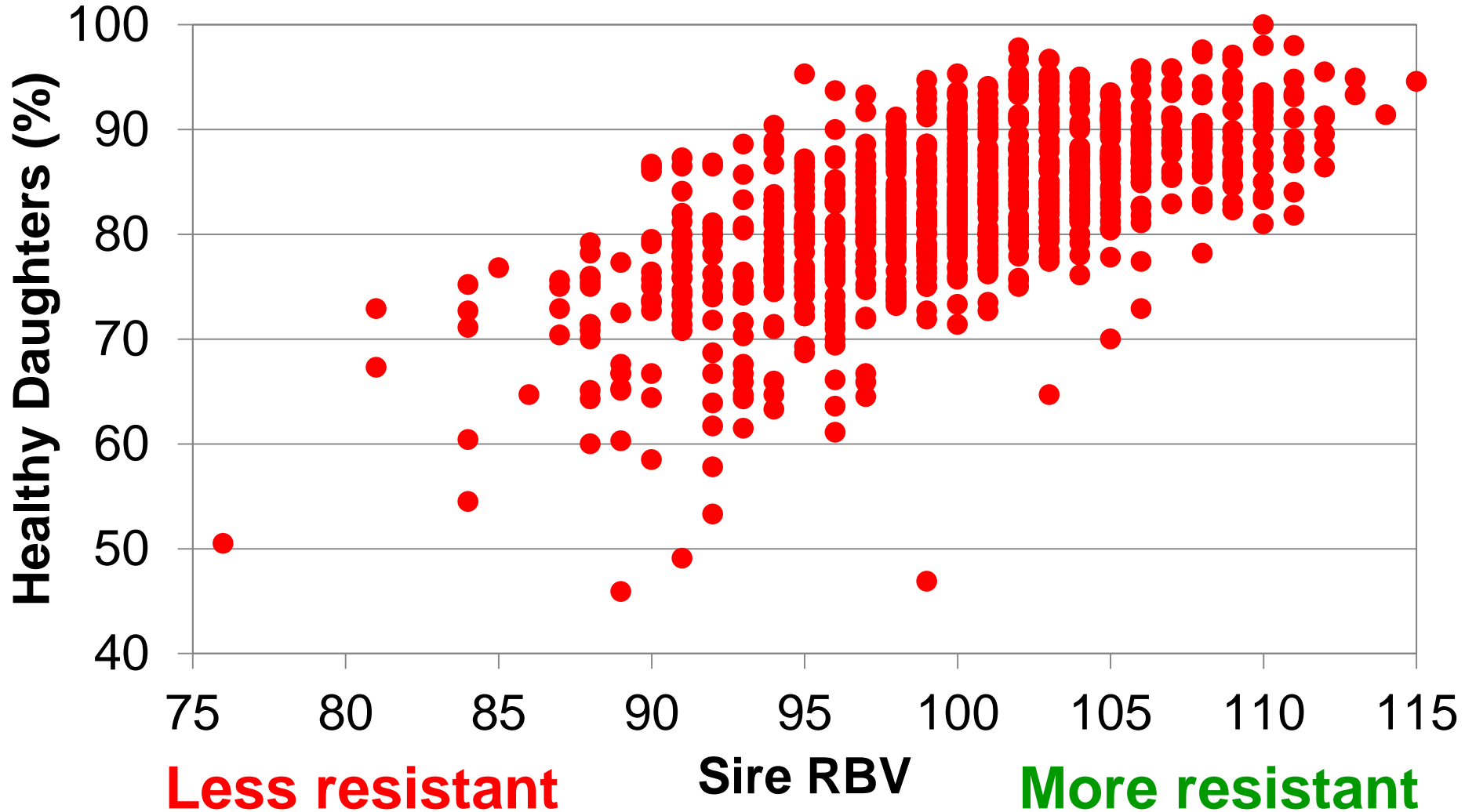
# Reliability of Sire RBV for Mastitis Resistance

■ Univariate Model   ■ Multivariate Model + Historical Data





# % Healthy Daughters by RBV for Mastitis Resistance



## Next Steps

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- **Estimate/include genomic evaluations**
- **Interim releases to bull owners**
- **Official release in December 2013, expressed as Relative Breeding Value**
  - Publish one overall RBV that combines evaluations from first parity and later parities
  - Expect to add to LPI formula in April 2014
- **Submit for Interbull Test Run in January 2014 as 2<sup>nd</sup> Udder Health trait**

Réseau laitier canadien



Canadian Dairy Network

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Thank You!

# 10<sup>th</sup> World Congress on Genetics Applied to Livestock Production

Vancouver, BC, Canada  
August 17-22, 2014

[wcgalp.com](http://wcgalp.com)



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