

GENETIC & GENOMIC EVALUATIONS OF QUANTITATIVE MILKING SPEED PHENOTYPES

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PROPOSED RESEARCH

- OBJ. 1:** Assemble a high-resolution dataset pertinent to MS representing different dairy breeds, equipment manufacturers, parlor types, and milking management strategies
- OBJ. 2:** Characterize MS for herds grouped by equipment manufacturer and parlor type and assess the impact of additional system effects on the phenotype
- OBJ. 3:** Characterize any biological effects that impact MS, especially concerning udder health
- OBJ. 4:** Standardize MS trait definition and estimate heritability to determine its suitability for selection

AVAILABLE DATA



Demographics

~300 herds
>230,000 cows
>300,000 lactations
>40 million observations

31 States
6+ Breeds
11 OEMs

DeLaval	80
GEA	75
Lely	47
Boumatic	46
AfiMilk	45
SCR	13
DairyMaster	10
AIC Waikato	5
AMS Galaxy	3
Jantec	2
Universal	2

PRELIMINARY PTAS

Different Trait Definitions

1. **Average MS (lbs/min) over all available data**
 - a) *Fixed effects: breed, parity, lactation length, OEM*
 - b) *n = 20,000 cows with complete lactations (1 year)*



PRELIMINARY RESULTS

$$h^2 = 0.37$$

Genetic Correlations

SCS	0.39
Milk Yield	0.14
NM\$	0.08

Mean REL	0.67
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PRELIMINARY PTAS

Different Trait Definitions

1. Average MS (lbs/min) over all available data

Trait	<i>PTA</i>				<i>REL</i>			
	Min	Mean	SD	Max	Min	Mean	SD	Max
MSPD	-0.80	0.12	0.30	1.00	50.10	67.05	11.84	97.80
SCS	-0.72	-0.17	0.18	0.67	50.00	92.95	10.50	99.90

***Detailed results for 772 HO bulls**

PRELIMINARY PTAS

Different Trait Definitions

1. **Average MS (lbs/min) over all available data**
 - a) *Fixed effects: breed, parity, lactation length, OEM*
 - b) *n = 20,000 cows with complete lactations (1 year)*
2. Average MS (lbs/min) from test-days only
3. Primiparous cows only

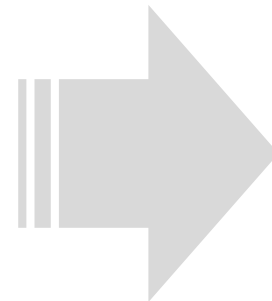


A hypothetical 3X cow would have $3 * 305 = 915$ phenotype records

PRELIMINARY PTAS

Different Trait Definitions

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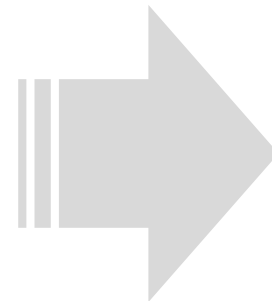
A hypothetical 3X cow would have $3 * 10 = 30$ phenotype records

(97% reduction in data!)

PRELIMINARY PTAS

Different Trait Definitions

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 - b) *n = 20,000 cows with complete lactations (1 year)*
2. **Average MS (lbs/min) from test-days only**
3. Primiparous cows only



PRELIMINARY RESULTS

$$h^2 = 0.28$$

Genetic Correlations

SCS	0.43
Milk Yield	0.16
NM\$	0.06

Mean REL	0.64
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PRELIMINARY PTAS

Genetic Correlations (upper diagonal)
Phenotypic Correlations (lower diagonal)

	Avg_all	Avg_TD	Avg_all_P1	Avg_TD_P1
Avg_all		0.968	0.916	0.976
Avg_TD	0.821		0.944	0.991
Avg_all_P1	1.000	0.819		0.924
Avg_TD_P1	0.820	1.000	0.819	

ENSURING DATA FLOW

Minimum Required Data Novel to MSPD

Observation date (YYYYMMDD)

Milking Session Number (1, 2, ... 6)

Milking Frequency (01X, 02X, 03X, 04X, AMS)

Robotic or Manual Attachment (R or M)

Original Equipment Manufacturer (OEM) Code

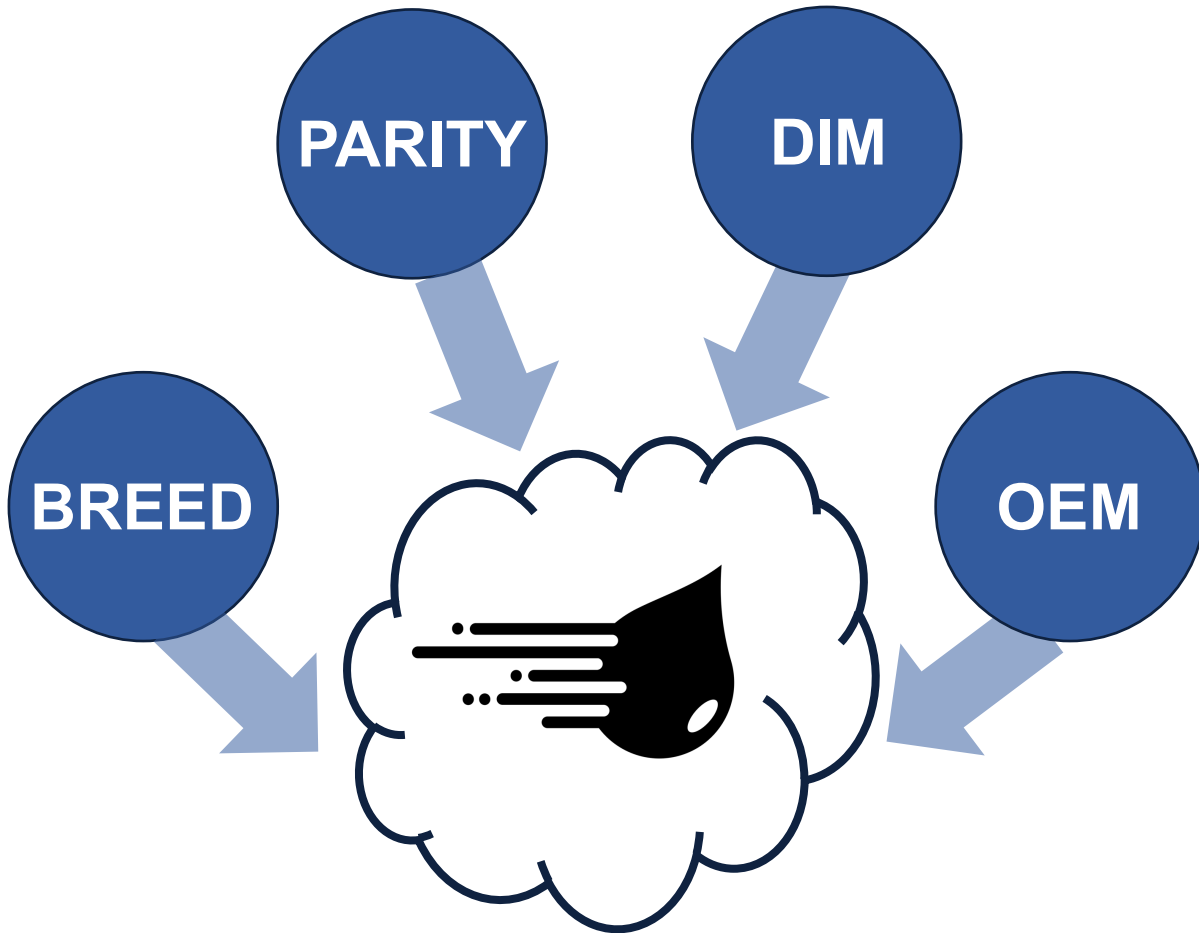
Milk Yield from Individual Milking (lbs * 10)

Milking Duration of Individual Milking (minutes * 10)

Abnormal Flags (Y or N)



**ICAR Device
Reference IDs**



**Many factors influence
quantitative MSPD measurements**

THE BOTTOM LINE

- Genetic and genomic prediction methodology for milking speed has been developed
- We are targeting delivery of a new trait in December 2024
- Routine data flow is a key hurdle
- Next steps include incorporation of partial lactation records and exploring the use of AMS data

THANK YOU

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