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

DRMS DAIRY RECORDS MANAGEMENT SYSTEMS

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

Special thanks to Robert Fourdraine & John Clay

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**

PRELIMINARY PTAS

Different Trait Definitions

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

	PTA				*REL*			
Trait	**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

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 * 10 = 30 phenotype records

(97% reduction in data!)

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

PRELIMINARY RESULTS

$h^2 = 0.28$

Genetic Correlations

SCS	**0.43**
Milk Yield	**0.16**
NM$	**0.06**

Mean REL **0.64**

PRELIMINARY PTAS

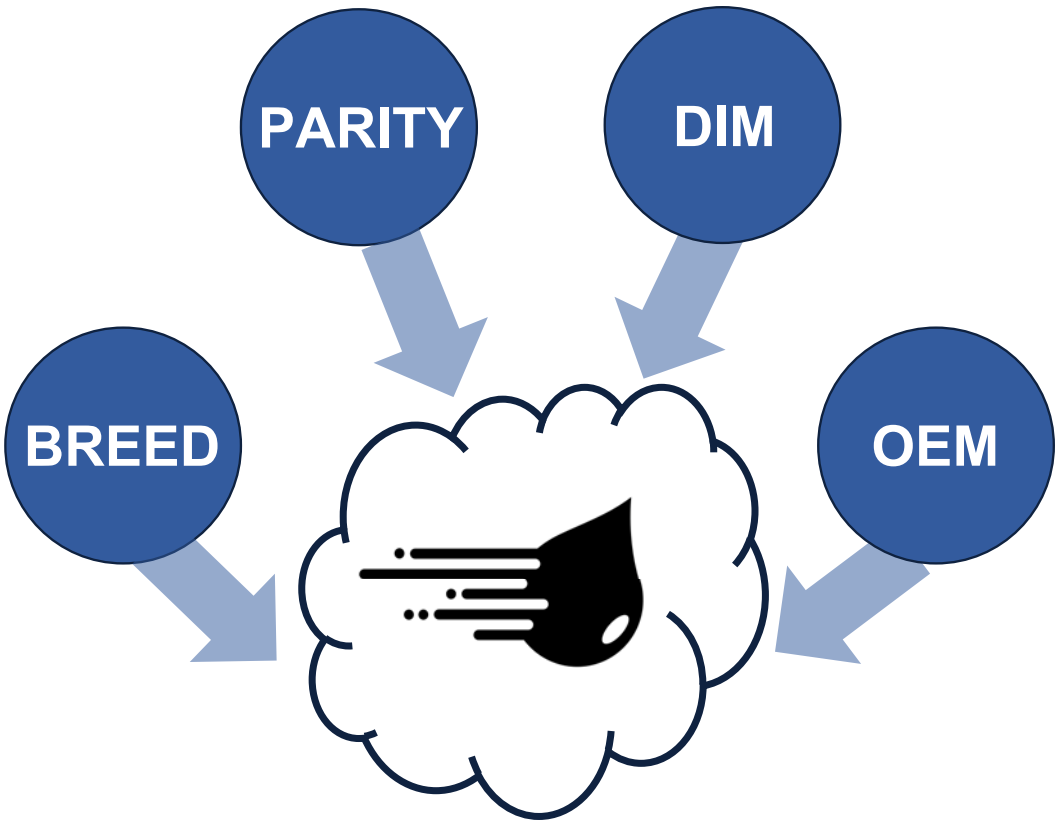
Genetic Correlations (upper diagonal)
Phenotypic Correlations (lower diagonal)

	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 → **ICAR Device Reference IDs**
Milk Yield from Individual Milking (lbs * 10)
Milking Duration of Individual Milking (minutes * 10)
Abnormal Flags (Y or N)



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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