A Million Reasons Why Conformation Matters

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Notes:

PowerPoint Slides on next page

A Million Reasons Why Conformation Matters

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1

Data

- Holstein Association USA official classification scores were used for linear classification data
- The first classification score for a cow assigned in her first lactation was used for analyses
- Official DHIA records were used for production and culling data
- Only cows born after 1/1/90 were included in analyses
- Only test dates after 1/1/00 were included in test day analyses

2

Data

- Lactations starting between 1/1/00 and 8/27/21 were included in analyses
- For lifetime production analyses only first 6 lactations were included
- Only cows calving for first time before 1/1/16 were included in lifetime analyses
- Only animals with complete 305-day lactations were included in 305-day milk analyses
- All DHIA data was edited to remove biologically unlikely test day results

3

Data

- Only 1st lactation records with age at first calving between 18 to 35 months were included
- Lactation records with milking frequencies >3 were removed
- After edits, 937,603 cows were available for analyses
- 5,496 unique herds were represented in the data set
- Cows were only included in the final analysis if there were at least 5 herdmates in their herd, year, and season of calving

4

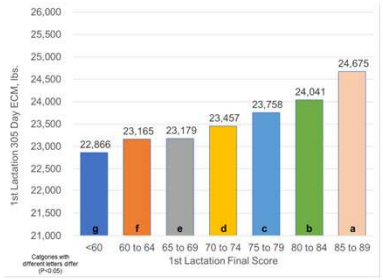
Analyses

- Cows were categorized into quartiles for each trait with approximately the same number of cows categorized into each category
- The CORR Procedure of SAS 9.4 ® was used to calculate correlations between type and production traits
- The FREQ Procedure of SAS 9.4 ® was used for the percent of cows surviving to 6 years old analyses
- The MIXED Procedure of SAS 9.4 ® was used for modeling 1st lactation ECM, SCS, lifetime DIM, and lifetime ECM using a compound symmetry covariance structure. Subject was herd-year-season. Milking frequency was a covariate in the 1st lactation ECM model
- LSMeans are presented with statistical significance presented at p<0.05

5

>1800-pound range

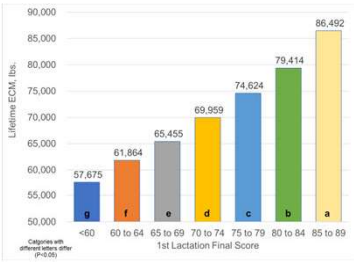
@$20/cwt milk ~$360 milk revenue



6

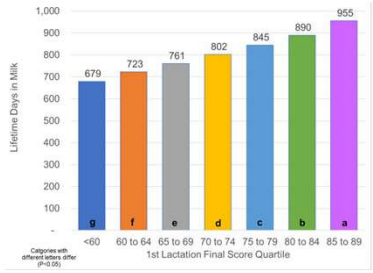
>28,800-pound range

@$20/cwt milk ~$5,700 milk revenue

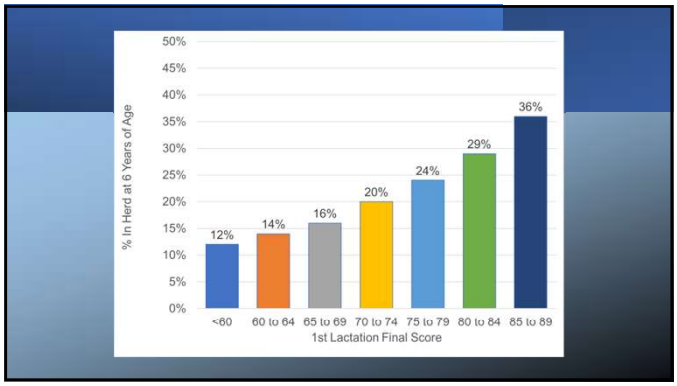


7

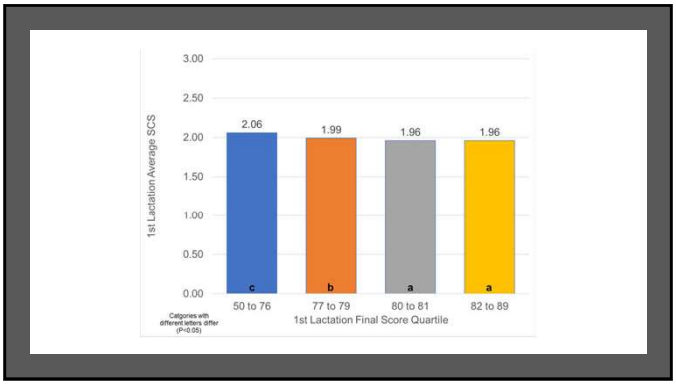
1 full 305-day lactation range



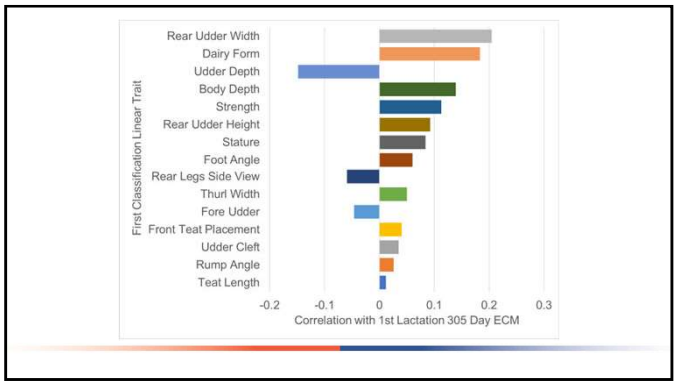
8


% In Herd at 6 Years of Age
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
12%
14%
16%
20%
24%
29%
36%
<60
60 to 64
65 to 69
70 to 74
75 to 79
80 to 84
85 to 89
1st Lactation Final Score

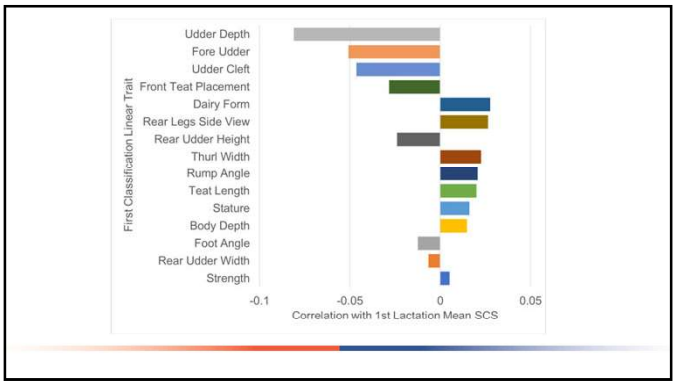
9


1st Lactation Average SCS
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.06
1.99
1.96
1.96
c
b
a
a
50 to 76
77 to 79
80 to 81
82 to 89
1st Lactation Final Score Quartile

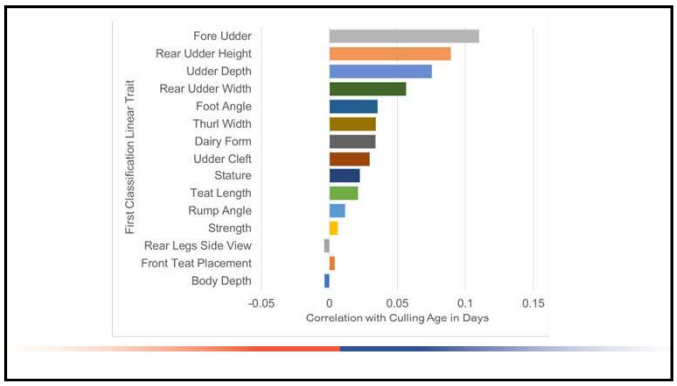
10


First Classification Linear Trait
Rear Udder Width
Dairy Form
Udder Depth
Body Depth
Strength
Rear Udder Height
Stature
Foot Angle
Rear Legs Side View
Thurl Width
Fore Udder
Front Teat Placement
Udder Cleft
Rump Angle
Teat Length
-0.2
-0.1
0
0.1
0.2
0.3
Correlation with 1st Lactation 305 Day ECM

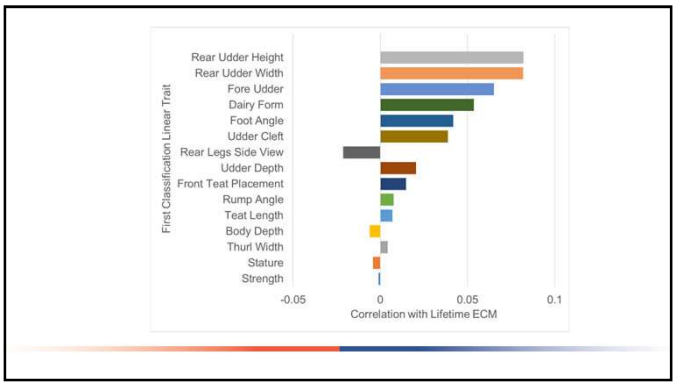
11


First Classification Linear Trait
Udder Depth
Fore Udder
Udder Cleft
Front Teat Placement
Dairy Form
Rear Legs Side View
Rear Udder Height
Thurl Width
Rump Angle
Teat Length
Stature
Body Depth
Foot Angle
Rear Udder Width
Strength
-0.1
-0.05
0
0.05
Correlation with 1st Lactation Mean SCS

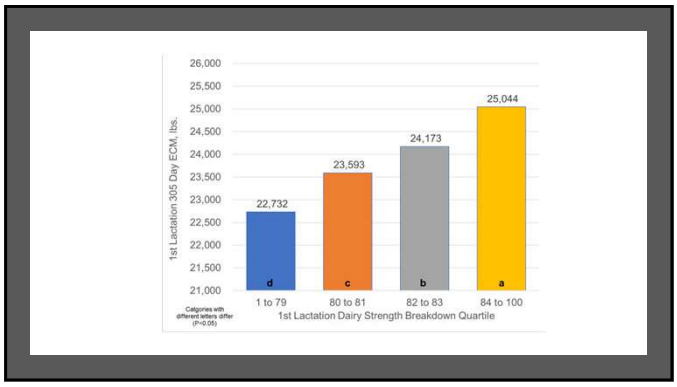
12


Fore Udder
Rear Udder Height
Udder Depth
Rear Udder Width
Foot Angle
Thurl Width
Dairy Form
Udder Cleft
Stature
Teat Length
Rump Angle
Strength
Rear Legs Side View
Front Teat Placement
Body Depth
First Classification Linear Trait
-0.05
0
0.05
0.1
0.15
Correlation with Culling Age in Days

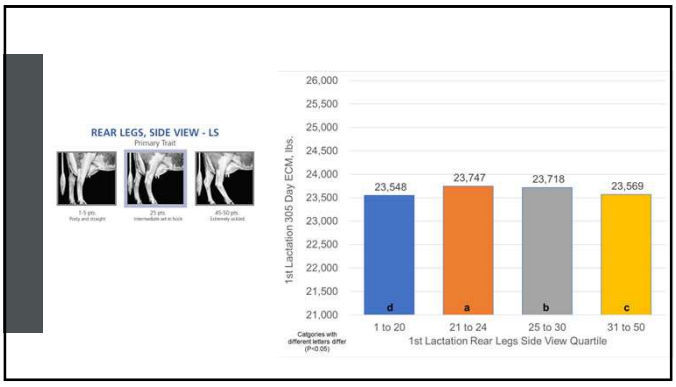
13


Rear Udder Height
Rear Udder Width
Fore Udder
Dairy Form
Foot Angle
Udder Cleft
Rear Legs Side View
Udder Depth
Front Teat Placement
Rump Angle
Teat Length
Body Depth
Thurl Width
Stature
Strength
First Classification Linear Trait
-0.05
0
0.05
0.1
Correlation with Lifetime ECM

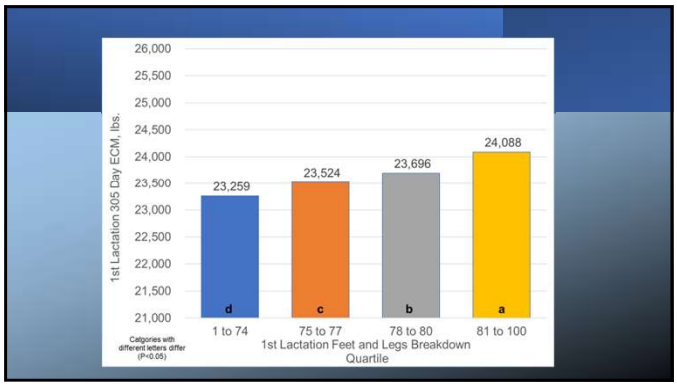
14


26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
1st Lactation 305 Day ECM, lbs.
22,732
23,593
24,173
25,044
d
c
b
a
1 to 79
80 to 81
82 to 83
84 to 100
1st Lactation Dairy Strength Breakdown Quartile

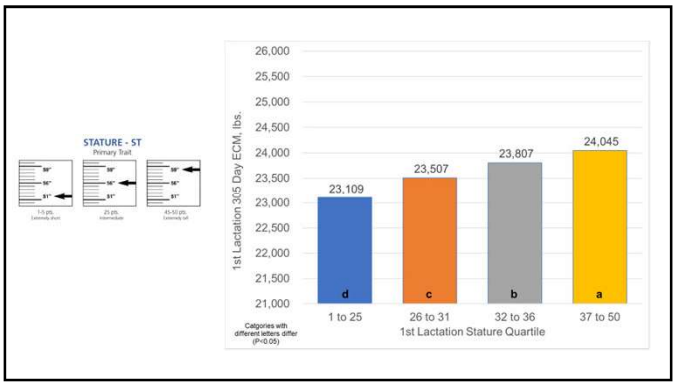
15


REAR LEGS, SIDE VIEW - LS
Primary Trait
26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
1st Lactation 305 Day ECM, lbs.
23,548
23,747
23,718
23,569
d
a
b
c
1 to 20
21 to 24
25 to 30
31 to 50
1st Lactation Rear Legs Side View Quartile

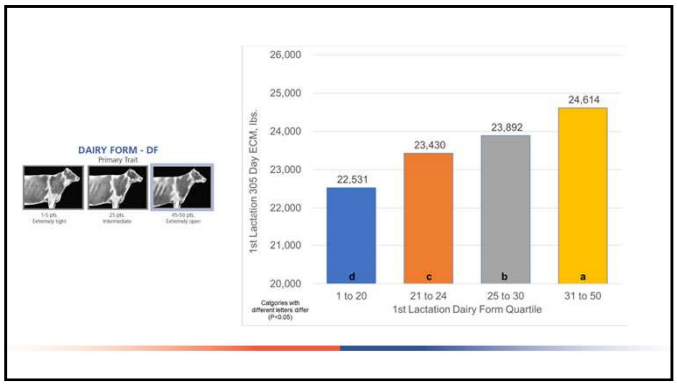
16


1st Lactation 305 Day ECM, lbs.
26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
23,259
23,524
23,696
24,088
d
c
b
a
1 to 74
75 to 77
78 to 80
81 to 100
1st Lactation Feet and Legs Breakdown Quartile
Catgories with different letters differ (P<0.05)

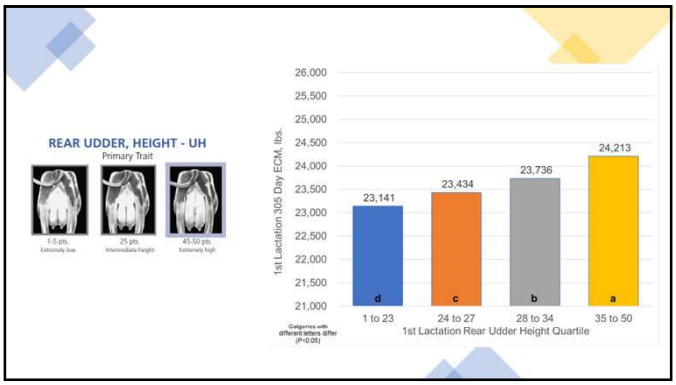
17


STATURE - ST
Primary Trait
1st Lactation 305 Day ECM, lbs.
26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
23,109
23,507
23,807
24,045
d
c
b
a
1 to 25
26 to 31
32 to 36
37 to 50
1st Lactation Stature Quartile
Catgories with different letters differ (P<0.05)

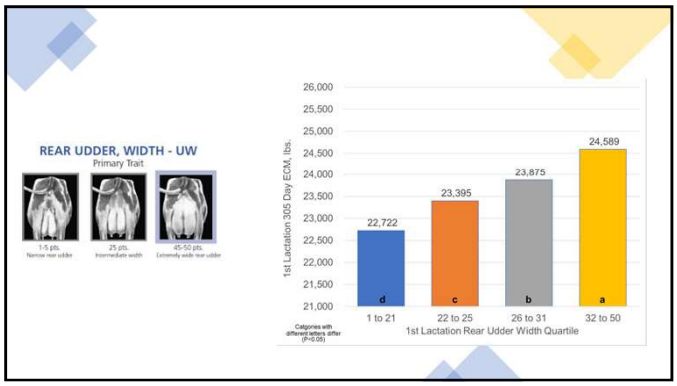
18


DAIRY FORM - DF
Primary Trait
1st Lactation 305 Day ECM, lbs.
26,000
25,000
24,000
23,000
22,000
21,000
20,000
22,531
23,430
23,892
24,614
d
c
b
a
1 to 20
21 to 24
25 to 30
31 to 50
1st Lactation Dairy Form Quartile
Catgories with different letters differ (P<0.05)

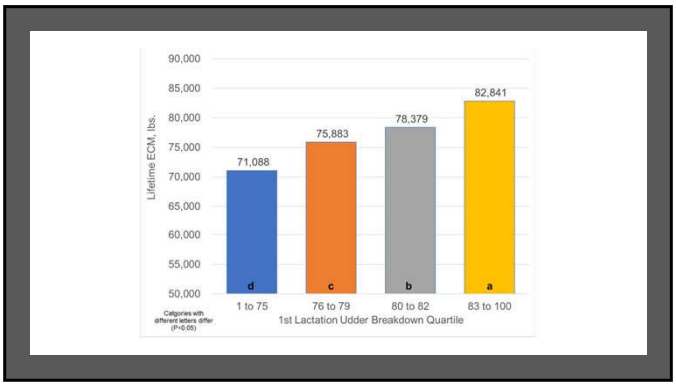
19


REAR UDDER, HEIGHT - UH
Primary Trait
1st Lactation 305 Day ECM, lbs.
26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
23,141
23,434
23,736
24,213
d
c
b
a
1 to 23
24 to 27
28 to 34
35 to 50
1st Lactation Rear Udder Height Quartile
Catgories with different letters differ (P<0.05)

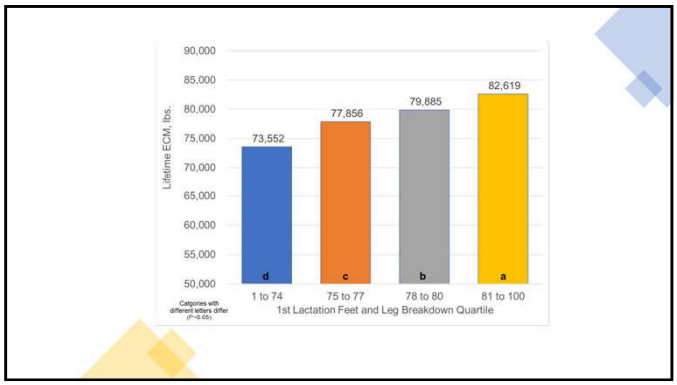
20


REAR UDDER, WIDTH - UW
Primary Trait
1-5 pts.
Narrow rear udder
25 pts.
Intermediate width
45-50 pts.
Extremely wide rear udder
1st Lactation 305 Day ECM, lbs.
26,000
25,500
25,000
24,500
24,000
23,500
23,000
22,500
22,000
21,500
21,000
22,722
23,395
23,875
24,589
d
c
b
a
1 to 21
22 to 25
26 to 31
32 to 50
Catgories with different letters differ (P<0.05)
1st Lactation Rear Udder Width Quartile

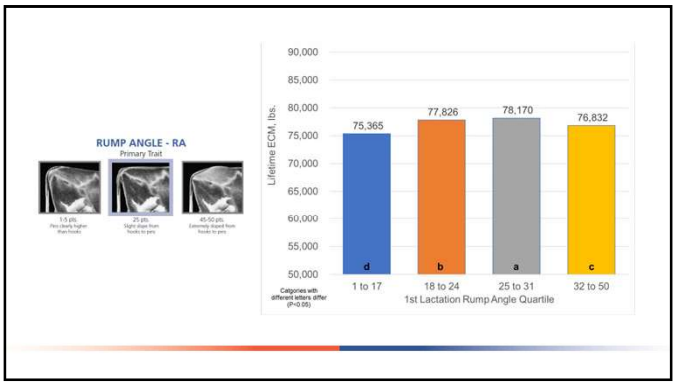
21


Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
71,088
75,883
78,379
82,841
d
c
b
a
1 to 75
76 to 79
80 to 82
83 to 100
Catgories with different letters differ (P<0.05)
1st Lactation Udder Breakdown Quartile

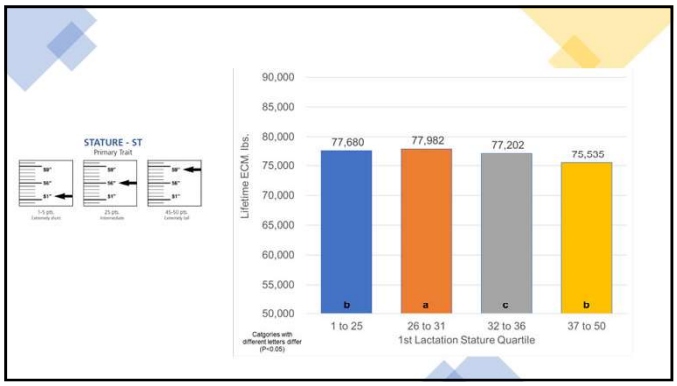
22


Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
73,552
77,856
79,885
82,619
d
c
b
a
1 to 74
75 to 77
78 to 80
81 to 100
Catgories with different letters differ (P<0.05)
1st Lactation Feet and Leg Breakdown Quartile

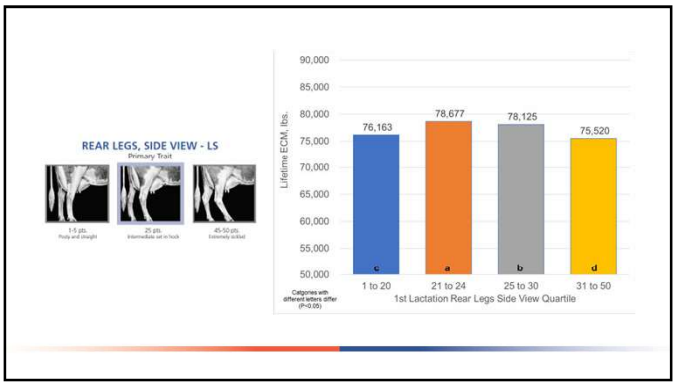
23


RUMP ANGLE - RA
Primary Trait
1-5 pts.
Very clearly higher than hocks
25 pts.
Slight slope from hocks to pins
45-50 pts.
Extremely sloped from hocks to pins
Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
75,365
77,826
78,170
76,832
d
b
a
c
1 to 17
18 to 24
25 to 31
32 to 50
Catgories with different letters differ (P<0.05)
1st Lactation Rump Angle Quartile

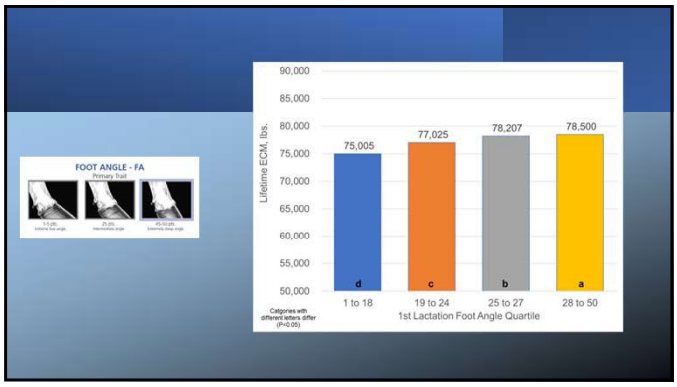
24


STATURE - ST
Primary Trait
Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
77,680
77,982
77,202
75,535
b
a
c
b
1 to 25
26 to 31
32 to 36
37 to 50
1st Lactation Stature Quartile

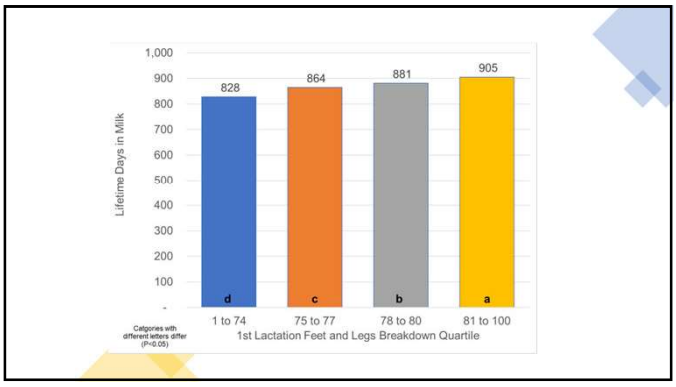
25


REAR LEGS, SIDE VIEW - LS
Primary Trait
Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
76,163
78,677
78,125
75,520
c
a
b
d
1 to 20
21 to 24
25 to 30
31 to 50
1st Lactation Rear Legs Side View Quartile

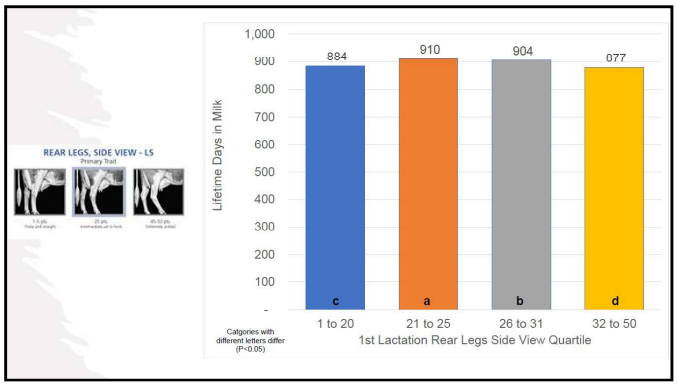
26


FOOT ANGLE - FA
Primary Trait
Lifetime ECM, lbs.
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
50,000
75,005
77,025
78,207
78,500
d
c
b
a
1 to 18
19 to 24
25 to 27
28 to 50
1st Lactation Foot Angle Quartile

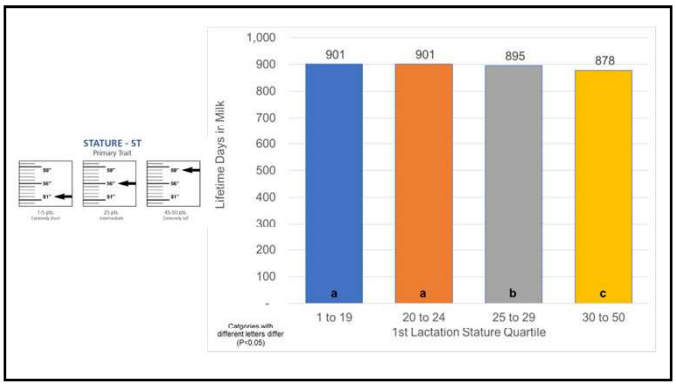
27


Lifetime Days in Milk
1,000
900
800
700
600
500
400
300
200
100
-
828
864
881
905
d
c
b
a
1 to 74
75 to 77
78 to 80
81 to 100
1st Lactation Feet and Legs Breakdown Quartile

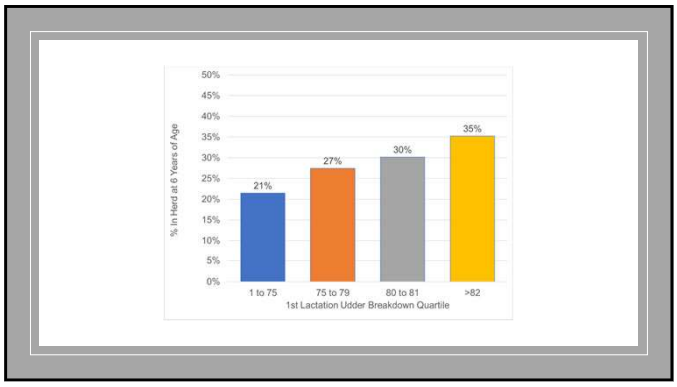
28


REAR LEGS, SIDE VIEW - LS
Primary Trait
Lifetime Days in Milk
1,000
900
800
700
600
500
400
300
200
100
-
884
910
904
077
c
a
b
d
1 to 20
21 to 25
26 to 31
32 to 50
Catgories with different letters differ (P<0.05)
1st Lactation Rear Legs Side View Quartile

29


STATURE - ST
Primary Trait
Lifetime Days in Milk
1,000
900
800
700
600
500
400
300
200
100
-
901
901
895
878
a
a
b
c
1 to 19
20 to 24
25 to 29
30 to 50
Catgories with different letters differ (P<0.05)
1st Lactation Stature Quartile

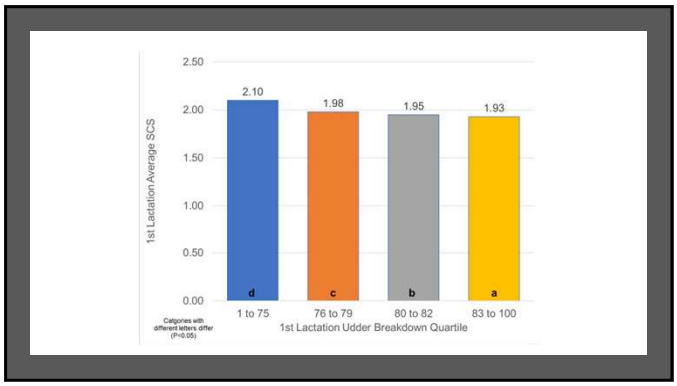
30


% In Herd at 6 Years of Age
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
21%
27%
30%
35%
1 to 75
75 to 79
80 to 81
>82
1st Lactation Udder Breakdown Quartile

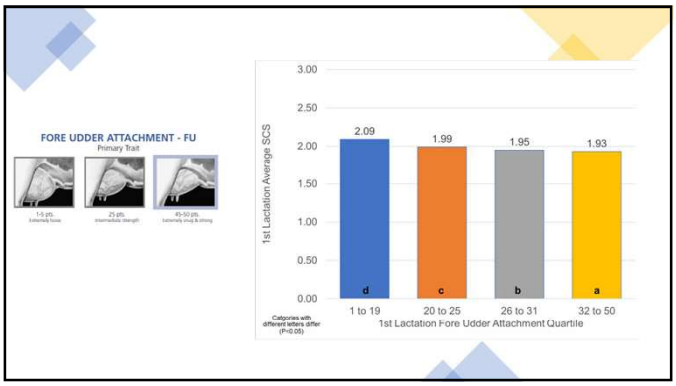
31


% In Herd at 6 Years of Age
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
23%
27%
30%
34%
1 to 74
75 to 77
78 to 80
>80
1st Lactation Feet and Leg Breakdown Quartile

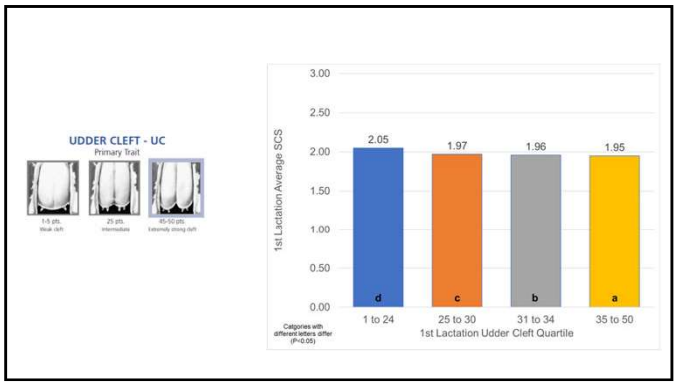
32


1st Lactation Average SCS
2.50
2.00
1.50
1.00
0.50
0.00
2.10
1.98
1.95
1.93
d
c
b
a
1 to 75
76 to 79
80 to 82
83 to 100
1st Lactation Udder Breakdown Quartile

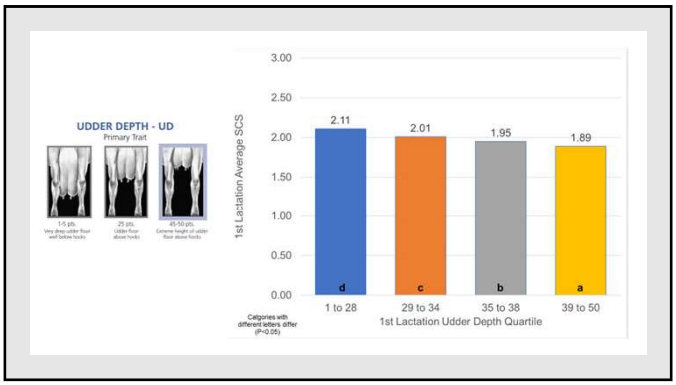
33


FORE UDDER ATTACHMENT - FU
Primary Trait
1st Lactation Average SCS
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.09
1.99
1.95
1.93
d
c
b
a
1 to 19
20 to 25
26 to 31
32 to 50
1st Lactation Fore Udder Attachment Quartile

34


UDDER CLEFT - UC
Primary Trait
1st Lactation Average SCS
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.05
1.97
1.96
1.95
d
c
b
a
1 to 24
25 to 30
31 to 34
35 to 50
1st Lactation Udder Cleft Quartile

35


UDDER DEPTH - UD
Primary Trait
1st Lactation Average SCS
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.11
2.01
1.95
1.89
d
c
b
a
1 to 28
29 to 34
35 to 38
39 to 50
1st Lactation Udder Depth Quartile

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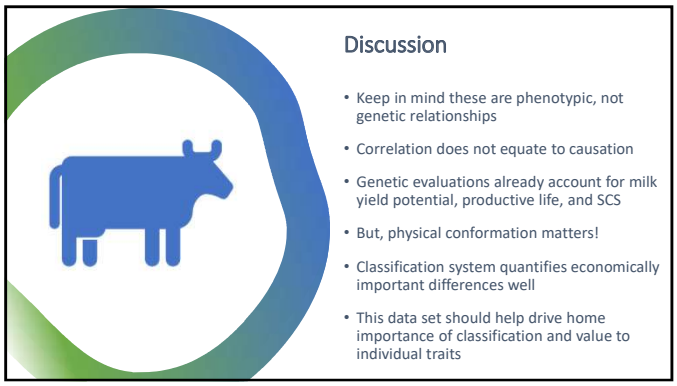
Discussion
• Keep in mind these are phenotypic, not genetic relationships
• Correlation does not equate to causation
• Genetic evaluations already account for milk yield potential, productive life, and SCS
• But, physical conformation matters!
• Classification system quantifies economically important differences well
• This data set should help drive home importance of classification and value to individual traits

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