CDCB Health Traits

CDCB Genomic Nominators & Labs Workshop

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BACKGROUND

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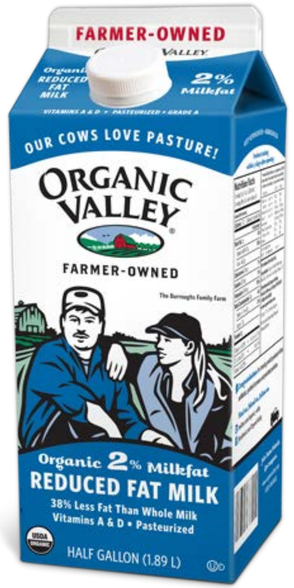
Why select for health traits?



- Consumer pressures
- Increase producer profitability → decreasing management costs
  - Healthy cows are more profitable than cows with health conditions requiring additional farm labor, veterinary treatment, and medicine

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Economics of health events

- Direct costs: cost of treatment
  - Used in index calculations
- Indirect costs: declines in fertility, reduced production, decreased longevity

Health event	Average direct cost per case*
Hypocalcemia	$38
Displaced abomasum	$178
Ketosis	$28
Mastitis	$72
Metritis	$105
Retained placenta	$64

* Liang et al., 2017; Donnelly et al.

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Research

- Research has been on-going for ~10 years
- Based on this, six health traits were selected initially to develop evaluations
  - Based on data consistency, incidence rate, heritability, economic impact, etc.

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Traits

- Milk fever / hypocalcemia: metabolic problem occurring when normal blood calcium levels cannot be maintained
- Displaced abomasum: enlargement of abomasum with fluid/gas causing migration to either left or right side of the abdominal cavity
- Ketosis: metabolic disease caused by increased ketone levels in the blood

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Traits (cont.)

- Mastitis: inflammation of the mammary gland
- Metritis: infection of the endometrium
- Retained placenta: failure to expel fetal membranes within 24 hours following parturition

Photo source: GENEX Cooperative, Inc.

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Data editing

- Standardization steps – DRPCs
- Holstein cows, acceptable ID, parities 1 to 5
- Event must occur within specified time frame after calving (e.g., retained placenta must be reported within 10 days of calving)
- Minimum and maximum incidence constraints in place for herd-year reporting

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Evaluations

- Linear univariate BLUP repeatability animal model
- SNP effects estimated using a model similar to BayesA
  - Using 60,671 markers currently included in U.S. routine genomic evaluations

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Statistics

	Heritability	Young Bulls Genomic REL	Proven Bulls Genomic REL
Hypocalcemia	0.6%	40.0	44.2
Displaced abomasum	1.1%	41.8	47.1
Ketosis	1.2%	41.2	46.2
Mastitis	3.1%	49.4	56.3
Metritis	1.4%	42.2	48.1
Retained placenta	1.0%	41.6	46.7

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INDICES & ECONOMIC CONSIDERATIONS

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Direct costs

- Merit indexes already account for correlated declines in production, fertility, longevity, etc.
- These do not need to be included when calculating a cost for health events to include in an index

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Additional economic considerations

- Abnormal TD yields: <60% or >150% of predicted test day yields
- Sick TD: coded by farmer; may not be used in computation of lactation records
- Milk, fat, and protein lactation yields were compared with and without these adjustments (Wiggans et al., 2003) for a random sample of animals

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Additional economic considerations

- For most traits, approximately $4 was added to the direct health costs per case to account for adjusted yields
- Larger difference for DA: $19 added to direct cost
  - Likely due to the acute effects of DA (e.g., surgical)

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Index updates 2018

- Updated Net Merit index (NM$) will be implemented in August 2018 tri-annual evaluation
- Will then include genetic evaluations for the 6 new health traits
  - Added in the form of a health trait sub-index (HTH$)
    - Not published separately!

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A closer look at HTH$

Health Event	% of health traits	% of NM$
Hypocalcemia	3%	0.07%
Displaced abomasum	39%	0.90%
Ketosis	5%	0.12%
Mastitis	23%	0.53%
Metritis	20%	0.46%
Retained placenta	11%	0.25%
HTH$	**100%**	**2.3%**

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NM$ 2018 revision

Trait	NM$	CM$	FM$	GM$
Milk	-0.7	-7.9	18.5	-0.5
Fat	26.9	22.9	27.1	23.3
Protein	16.9	21.0	0.0	14.7
PL	12.2	10.3	12.3	7.2
SCS	-4.0	-4.4	-2.3	-3.5
Body weight composite	-5.3	-4.5	-5.3	-5.8
Udder composite	7.4	6.3	7.5	7.4
Feet/legs composite	2.7	2.3	2.8	2.8
DPR	6.7	5.7	6.8	17.9
CA$	4.8	4.1	4.8	4.5
HCR	1.4	1.2	1.4	2.5
CCR	1.6	1.4	1.7	4.4
LIV	7.4	6.3	7.4	5.0
HTH$	2.3	1.9	2.3	2.1

Relative Values (%)

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Index comparison

Trait	NM$ 2017	NM$ 2018
Milk	-0.7	-0.7
Fat	23.7	26.9
Protein	18.3	16.9
PL	13.4	12.2
SCS	-6.5	-4.0
Body weight composite	-5.9	-5.3
Udder composite	7.4	7.4
Feet/legs composite	2.7	2.7
DPR	6.7	6.7
CA$	4.8	4.8
HCR	1.4	1.4
CCR	1.6	1.6
LIV	7.4	7.4
HTH$	0.0	2.3

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For recent bulls, 2018 and 2017 NM$ index correlation = 0.994

FUTURE DEVELOPMENTS

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Future possibilities

- Incorporation of new traits
  - Format 6 currently allows for over 20 events to be submitted, e.g., lameness
  - Calf/heifer health (in addition to calf termination)
  - Feed efficiency work is on-going

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More information

- Visit www.uscdcb.com
- General FAQs
- Trait-specific reference sheets
- Scientific articles & presentations

CDCB Health Traits

CDCB launched six new genetic evaluations for disease resistance in April 2018.

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