



Genetic research on colostrum quality traits and passive transfer of immunity in Greek dairy herds

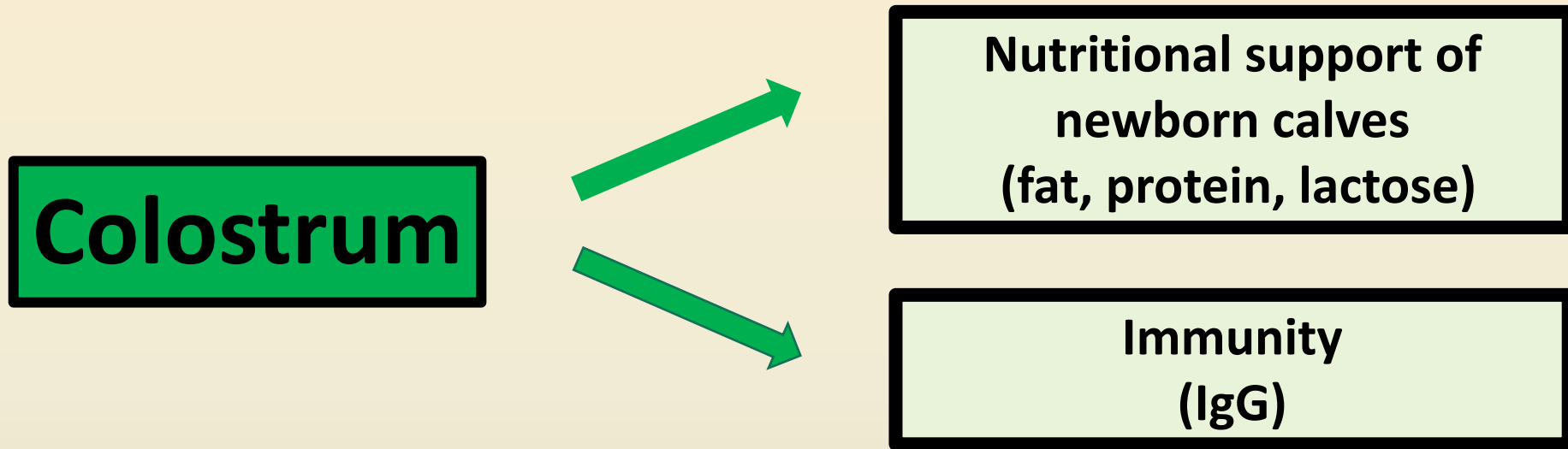
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Introduction



Introduction



The screenshot shows the top navigation bar of the Journal of Dairy Science website. The main header features the journal title "Journal of Dairy Science" and the American Dairy Science Association logo. Below the header, there are navigation links for "Collections", "Editor's Choice", "Meeting Abstracts", and "Highly Cited Awards". A search bar is present with a dropdown menu set to "All Content". The article title "Genetic parameters of colostrum traits in Holstein dairy COWS" is prominently displayed, along with the authors' names: A. Soufleri¹, G. Banos^{1,2}, N. Panousis³, D. Fletouris⁴, G. Arsenos¹, and G.E. Valergakis^{1,*}. The article is marked as "Article in Press".


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Genetic parameters of colostrum traits in Holstein dairy COWS

[A. Soufleri](#)¹, [G. Banos](#)^{1,2}, [N. Panousis](#)³, [D. Fletouris](#)⁴, [G. Arsenos](#)¹, [G.E. Valergakis](#)^{1,*}  

 PlumX Metrics

DOI: <https://doi.org/10.3168/jds.2019-17054>

Significant heritability estimates on colostrum traits

Introduction



animals



[Animals \(Basel\)](#). 2023 Feb; 13(3): 366.

Published online 2023 Jan 20. doi: [10.3390/ani13030366](https://doi.org/10.3390/ani13030366)

PMCID: PMC9913346

PMID: [36766255](https://pubmed.ncbi.nlm.nih.gov/36766255/)

Genetic Parameters of Serum Total Protein Concentration Measured with a Brix Refractometer in Holstein Newborn Calves and Fresh Cows

Significant heritability estimates on passive transfer of immunity

Introduction

➤ Trait:

- ✓ Fat content
- ✓ Protein content
- ✓ Lactose content
- ✓ Total solids content (BRIX value)
- ✓ Calf serum total protein concentration

➤ Heritability (h^2):

- 0.21
- 0.19
- 0.15
- 0.27
- 0.21

Colostrum

*Passive transfer
of immunity*

$P < 0.05$

Introduction

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Introduction

Statistically significant genetic correlations

	Colostrum protein
Total solids (Brix value)	0.97
Calf serum total protein (Brix value)	0.99

Introduction

Statistically significant genetic correlations

	Colostrum protein
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Traits can be improved with selective breeding based on EBVs

Aim of the study

To derive and examine **EBVs** of Holstein sires
for **colostrum** and **calf traits**



Materials and methods

Cows

Calves



Materials and methods

Cow records:

- Parity number
- Calendar season
- Cow age at calving
- Colostrum yield
- Time interval between calving and colostrum collection
- Body condition score (BCS)
- Dry period duration
- Milk yield in previous lactation (305 days)

Materials and methods

Calves' records:

- Calendar season of birth
- Calf gender and body weight
- Quality and quantity of colostrum fed
- Time interval between birth and colostrum administration
- Calving ease
- Time interval between birth and blood sampling

Materials and methods

Statistical analysis:

Sire EBVs for colostrum traits (total solids, fat, protein, lactose content) and calf trait (serum total protein concentration)

- **Univariate mixed model (ASREML software)**
- **Records: Fixed effects**
- **Cow/calf: random additive genetic effect**
- **Significance level $P \leq 0.05$**

Materials and methods

Statistical analysis:

EBVs and their reliabilities of production, conformation and functional traits of the sires included in the study were obtained online from *DairyBulls.com*.

Traits available online (EBVs):

- Milk yield
- Fat yield
- Protein yield
- Fat content
- Protein content
- Productive Life
- SCC
- Daughter pregnancy rate
- Livability
- Udder composite
- Feet & Legs composite

Pearson correlations with colostrum and calf traits

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Pearson correlations with colostrum and calf traits

Estimation of approximate genetic correlations and SE according to Onyiro et al. 2008 equations.

Results

Colostrum

Variable	Estimated breeding value (EBV)					Average EBV reliability
	Average	Min	Max	10 th percentile (7 bulls)	90 th percentile (7 bulls)	
Total solids content (Brix value)	+0.17	-4.05	+3.47	-1.50	+1.70	0.42
Fat content	-0.40	-2.60	+1.29	-1.56	+0.67	0.29
Protein content	+0.19	-2.76	+2.04	-0.92	+1.40	0.34
Lactose content	-0.03	-0.34	+0.38	+0.12	-0.21	0.24

Results

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Total solids content (Brix value)	+0.17	-4.05	+3.47	Difference of EBV: 3.20		0.42
Fat content	-0.40	-2.60	+1.29	Difference of EBV: 2.23		0.29
Protein content	+0.19	-2.76	+2.04	Difference of EBV: 2.32		0.34
Lactose content	-0.03	-0.34	+0.38	+0.12	-0.21	0.24

Results

Colostrum

3 bulls had positive EBVs

5 bulls had negative EBVs

For all
four traits
studied

Results

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Results

Colostrum

15% of bulls had positive EBVs

21% of bulls had negative EBVs

**For all
three
traits
studied**

Results

Colostrum

15% of bulls had positive EBVs

Variable	EBV
	Average
Total solids content (Brix value)	+1.05
Fat content	+0.44
Protein content	+0.61

Results

Colostrum

15% of bulls had positive EBVs

Variable	EBV
	Average
Total solids content (Brix value)	+1.05
Fat content	+0.44
Protein content	+0.61

Number of bulls	EBVs		
	Milk yield	Milk fat yield	Milk protein yield
10	+10 kg (-1102 to +1270)		
6	Negative	Negative	Negative
2	Positive	Positive	Positive
2	Positive	Negative	Positive

Results

Colostrum

21% of bulls had negative EBVs

Variable	EBV
	Average
Total solids content (Brix value)	-1.10
Fat content	-0.66
Protein content	-0.67

Results

Colostrum

21% of bulls had negative EBVs

Number of bulls	EBVs		
	Milk yield	Milk fat yield	Milk protein yield
14	+336kg (-622 to +880)		
4	Positive	Negative	Negative
5	Positive	Positive	Positive
1	Negative	Positive	Negative
4	Positive	Negative	Positive

Variable	EBV
	Average
Total solids content (Brix value)	-1.10
Fat content	-0.66
Protein content	-0.67

Results

Calves

Variable	Estimated breeding value (EBV)					Average EBV reliability
	Average	Min	Max	10 th percentile	90 th percentile	
Total protein content (Brix value)	-0.07	-0.93	+0.82	-0.75	+0.48	0.33

Results

Calves

Variable	Estimated breeding value (EBV)					Average EBV reliability
	Average	Min	Max	10 th percentile	90 th percentile	
Total protein content (Brix value)	-0.07	-0.93	+0.82	Difference of EBV: 1.23		0.33

Results

Calves

43% of bulls had positive EBVs

57% of bulls had negative EBVs

Results

Calves

43% of bulls had positive EBVs

Variable	EBV
	Average
Total protein content (Brix value)	+0.35

Results

Calves

43% of bulls had positive EBVs

Variable	EBV
	Average
Total protein content (Brix value)	+0.35

Number of bulls	EBVs		
	Milk yield	Milk fat yield	Milk protein yield
26	+218 kg (-962 to +1394)		
5	Negative	Negative	Negative
13	Positive	Positive	Positive
3	Negative	Positive	Negative
5	Positive	Negative	Positive

Results

Calves

57% of bulls had negative EBVs

Variable	EBV
	Average
Total protein content (Brix value)	-0.38

Results

Calves

57% of bulls had negative EBVs

Variable	EBV
	Average
Total protein content (Brix value)	-0.38

Number of bulls	EBVs		
	Milk yield	Milk fat yield	Milk protein yield
35	+506 kg (-1612 to +2858)		
5	Negative	Negative	Negative
23	Positive	Positive	Positive
7	Positive	Negative	Positive

Results

Approximate genetic correlations

Trait	Colostrum total solids	Colostrum fat content	Colostrum protein content	Colostrum lactose content	Calf serum total protein content
Milk yield	-0.56±0.10*	NS	-0.49±0.11*	NS	NS
Milk fat yield	NS	-0.41±0.11*	NS	NS	NS
Milk fat content	NS	NS	NS	NS	NS
Milk protein yield	-0.50±0.11*	NS	-0.49±0.11*	+0.37±0.12*	NS
Milk protein content	NS	NS	NS	NS	NS
Productive life	NS	NS	NS	+0.33±0.12*	NS
SCC	NS	NS	NS	NS	NS
Daughter pregnancy rate	NS	NS	NS	NS	+0.33±0.12*
Livability	-0.41±0.11*	NS	-0.45±0.11*	+0.39±0.11*	NS
Udder composite	NS	-0.39±0.11*	NS	NS	NS
Feet & Legs composite	NS	NS	NS	NS	NS

Results

Approximate genetic correlations

Trait	Colostrum total solids	Colostrum fat content	Colostrum protein content	Colostrum lactose content	Calf serum total protein content
Milk yield	$-0.56 \pm 0.10^*$	NS	$-0.49 \pm 0.11^*$	NS	NS
Milk fat yield	NS	$-0.41 \pm 0.11^*$	NS	NS	NS
Milk fat content	NS	NS	NS	NS	NS
Milk protein yield	$-0.50 \pm 0.11^*$	NS	$-0.49 \pm 0.11^*$	$+0.37 \pm 0.12^*$	NS
Milk protein content	NS	NS	NS	NS	NS
Productive life	NS	NS	NS	$+0.33 \pm 0.12^*$	NS
SCC	NS	NS	NS	NS	NS
Daughter pregnancy rate	NS	NS	NS	NS	$+0.33 \pm 0.12^*$
Livability	$-0.41 \pm 0.11^*$	NS	$-0.45 \pm 0.11^*$	$+0.39 \pm 0.11^*$	NS
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Milk protein yield	-0.50±0.11*	NS	-0.49±0.11*	+0.37±0.12*	NS
Milk protein content	NS	NS	NS	NS	NS
Productive life	NS	NS	NS	+0.33±0.12*	NS
SCC	NS	NS	NS	NS	NS
Daughter pregnancy rate	NS	NS	NS	NS	+0.33±0.12*
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Udder composite	NS	-0.39±0.11*	NS	NS	NS
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Conclusions

- **Variability in sire EBVs → tremendous potential for improvement by genetic selection**
- **Small number of bulls, not necessarily representative but random**

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- **Variability in sire EBVs → tremendous potential for improvement by genetic selection**
- **Small number of bulls, not necessarily representative but random**
- **Differences in EBVs between best and worst were considerable**

Conclusions

- **Correlations of colostrum and calf traits with other conformation, functional and production traits should be considered**
- **Synthetic colostrum quality index could be developed**

... and then included ...

Overall performance index ➡ **future breeding programs**



**Many thanks
for your attention!**