



Genetic parameters of colostrum qualitative traits in *Holstein* dairy cows in Greece

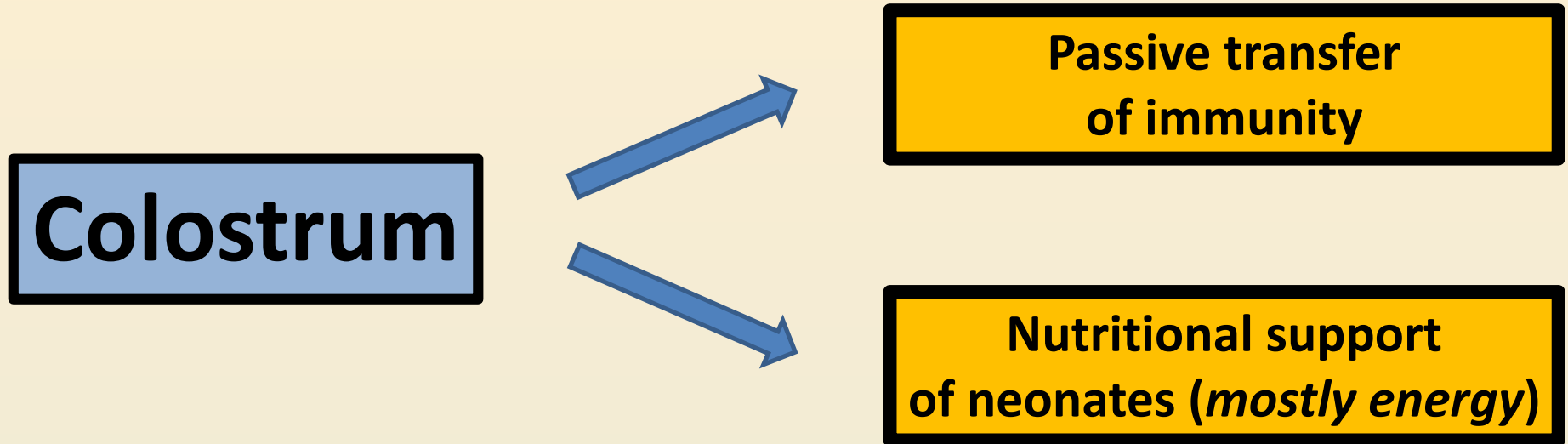
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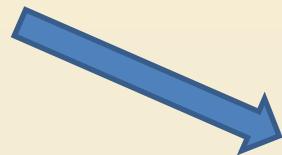
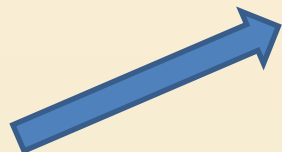
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Introduction



Introduction

Colostrum

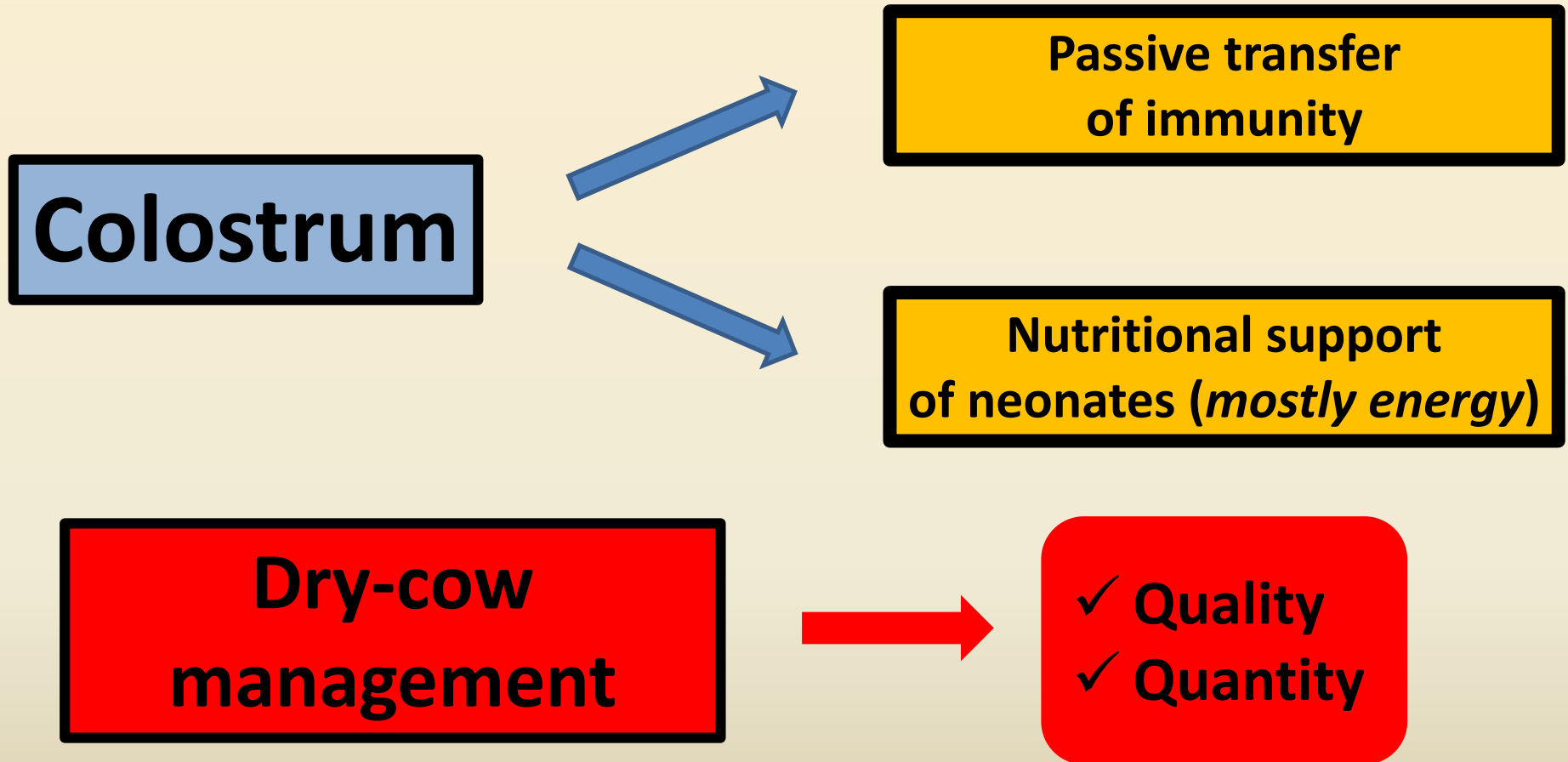


**Passive transfer
of immunity**

**Nutritional support
of neonates (*mostly energy*)**

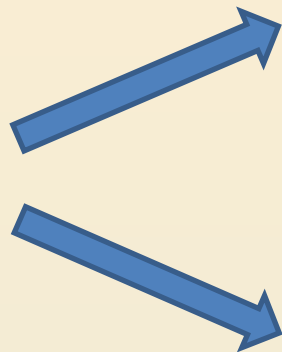
**Dry-cow
management**

Introduction



Introduction

Colostrum



**Passive transfer
of immunity**

**Nutritional support
of neonates (*mostly energy*)**

Genetic merit?

- ✓ **Quality**
- ✓ **Quantity**

Aim of the study

**Estimation of genetic parameters
of colostrum fat, protein, lactose, total solids
and energy content**



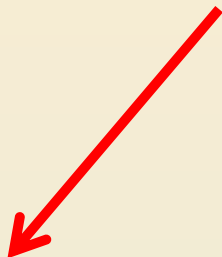
Materials and methods

- **February 2015 to September 2016**
- **10 commercial dairy cow farms in Northern Greece**
- **1,074 *Holstein* cows**
- **Detailed pedigree available**

Materials and methods

Cows

- Milking 232 ± 195 min after calving & **colostrum collection sample**



Colostrum total solids
determination
using a digital
BRIX refractometer



Materials and methods

Cows

- Milking 232 ± 195 min after calving & **colostrum collection sample**

Indirect but reliable
assessment
of immunoglobulin
concentration

Colostrum total solids
determination
using a digital
BRIX refractometer



Materials and methods

Cows

- Milking 232 ± 195 min after calving & **colostrum collection sample**



Colostrum total solids
determination
using a digital
BRX refractometer

Determination of colostrum
fat, protein & lactose content
with Milkoscan

Materials and methods

Calculation:

➤ Colostrum energy content

$$\text{Energy (Mcal/kg)} = (0.057 * \text{CP}\% + 0.092 * \text{fat}\% + 0.0395 * \text{lactose}\%) * 0.97 * 0.96 * 0.86$$

NRC (2001). 7th rev.ed. Natl.Acad.Sci., Washington, DC, 225-226

Materials and methods

Records:

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

Materials and methods

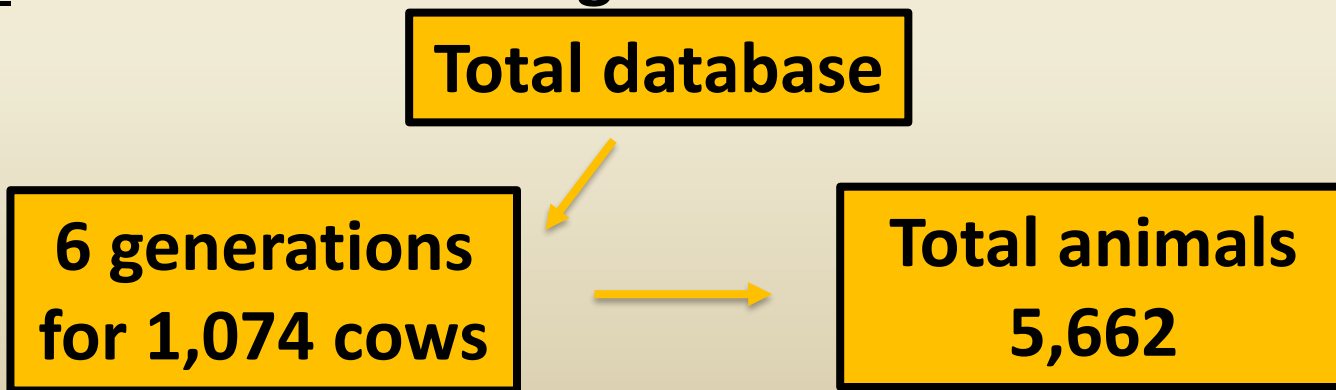
Statistical analysis:

- **Univariate mixed models (ASREML software)**
- **Records: Fixed effects**
- **Cow: random additive genetic effect**

Materials and methods

Statistical analysis:

- Univariate mixed models (ASREML software)
- Records: Fixed effects
- Cow: random additive genetic effect



Materials and methods

Statistical analysis:

- Estimation of (co) variance components
- Calculation of heritability (h^2)
- Estimation of genetic and phenotypic correlations with bivariate analysis
- Significance level $P \leq 0.05$

Results

	Mean (SD)	CV (%)
Fat (%)	6.4 (3.33)	52
Protein (%)	17.8 (3.97)	22
Lactose (%)	2.2 (0.73)	34
Total solids (BRIX measurements)	25.8 (4.68)	18
Energy content (Mcal/l)	1.4 (0.29)	22

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Results

➤ Variability among farms:

✓ Fat 22 %

✓ Lactose 12 %

➤ Variability within farms ranged:

✓ Fat 44 % – 63 %

✓ Lactose 28 % – 82 %

Results

Variables	Factors						
	Herd	Parity number	Calving season	Cow age at calving	Colostrum quantity	Time interval between calving & colostrum collection	Dry period duration
Colostrum fat content	✓	✓	✓	✓		✓	✓
Colostrum protein content	✓	✓	✓	✓	✓	✓	
Colostrum lactose content	✓	✓	✓	✓	✓	✓	✓
Colostrum total solids content	✓	✓ Lowest in 2 nd	✓ Lowest in summer	✓	✓ Higher when low quantity	✓ Higher when short time interval	
Colostrum energy content	✓	✓	✓	✓		✓	✓

Results

➤ Trait:

✓ Fat

✓ Protein

✓ Lactose

✓ Total solids (BRIX measurements)

✓ Colostrum energy content

➤ Heritability (h^2):

• 0.21

• 0.19

• 0.15

• 0.27

• 0.22

$P < 0.05$

Results

➤ Trait:

✓ Fat

✓ Protein

✓ Lactose

✓ Total solids (BRIX measurements)

✓ Colostrum energy content

➤ Heritability (h^2):

• 0.21


• 0.19

• 0.15

• 0.27

• 0.22

Results



“Trait”	Heritability (h²)
Milk yield	0.30 – 0.35
BCS	0.25 – 0.30
Fertility	< 0.10
Disease resistance	0.05

✓ **Total solids (BRIX measurements)** • **0.27**

✓ **Colostrum energy content** • **0.22**

Results

Statistically significant phenotypic correlations

	Fat	Protein	Lactose	Colostrum energy content	Colostrum quantity
Total solids (BRIX measurements)	+0.21	+0.92	-0.67	+0.70	-0.10
Fat			-0.14	+0.82	
Protein			-0.68	+0.58	-0.13
Lactose				-0.46	+0.16

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There were no statistically significant genetic correlations

Conclusions

- Colostrum quality traits are heritable
- Genetic selection could be feasible
- Absence of genetic correlations



Simplify genetic selection programs



**Thank you
for your attention!!!**

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