



Does the selection on β -casein affect the traits important for dairy production of Slovenian Brown Swiss cattle?

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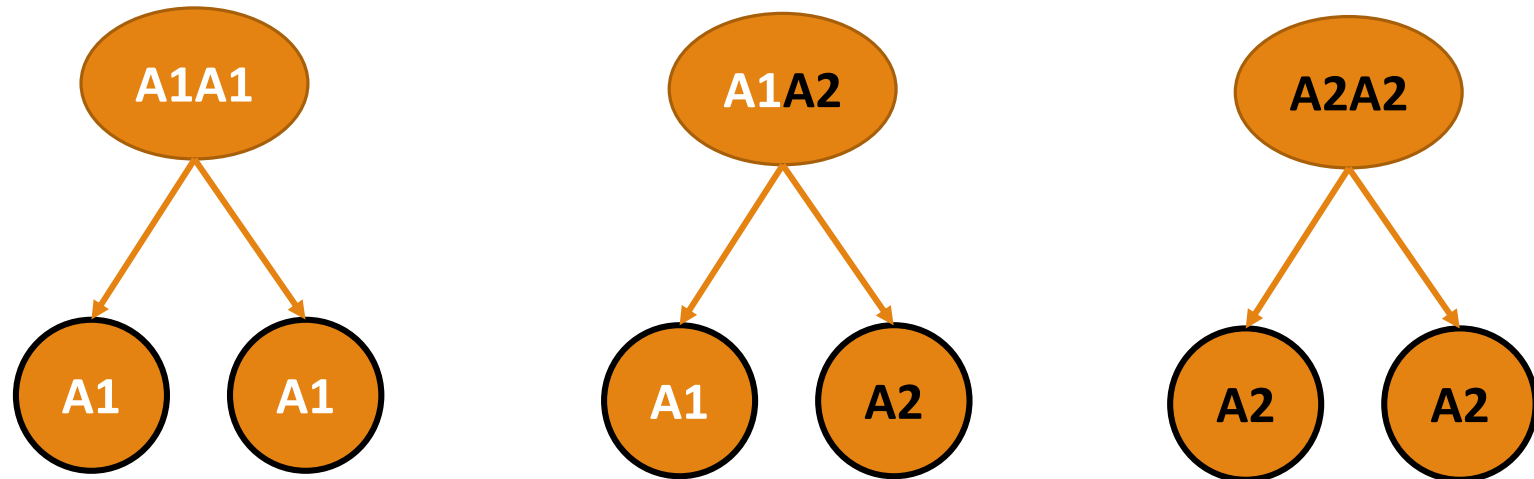
PTUJ, 22.9.2016

Background

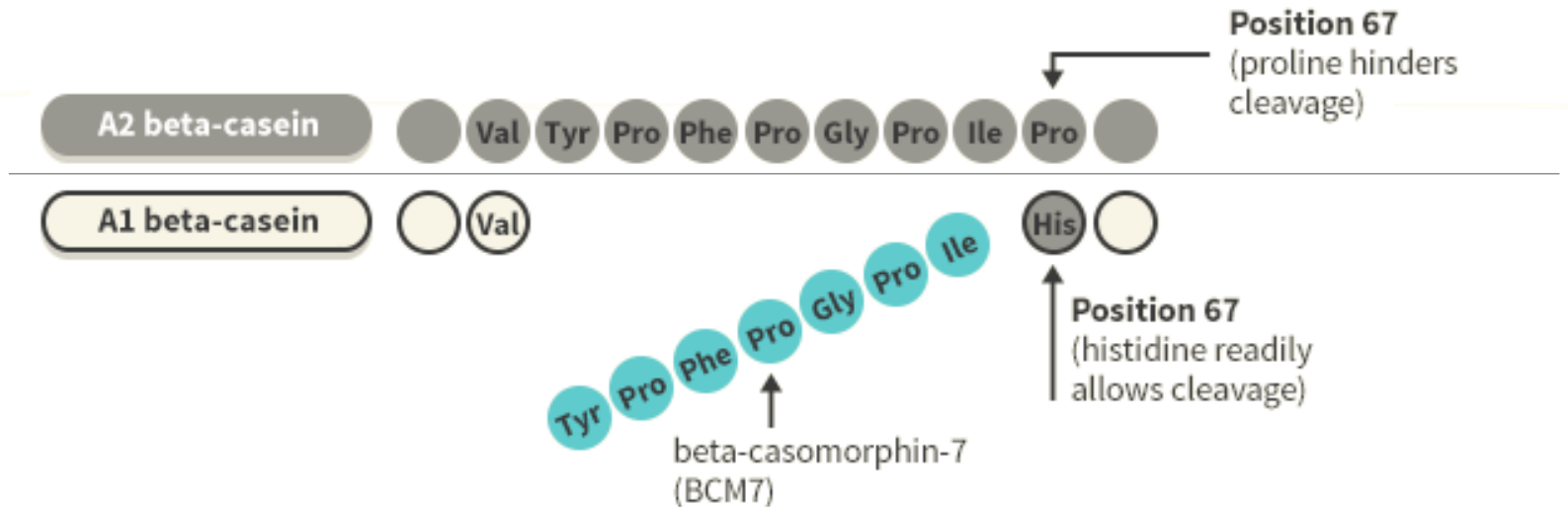
- Beta casein → human digestion
- Scepticism - especial in Science people
- Speculation:
 - elimination of A1 allele will caused lower production.

Milk protein β – casein (β C)

- Bovine milk genetic variants:
 - A2 (wild type)
 - A1 (mutated)



Bovine β C & human health



BCM-7 (immune response):

- ↓ gastrointestinal physiology and digestive discomfort symptoms
- ↑ type 1 diabetes mellitus
- ↑ ischaemic heart disease
- ↑ neurological disorders (schizophrenia, autism, postpartum psychosis) and even sudden infant death syndrome

BC & dairy industry

Welcome to



The
a2 Milk
Company™

2013/14
Annual Report

Aksel All. Denti Akse! E93

127 FIGLIE

BETA CASEINA A2A2



FOEMINA
ROBOT MILK

Accoppiamenti

PRODUZIONE

GPT	+ 2911
Latte	+ 797
Grasso	+ 0,07 kg + 38
Proteina	+ 0,01 kg + 27

VALUTAZIONE LINEARE


Statura	2,59
Forza - Vigore	1,49
Profondità	1,31
Angolosità	2,74

● FORTE MIGLIORAMENTO PRODUTTIVO CON L'ENTRATA DELLE 52 SECONDIPARE!
● MAMMELLE OTTIME +3.29

DONATELLO-ET (GM)

GA TV TL TY TD

PGA- A2A2



KINGS-RANSOM DONATELL LEWIE (VG-85)
Kings-Ransom Farm LLC, Schuylerville, NY

Birth	0.70	1	0.70	1
By Birth	1.01	0.5	1.01	0.5
Length	0.40	0	0.40	0
By Length	0.10	0	0.10	0
By Width	0.33	0	0.33	0
By Angle	1.31	0	1.31	0
By Side View	0.02	0	0.02	0
By Rear View	0.01	0	0.01	0
By Angle	4.04	1	4.04	1
By Udder Attachment	1.04	0	1.04	0
By Udder Attachment	0.00	0	0.00	0
By Udder Height	1.89	1	1.89	1

Aim

Different β C genotypes





Traits important for dairy production

Slovenian
Brown
Swiss



Material and methods

- 190 Slovenian Brown Swiss cattle (83  and 107 )
- DGVs for economically important traits
- Known genotype for **BC**

interGenomics

$$DGV_{ij} = \mu + G_i + e_{ij}$$

Results: Allele and genotype frequencies

	GENOTYPE (%)	FEMALE : MALE
A1A1	2.63	40 : 60
A1A2	35.26	47.8 : 52.2
A2A2	62.11	41.5 : 58.5

	ALLELE (%)
A1	20.3
A2	79.7

$$p^2 + 2pq + q^2 = 1$$



Descriptive statistics: DGVs

	N	Mean			
Rump height	190	118.8			
Rear legs-side view	190	97.6			
Pasterns	190	110.9			
Hoof height	190	111.6			
TMI milk	190	111.3			
TMI dual purpose	190	108.1			
Teat length	190	88.3	13.4	43.3	122.7
Rump angle	190	99.3	13.6	53.2	139.4
Rear udder height	190	117.2	16.0	59.4	149.3
Rear udder width	190	117.2	13.8	75.9	148.3
Udder depth	190	110.5	14.6	71.0	153.5
Milking speed	190	104.9	16.2	54.9	150.6
Chest width	190	98.9			
Front teat position	190	113.0			
Rear teat position	190	112.1			
Somatic cell score	190	104.0			
Milk yield	190	113.4			
Fat yield	190	113.9			
Protein yield	190	115.5			
Longevity	190	113.2			
Body depth	190	109.7			
Structural width	190	116.5			
Fore udder attachment	190	114.6			
Udder cleft	190	112.7	16.3	65.5	155.6
Legs overall	190	114.4	23.5	59.6	182.3
Udder overall	190	119.1	17.9	71.6	161.6
Exterior overall	190	120.4	21.3	62.9	171.6
Fat and protein index	190	115.2	9.4	87.2	143.4

DGV for TMI for dairy production ~ 1 SD higher than the average of Slovenian Brown Swiss population

For most individual traits average DGVs ~ 1 SD above population average



Animals preselected on parent average

Results: DGVs – significant differences

Significant differences between genotypes for **BC**:

- Pasterns and rear teat position (2 type traits)
- TMI for dual purpose

Trait \ Difference	A1A1 – A1A2	A1A1 – A2A2	A1A2 – A2A2
Pasterns	1.0000	0.6570	0.0219
TMI for dual purpose	1.0000	1.0000	0.0467
Rear teat position	0.0711	0.0412	1.0000

Results:

- **A2A2** → significantly **steeper pasterns** + **higher TMI** for dual purpose
- **A1A1** → **closely placed rear teats** → not desirable! (mastitis/robot milking)

	Pasterns		TMI for dual purpose		Rear teat position	
	LSM	SE	LSM	SE	LSM	SE
A1A1	104.5 ^{ab}	7.08	108.4 ^{ab}	3.7	126.7 ^b	6.06
A1A2	106.9 ^b	1.9	106.1 ^b	1.02	112.4 ^{ab}	1.7
A2A2	113.4 ^a	1.5	109.2 ^a	0.8	111.3 ^a	1.2

Conclusions

- No statistically significant effect of **βC** genotype on most of polygenic traits
- Statistical significant effect of BC on:
TMI for dual purpose, pasterns and rear teat position
positive for A2A2 genotype
- **Selection on A2A2 βC genotype could be solution for ...**





Thank you for your attention!

The  **milk** that might
change everything