



Metabolic disorders and their relationships to milk production traits in Austrian Fleckvieh

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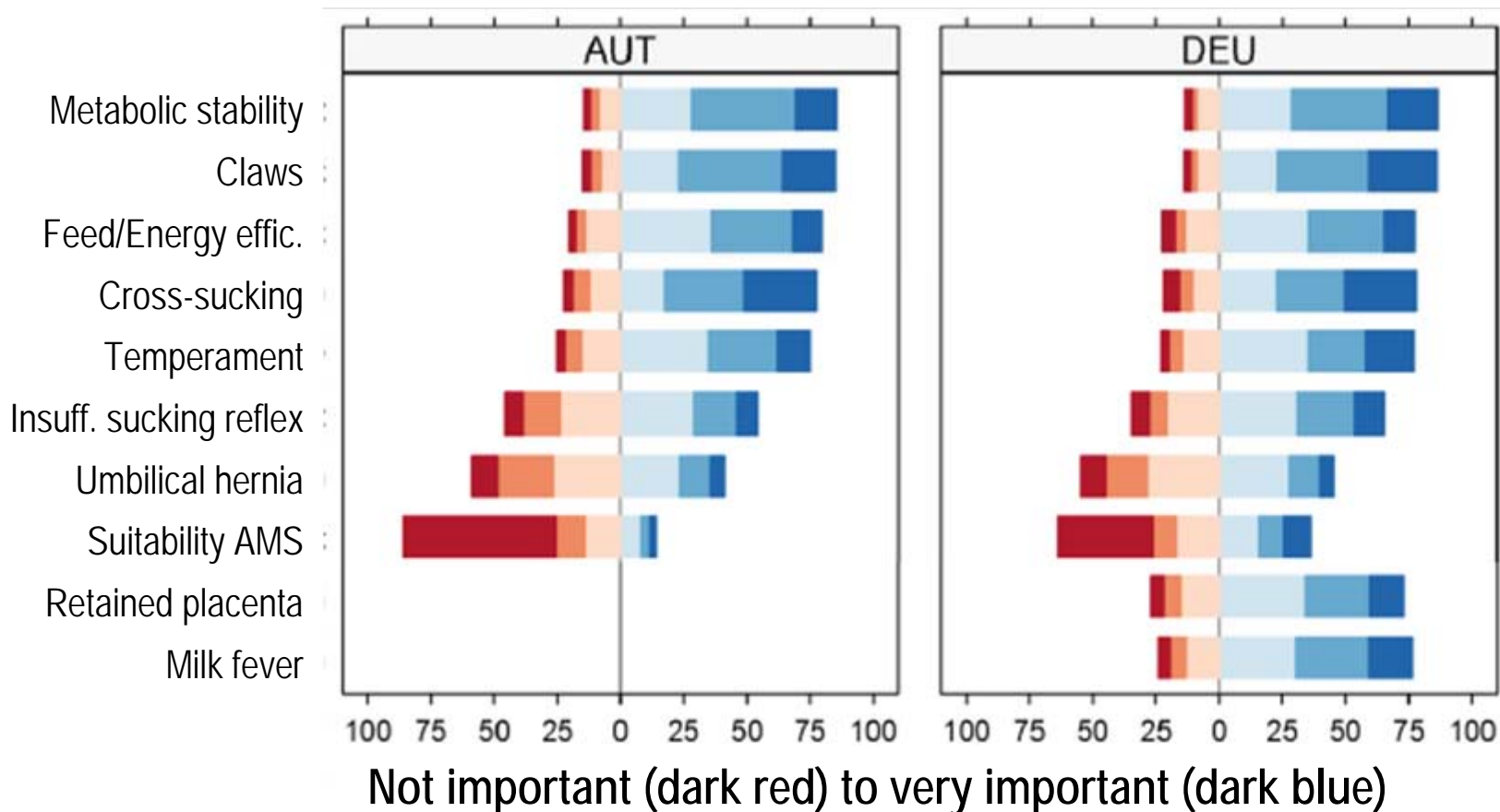
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Background

- **Direct health traits** considered in joint German/Austrian genetic evaluation (2010 – Fleckvieh, 2013 – Brown Swiss)
 - Data source: **veterinarian diagnoses**
 - Introduction of two **indices** (Fuerst & Egger-Danner, 2014) to include direct health traits into TMI (female fertility, udder health)
 - For **metabolic disorders**, no such index has been developed yet (routine evaluation for milk fever)
-

Background - new traits desired by breeders (Steininger, 2013)



Aims

- Definition of **specific observation periods**
- **Frequencies** of metabolic disorders
- Investigation of possible **indicator traits**
- Estimation of **variance components**



Data

- Only herds with electronically transmitted veterinarian diagnoses regarding metabolic disorders (2006 – Jan 2013)
- more than two million test-day records
- after plausibility checks and restrictions (10 cows/hy; 20 daughters/sire, first diagnoses only) about 120,000 lactation records available

Trait definition

- Metabolic disorders defined as binary traits (0/1; healthy/diseased) within specific time periods
 - **Rumen acidosis:** full standard lactation
 - **Displaced abomasum:** left- and right-sided until 42 days in milk subsumed as one trait
 - **Milk fever:** 10 d before and 10 d after calving
 - **Ketosis:** until 70 days in milk
 - **Culling** due to metabolic disorder
-

Trait definition

- Traits routinely recorded in **milk performance** testing:
 - **fat, protein and lactose** content (in %)
 - **urea** (mg/100ml milk) of the first test-day (8-49 days in milk)
 - **fat-protein-ratio, fat-lactose-ratio, protein-lactose-ratio** calculated for the first and second test-day (40-90 days in milk)

Model

- Variance component estimation by VCE6 (Groeneveld et al., 2008); linear animal model
 - Effects considered for metabolic disorders
 - parity (1, 2, ..., 5+) by calving age (6 classes for 1st and 2nd parity); calving year-month; fixed
 - herd-year; pe, animal genetic; random
 - Effects considered for production traits:
 - same as above plus days in milk (linear, quadratic)
-

Data characteristics

	Trait	N	Frequency (%)
Health traits	Milk fever	117,757	2.8
	Ketosis	112,874	0.6
	Acidosis	96,843	0.1
	Displaced abomasum	115,435	0.02
	Culled for metabolic disorders	105,344	0.6

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		N	Mean
Production traits	Fat content (%)	97,981	4.15
	Protein content (%)	97,981	3.22
	Lactose content (%)	97,146	4.84
	Urea content (mg/100ml)	97,075	18.1
	Fat:protein ratio (1 st test-day)	97,981	1.30
	Fat:protein ratio (2 nd test-day)	93,316	1.25
	Fat:lactose ratio (1 st test-day)	97,146	0.86
	Fat:lactose ratio (2 nd test-day)	92,567	0.82
	Protein:lactose ratio (1 st test-day)	97,146	0.67
	Protein:lactose ratio (2 nd test-day)	92,567	0.67

Genetic parameters for metabolic disorders

	Mik fever	Ketosis	Culling
Milk fever	0.034 (0.004)	0.450 (0.092)	0.667 (0.075)
Ketosis		0.008 (0.002)	0.617 (0.137)
Culling			0.006 (0.001)

For acidosis and displaced abomasum, very low frequencies and genetic variance close to zero

Possible indicator traits

Trait	h^2	Milk fever	Ketosis	Culling
F:P1	0.16 _(0.01)			
F:L1	0.19 _(0.01)			
P:L1	0.29 _(0.01)			
F:P2	0.14 _(0.01)			
Urea	0.10 _(0.01)			

Possible indicator traits

Trait	h^2	Milk fever	Ketosis	Culling
F:P1	0.16 _(0.01)	0.18 _(0.05)	0.38 _(0.10)	0.38 _(0.09)
F:L1	0.19 _(0.01)	-0.07 _(0.05)	-0.25 _(0.10)	-0.26 _(0.09)
P:L1	0.29 _(0.01)	-0.13 _(0.05)	-0.21 _(0.09)	-0.18 _(0.10)
F:P2	0.14 _(0.01)	0.01 _(0.06)	0.25 _(0.09)	0.16 _(0.08)
Urea	0.10 _(0.01)	-0.21 _(0.06)	-0.11 _(0.11)	-0.13 _(0.09)

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Conclusions

- Displaced abomasum and acidosis seem to be of marginal importance in Fleckvieh cattle
- Milk fever, ketosis and culling due to metabolic disorder could be considered in a future metabolic index
- Fat:protein ratio and fat:lactose ratio of the first, maybe also of the second test-day among possible indicator traits
- Combination with feet and legs disorders?

**Thank you for
your attention**



Health monitoring in Austria: Standardisation of diagnoses

Diagnoseschlüssel

Spezifische Kälberkrankheiten

- 11 Nabelentzündung
- 12 Nabelbruch
- 13 Sehnenkontraktur
- 14 Missbildungen
- 15 Ikterus haemolyticus neonatorum
- 16 Kälberdurchfall
- 17 andere Krankheiten des Kalbes

Erkrankungen des Verdauungstraktes

- 21 Durchfall
- 22 Tympanie
- 23 Pansenübersäuerung
- 24 Fremdkörpererkrankung
- 25 Labmagenverlagerung
- 26 Darmverschluss
- 27 andere Erkrankungen der Bauchhöhle
- 28 Erkrankungen der Maulhöhle
- 29 Erkrankungen der Speiseröhre

Stoffwechselkrankheiten

- 31 Gebärparese, Hypocalcämie
- 32 Tetanie
- 33 Azetonämie
- 34 andere Stoffwechselkrankheiten
- 35 Vergiftungen

Fruchtbarkeits-u. Abkalbest.

- 41 Gebärmutterentzündung
- 42 Stillbrunst, Azyklie
- 43 Ovarialzysten
- 44 Scheidenvorfall
- 45 Abortus und andere Störungen der Gravidität
- 46 Schweregeburt
- 47 Geburtsverletzungen
- 48 Nachgeburtsverhaltung
- 49 puerperale Erkrankungen

Eutererkrankungen

- 51 akute Euterentzündung
- 52 chronische Euterentzündung
- 53 Erkrankungen der Euter- und Zitzenhaut
- 54 Euterödem
- 55 Andere Eutererkrankungen
- 56 Prophylaktisches Trockenstellen

Klauen- und Gliedmaßenkrank.

- 61 Panaritium, Mortellaro
- 62 Klauengeschwür, Krankheiten der Gelenke an den Klauen
- 63 Klauenrehe
- 64 Frakturen, Luxationen, andere Gliedmaßenverletzungen
- 65 Krankheiten von Muskeln und Sehnen
- 66 spastische Parese, Paralyse
- 67 Peritarsitis

- 68 Festliegen infolge Erkrankung des Bewegungsapparates

- 69 Krankheiten des Schwanzes

Erkrankungen der Atemwege

- 71 Erkrankungen der oberen Luftwege
- 72 Lungenentzündung
- 73 andere Lungenerkrankungen

Herz-, Kreislauf- und Bluterkrank., Erkrankungen des Harntraktes

- 81 Herzerkrankungen
- 82 Septikämie, Anämie
- 83 Piroplasmose und andere Parasitosen des Blutes
- 84 Leukose
- 85 Erkrankungen der Gefäße und der Milz
- 86 Pyelonephritis
- 87 Erkrankungen der Harnblase

ZNS-Erkrankungen, Hauterkrankungen, Infektionen

- 91 ZNS-Erkrankungen
- 92 Erkrankungen der Sinnesorgane
- 93 Parasitosen und Infektionen der Haut
- 94 Erkrankung der Hörner
- 95 andere Hauterkrankungen
- 96 Allgemeininfektionen

Sonstige Erkrankungen

- 01 Abmagerung, Kachexie
- 02 verminderte Fresslust, Inappetenz
- 03 Fieber, fieberhafte Allgemeinerkrank.
- 00 ohne Diagnose

Health monitoring in Austria: Recording of data (Egger-Danner et al., 2012)

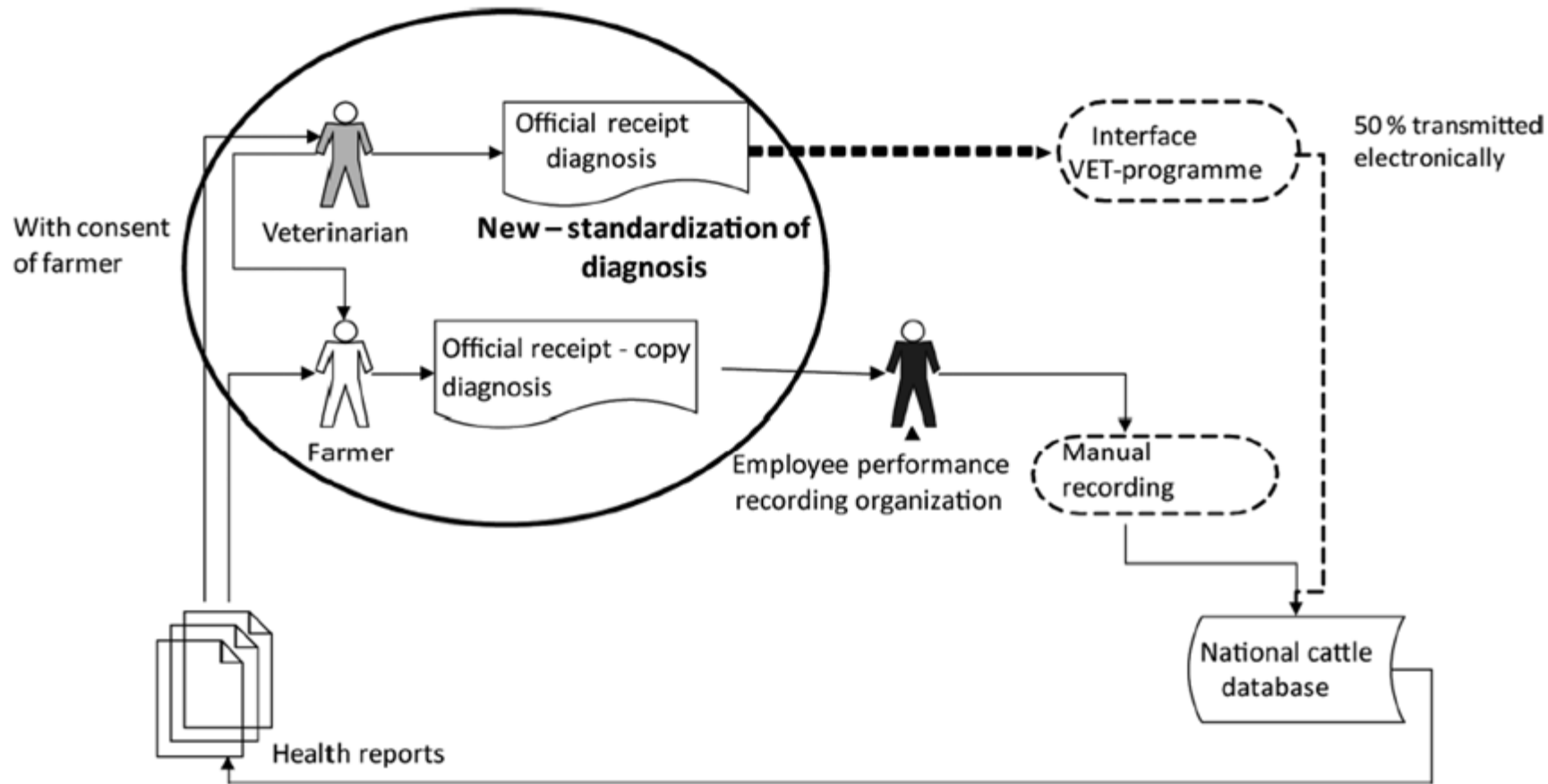


Figure 1. Recording of diagnostic data. VET = vocational education and training.