Hochschule
für Wirtschaft und Umwelt
Nürtingen-Geislingen

Health traits as a way to estimate faecal egg count in dairy goats? – preliminary results

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Florenz, 03rd September 2024, Maren Bernau

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Projektträger
Bundesanstalt für
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aufgrund eines Beschlusses
des Deutschen Bundestages

Förderkennzeichen:
28N-2-035-01

Introduction

- parasite load is a rising problem for small ruminants health: reduces health and welfare, increases costs, minimises economic value, problems with anthelminthic resistances (Voigt *et al.*, 2022; Sander *et al.*, 2024)

  ⇒ **correct selection of infected animals is the goal for success of a treatment**

- **„parasite indicators“** are described in the literature: bottle jaw, BCS & faecal fouling (Batz & van Wyk, 2009); FAMACHA© scoring for haematophagous parasites (Vatta *et al.*, 2001; Batz & van Wyk, 2009); body weight changes (Van Wyk *et al.*, 2006) or milk yield (Hoste *et al.*, 2002)

  ⇒ **clinical signs correlate low or not to faecal egg count (FEC)** (Sajovitz *et al.*, 2024)

Image sources: (1) & (2) https://www.kleinwiederkäuer.ch/de/programme-projekte/parasiten-programm.html#2908-2; (3) https://nwk-shop.de/p/famacha-c-farbkarte

Introduction

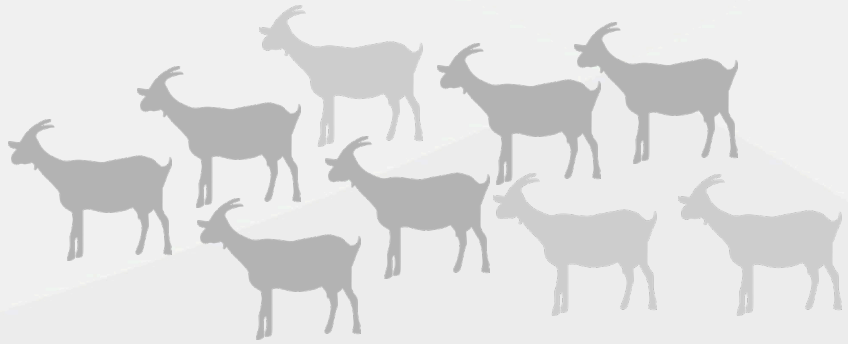
⇒ **But, what about imaging methods to detect health in dairy goats?**

- **linear traits** used in terms of dairy goat breeding (e.g. Lange *et al.*, 2018; Herold *et al.* 2019)
- **thermographic imaging** to detect elevated temperatures which might be used as key indicators for infectious diseases (McManus *et al.*, 2022)

The aim of this study is to identify health traits related to faecal egg count by methods which can be used on farm

Animals & methods
Animals

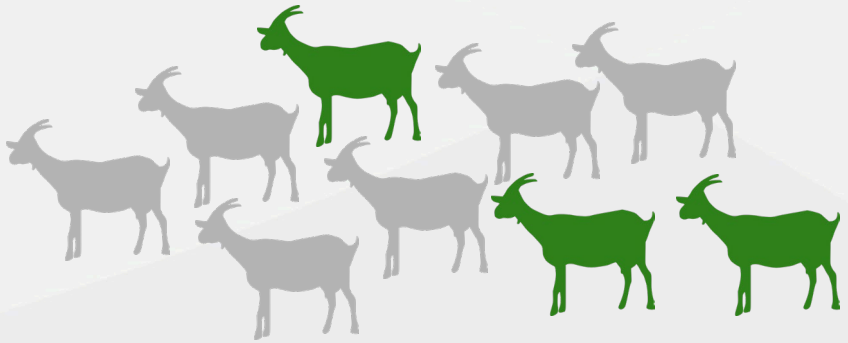
- 11 dairy goat farms (conventional and biological) in Germany
  German Fawn goat (52.8%), German White goat (34.3%) and Thuringian goat (12.9%)



Animals & methods

Animals & examination procedure

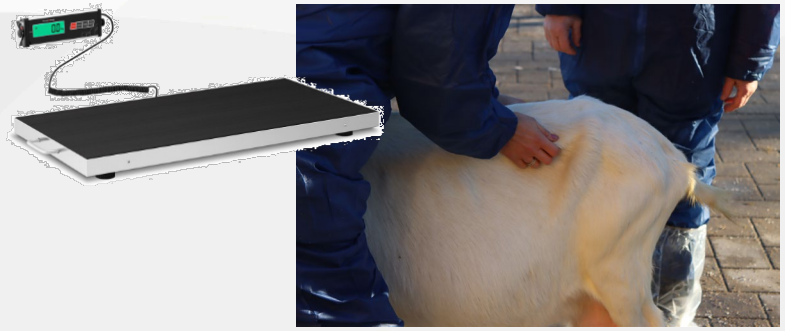
- 11 dairy goat farms (conventional and biological) in Germany
  German Fawn goat (52.8%), German White goat (34.3%) and Thuringian goat (12.9%)



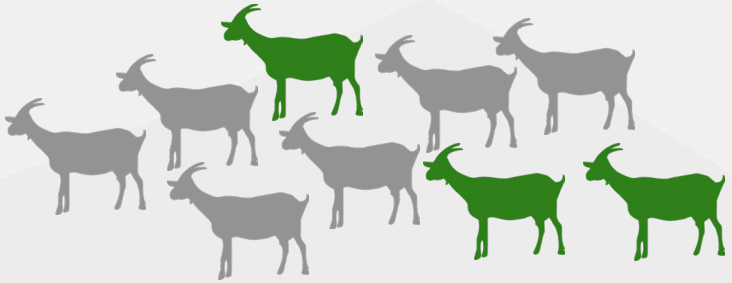
n = 24 animals of each farm

Animals & methods

Methods & parameters



Body Condition Scoring (BCS)
lumbal and *sternal* score from 1-5
(according to Leeb *et al.*, 2007)



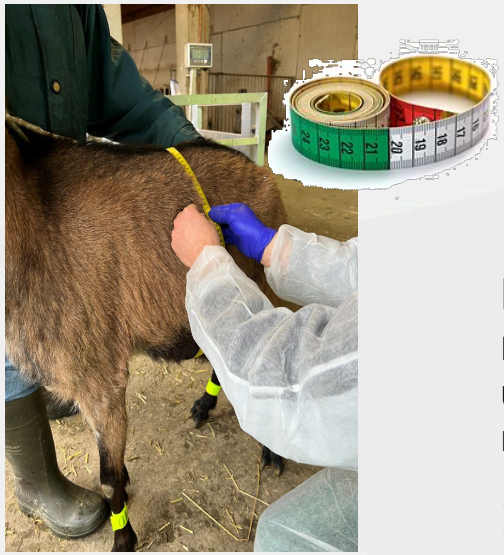
Body weight [kg]

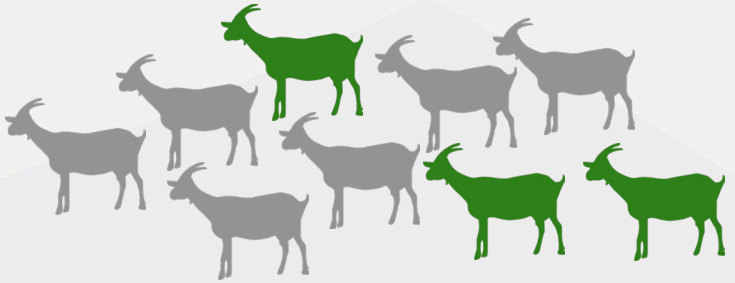
Animal welfare indicators (AWI)
n = 32 per goat
(according to Bielicke *et al.*, 2023, Sporkmann & Georg, 2018)

- **BCS**
- **Body weight**

Animals & methods

Methods & parameters



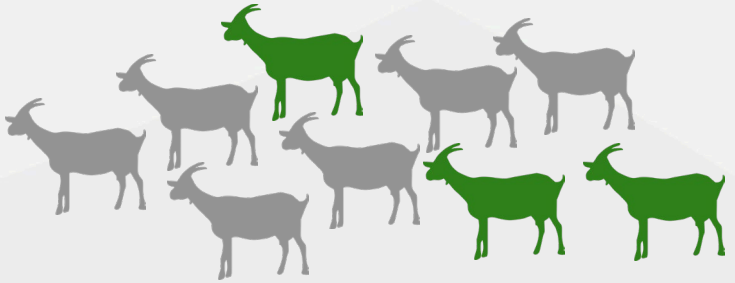


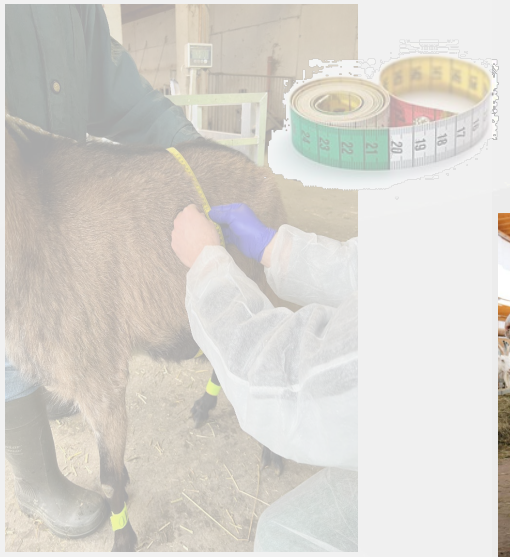
Linear body measurement (LBM)
using a scale
n = 4 per goat

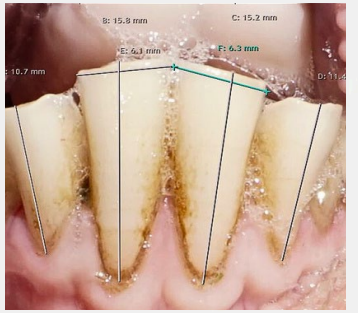
- **belly circumference**

Animals & methods

Methods & parameters







- **teeth length**
- **teeth width**

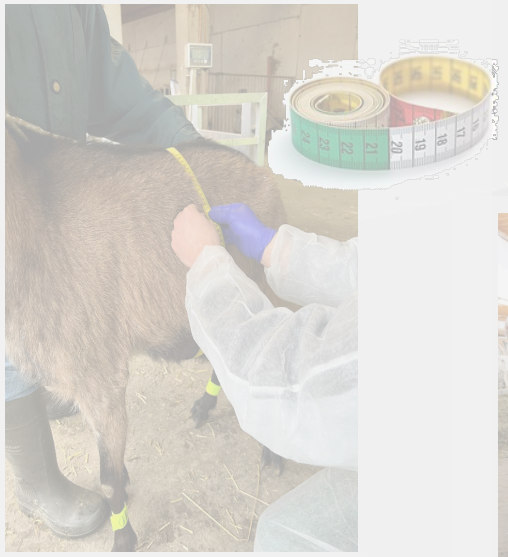
Digital photography

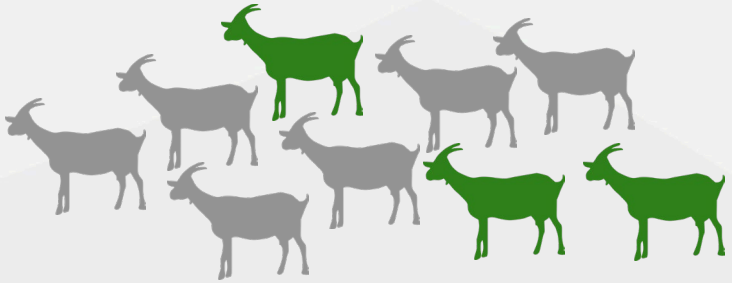
- side view (left & right side)
- front & hind view
- bird eyes view
- teeth

evaluated using Synedra® software

Animals & methods

Methods & parameters



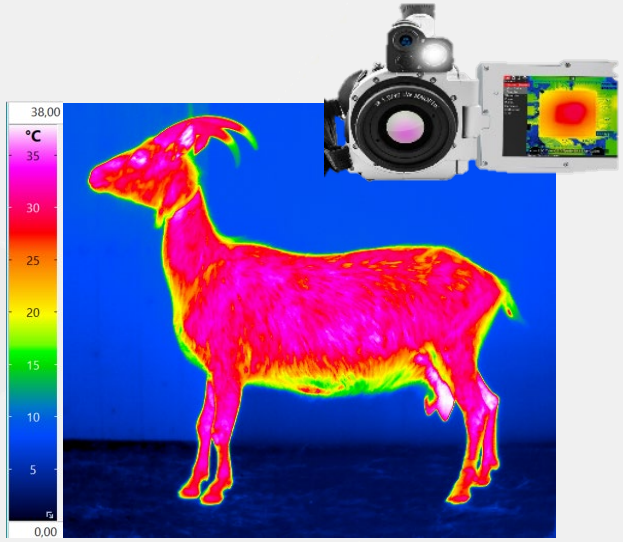


Infrared thermographic measurement (ITM)

- side view (left & right side)
- front & hind view

evaluated using IRBIS® software

- **body thermal temperature**
- **leg thermal temperature**



Animals & methods

Methods & parameters

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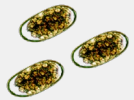
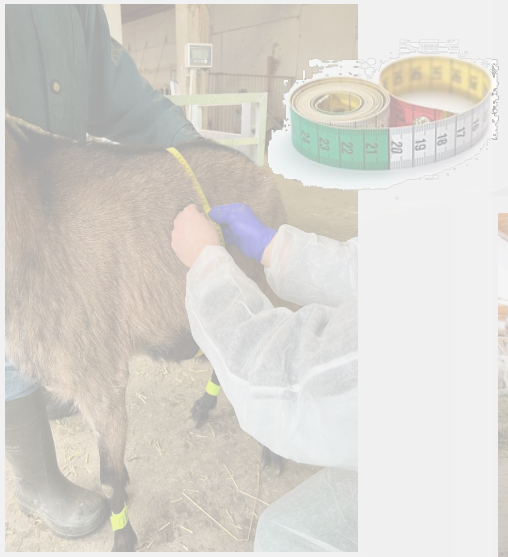
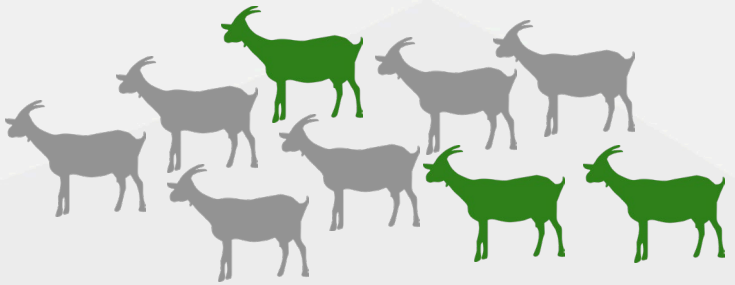
GesundeZiegen

Faecal egg count (FEC)

- from individual faeces (voluntarily collected)
- analysed via McMaster method







Animals & methods
Statistics

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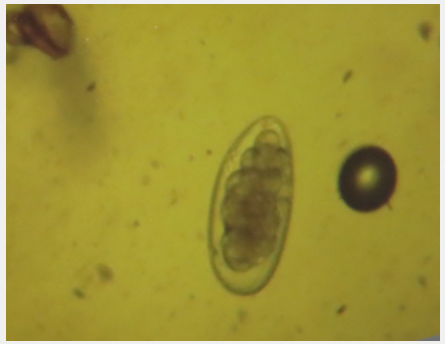
GesundeZiegen

- FEC was scored in three categories:
  - **low FEC group** (≤500 Eggs per Gram faeces)
  - **medium FEC group** (>500 ≤1500 Eggs per Gram faeces)
  - **high FEC group** (>1500 Eggs per Gram faeces)



- SAS® Studio
  - mixed model procedure to calculate influencing effects for FEC
  - proc corr to estimate correlations
  - significance level of p≤0.05

Results & discussion

Body weight and BCS

	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG	p-Value
Body weight [kg] n=869	68.11 ± 0.63^{a}	64.53 ± 0.77^{b}	62.46 ± 0.89^{b}	<0.0001
BCS n=859	3.14 ± 0.03^{a}	2.92 ± 0.04^{b}	2.82 ± 0.05^{b}	<0.0001

- significant differences regarding FEC group for body weight and BCS
  - correlation body weight - FEC: **-0.13** ($p<0.0001$; n=869)
  - correlation BCS - FEC: **-0.18** ($p<0.0001$; n=854)
  - seems to be a possible indicator

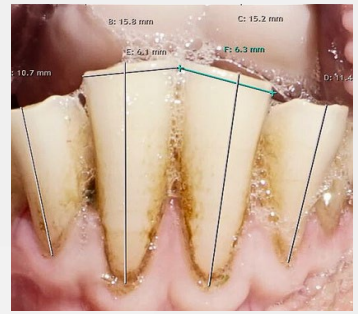
⇒ **in line with other studies** (e.g. van Wyk *et al.*, 2006; Sajovitz et al., 2024)

⇒ **Can this be a practicable method for farmers?**

Results & discussion

LBM & digital photography

	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG	p-Value
Belly circumference [cm] n=864	116.62 ± 0.47^{a}	114.40 ± 0.57^{b}	113.40 ± 0.66^{b}	<0.0001
Teeth length [mm] n=139	13.20 ± 0.24^{a}	11.77 ± 0.46^{b}	11.50 ± 0.87^{ab}	0.0079
Teeth width [mm] n=139	6.59 ± 0.10^{a}	6.15 ± 0.19^{b}	4.69 ± 0.34^{c}	<0.0001



- significant differences regarding FEC group for belly circumference
  - no correlation belly circumference - FEC (p=0.078, n=864)

- significant differences regarding FEC group for teeth length and width
  - width of I1 a promising parameter? feed intake as a key factor?
  - no to minimal correlation teeth width - FEC (n=139)

⇒ **only small numbers** (n=139) **=> further analyses are needed**

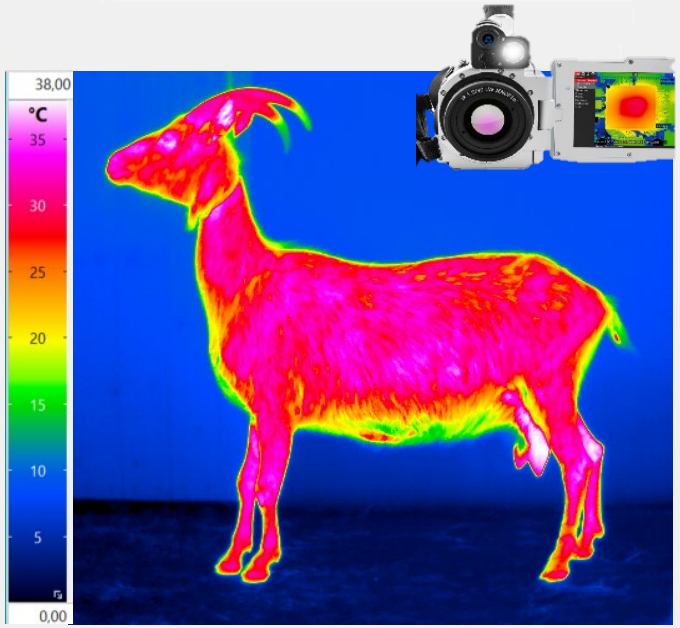
⇒ **Can this be a practicable method for farmers?**

- body weight or BCS seems to be easier in performing

Results & discussion

Infrared thermographic imaging

	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG	p-Value
ITM_body [°C] n=124	28.62 ± 0.39[a]	25.79 ± 0.38[b]	27.00 ± 0.55[b]	<0.0001
ITM_legs [°C] n=96	27.42 ± 0.67[a]	22.40 ± 0.67[b]	22.75 ± 0.92[b]	<0.0001



- significant differences regarding FEC groups for ITM
  - higher body and higher leg temperature in the low FEC group
  - correlation ITM body – FEC: **-0.22** ($p<0.0125$; n=124)
  - correlation ITM legs – FEC: **-0.39** ($p<0.0001$; n=96)

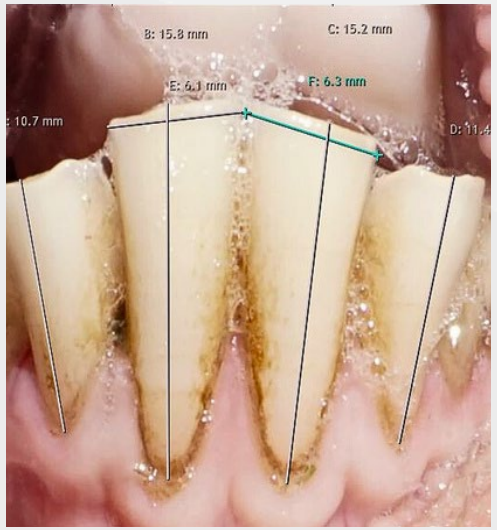
⇒ **only small numbers** (n=124/96) **=> further analyses are needed**

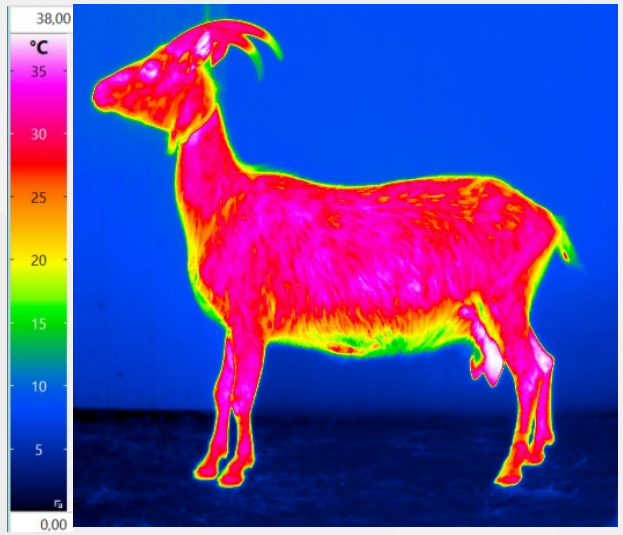
⇒ **This method can be used on farm!**

- ITM are already used in several areas of animal science (Coşkun & Aytekin, 2021)
- ITM´s may help to identify differences (e.g. Schaefer *et al.*, 2007; Mota-Rojas *et al.*, 2021; Gayathri *et al.*, 2024)
- elevated temperatures might be used as key indicators (McManus *et al.*, 2022)

Conclusion

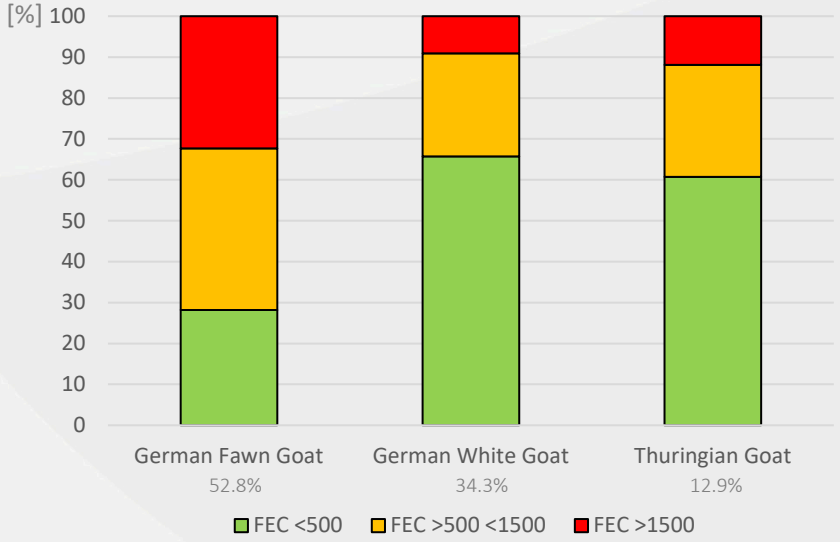
- compared to the **low FEC group** the **high FEC group** showed significant effects: animals belonging to the **high FEC group** having
  - lower BCS & lower body weight
  - lower belly circumference & smaller teeth (I1)
  - lower ITM of body and the legs

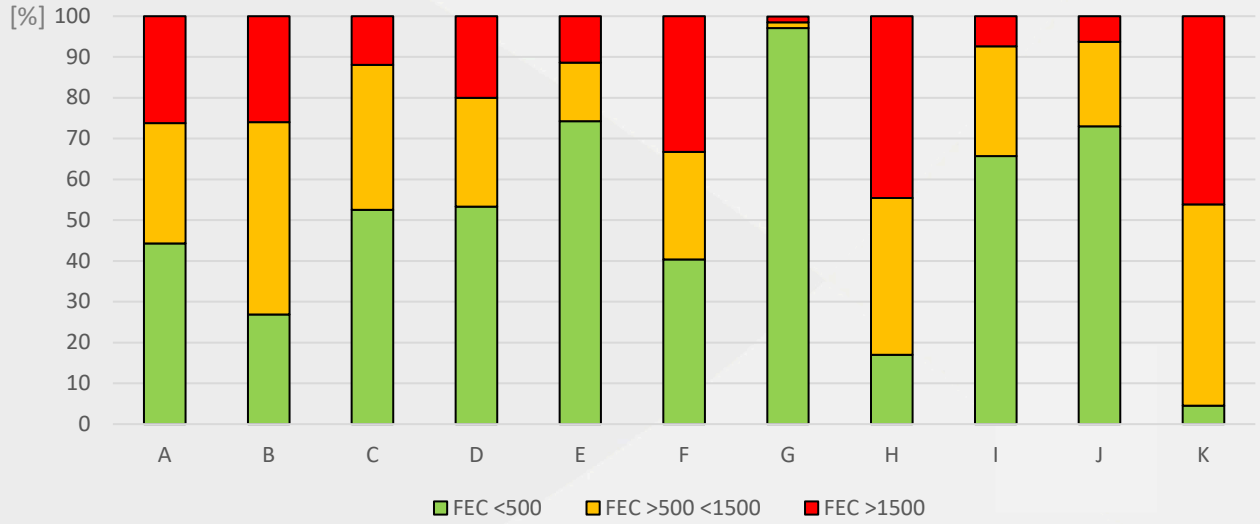




Further analyses

- further analyses are needed, focusing on
  - further infrared thermographic image analyses
  - linear body measurement
  - combining parameters as recommended (e.g. Batz & Van Wyk, 2009; Stafford *et al.*, 2009; Gaba *et al.*, 2010;)
  - faeces analyses (species differentiation and screening for *Haemonchus contortus*)
  - breed differences and
  - farm differences





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Projektträger

Bundesanstalt für Landwirtschaft und Ernährung

Förderkennzeichen: 28N-2-035-01

Andreas Kern Projektbeirat

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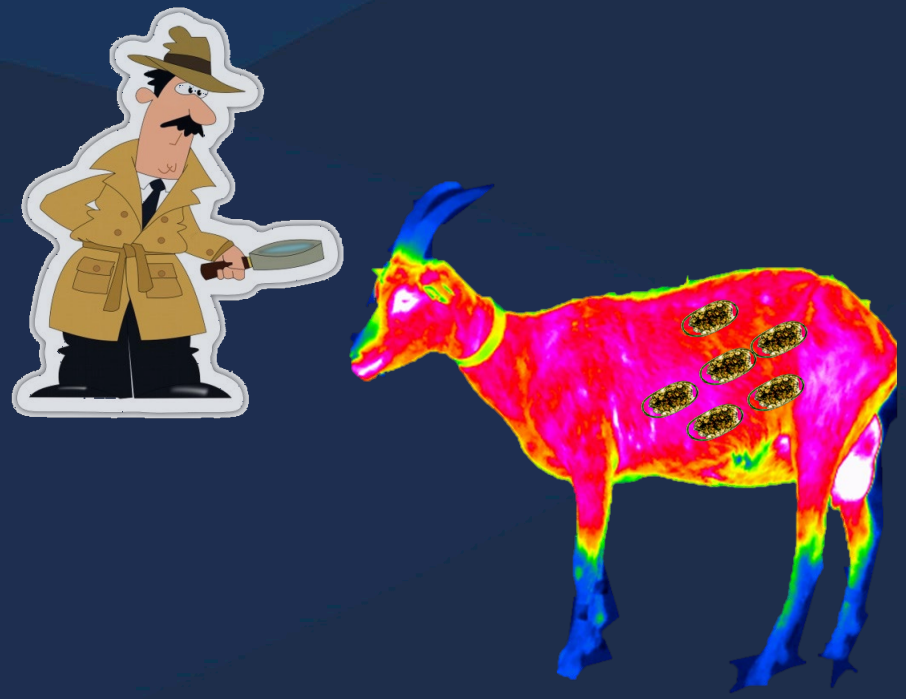
GesundeZiegen

Thank you for your attention !



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Results & discussion

General overview

	FEC = 0 EpG	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG
FEC	0	207.60 ± 139.31	914.93 ± 289.72	2929.04 ± 1566.96
Age [a]	4.12 ± 2.42	4.53 ± 2.26	4.47 ± 2.41	4.99 ± 2.53
Body weight [kg]	69.84 ± 15.10	67.87 ± 12.22	64.48 ± 13.13	62.13 ± 10.98
BCS	3.39 ± 0.62	3.10 ± 0.70	2.92 ± 0.63	2.80 ± 0.61
Faecal fouling	0.04 ± 0.19	0.01 ± 0.09	0.02 ± 0.12	0.01 ± 0.07
Coat quality	0.06 ± 0.23	0.07 ± 0.26	0.07 ± 0.25	0.03 ± 0.17
Belly circumference	118.60 ± 10.90	116.30 ± 8.84	114.38 ± 9.41	113.25 ± 8.96
Thoracic circumference	95.83 ± 7.12	95.24 ± 6.49	92.59 ± 6.45	91.01 ± 5.46

Results & discussion

Body weight and BCS

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	FEC = 0 EpG	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG
Body weight development [kg] n=432	6.27 ± 19.94	0.36 ± 7.50	-0.89 ± 4.73	-0.78 ± 5.85

- differences regarding FEC group for body weight development
  - ⇒ body weight development seems to be a promising indicator
  - ⇒ in line with studies in lambs (e.g. Gaba *et al.*, 2010)

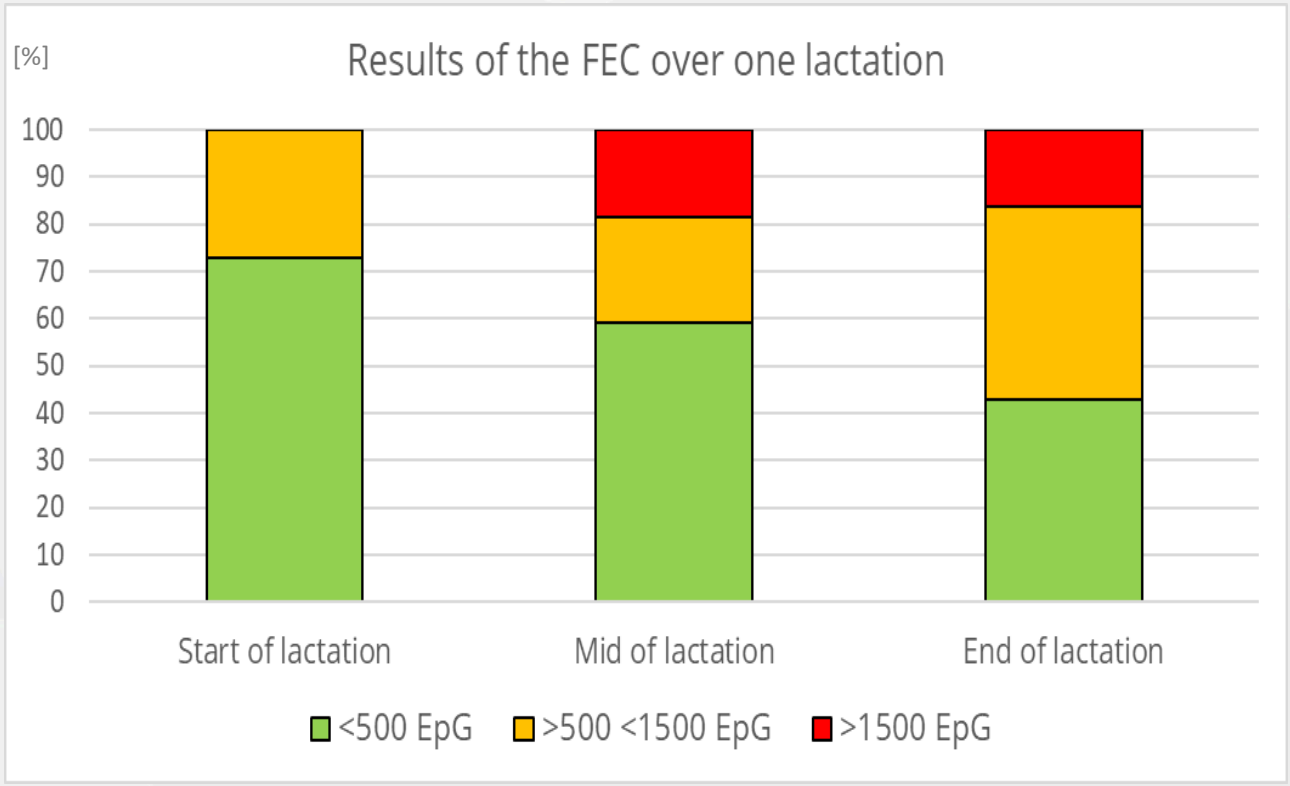
Results & discussion

Daily milk yield

	FEC ≤500 EpG	FEC >500 ≤1500 EpG	FEC >1500 EpG	p-Value
Daily milk yield [kg] n = 726	2.77 ± 0.06[a]	2.55 ± 0.07[b]	2.38 ± 0.09[b]	0.0005

- significant differences regarding FEC groups for milk yield
  ⇒ milk yield seems to be a possible indicator
- in contrast to other studies (e.g. Chartier & Hoste, 1997; Hoste *et al.*, 2002)
- we found higher milk yield in the low FEC group
  ⇒ further examination needed to explain this result
  ⇒ further analysis on a herd basis might present an explanation

Results & discussion
General overview



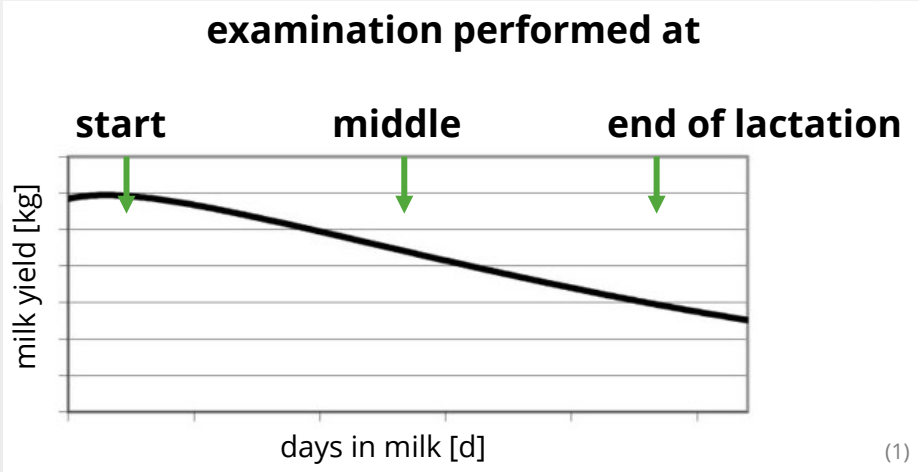


Image sources: (1) modified from Bömkes et al., 2004