

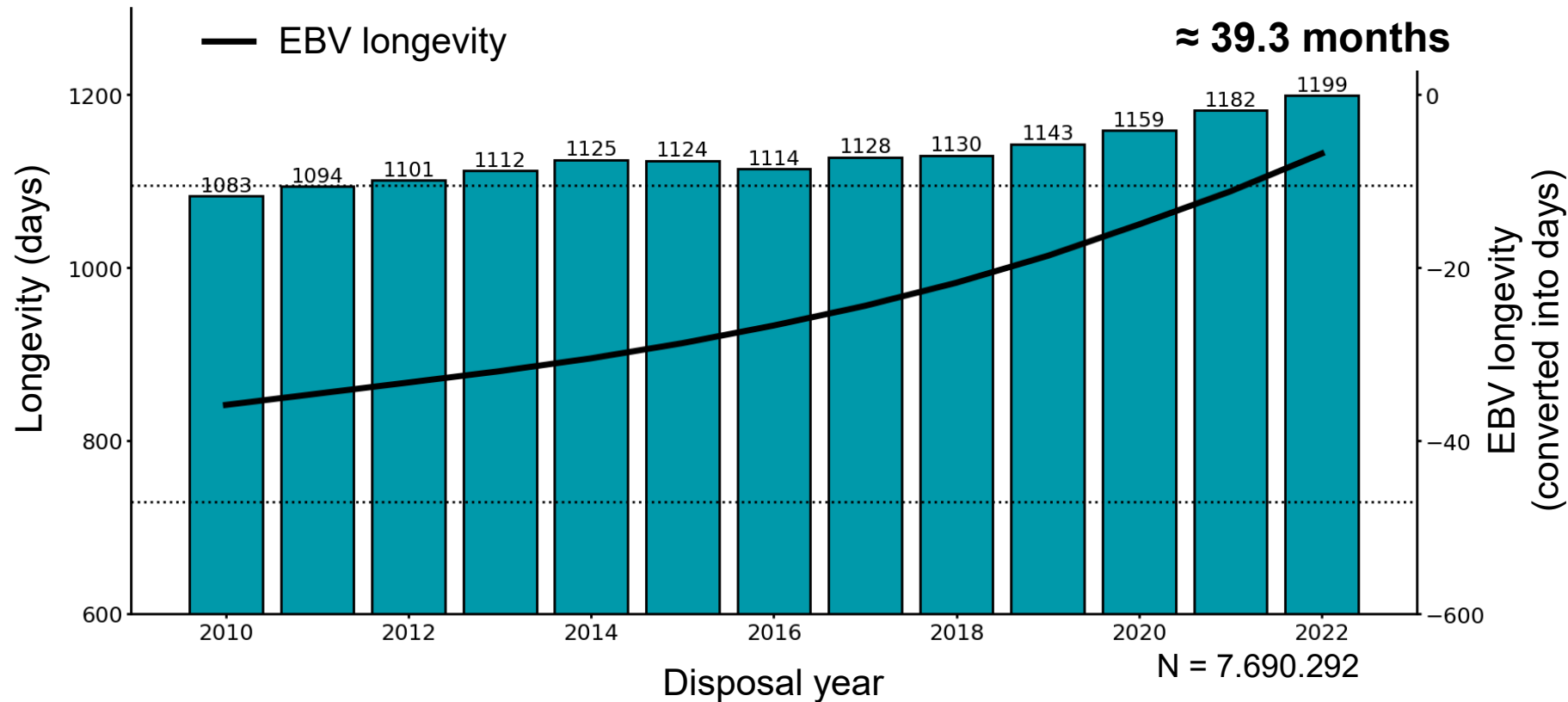
Beef-on-Dairy leads to increased longevity of Holstein cows

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Session 16: Genomic selection tools for within- and across- herd management in livestock species

Background - Trend longevity



	Ø per year
Phenotype	+ 9.6 days
Genotype	+ 24.4 days

→ Minor trend for the phenotypic longevity whereas the genetic potential increases faster

Motivation

- What is limiting the phenotypic trend in longevity?
- Hypothesis: heifer pressure
 - Common herd management: rearing of all purebred female calves as replacement heifers
 - Oversupply of replacement

Option A: selling of heifers



Option B: culling of older cows



VS.

- Prematurely culling of cows which are still capable of producing

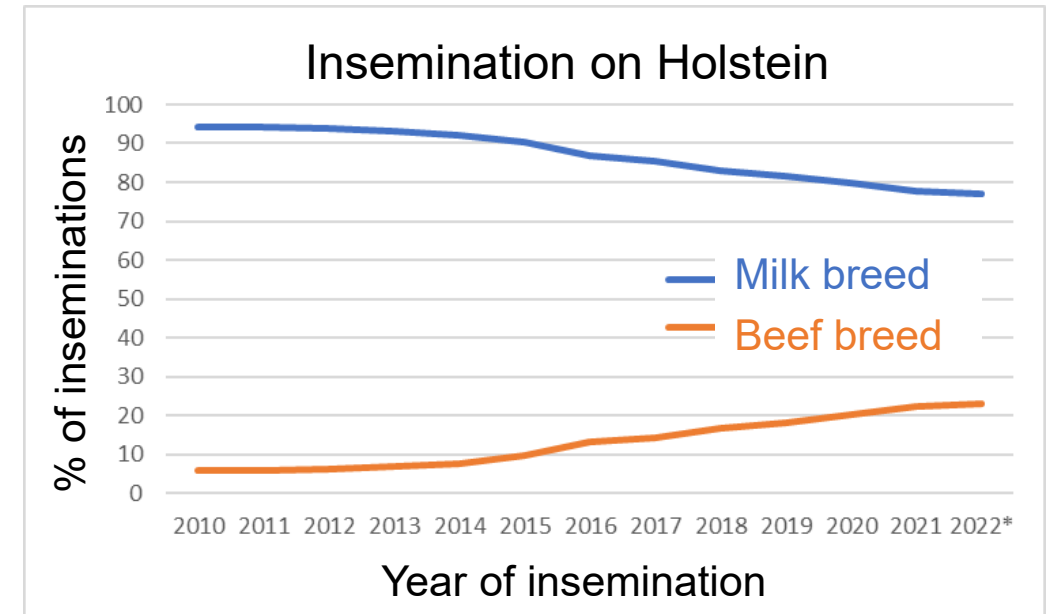
What does Beef-on-Dairy (BoD) have to do with it?

- Dairy dam x Beef sire
- Calf with superior fattening characteristics

- 23% of all inseminations in 2022 in Germany with beef semen (Rensing 2023)

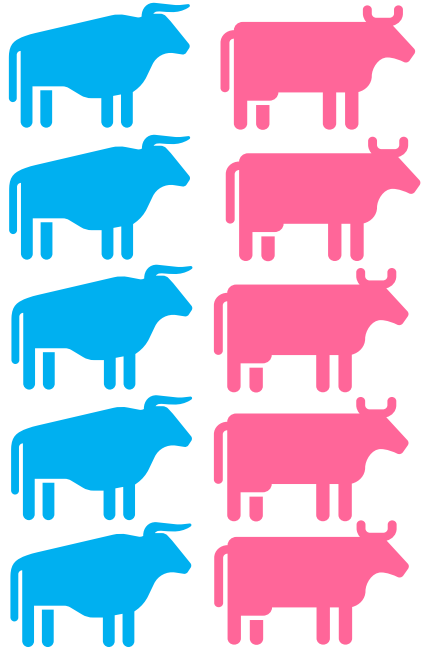


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What does Beef-on-Dairy have to do with it?

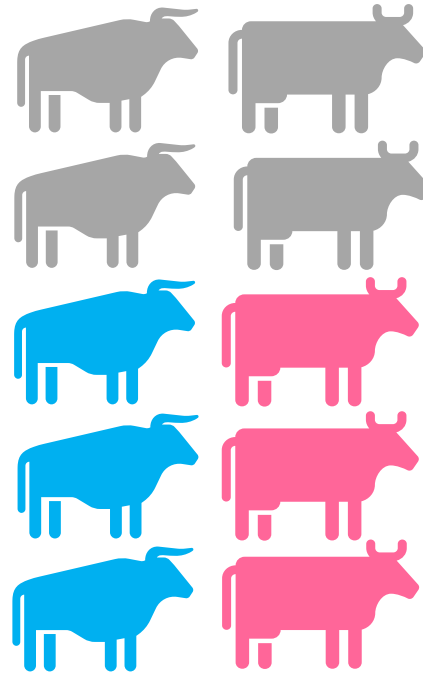
100% Purebred Dairy



Many female calves for replacement

→ High heifer pressure

40% Beef-on-Dairy



Few female calves for replacement

→ Low heifer pressure

Do herds with high beef semen use have a higher herd longevity?

Material and methods

- **Proportion of Beef-on-Dairy** per herd and year based on calves born was calculated
 - Calving year 2020/2021
 - 2'784'880 calvings

- **Longevity** of culled cows per herd and year, 2 years later
 - Disposal year 2022/2023
 - 1'025'203 culled cows

- Estimator for **general management level** per herd and year:
 - Average genetic level per herd (mean EBV for longevity)
 - Average production level (305-days milk yield) of herd

Material and methods

■ **Classification** of herds (in total 19'638) into different categories based on BoD use

- < 2% BoD
- 2-10% BoD
- 11-20% BoD
- >20% BoD

■ **Linear regression** model:

$$\mathbf{y} = \mathbf{X}\mathbf{b} + \mathbf{e}$$

$\mathbf{y}$ = vector of herd-level observations (phenotypic longevity)

$\mathbf{b}$ = vector of fixed effects (category BoD)

$\mathbf{X}$ = incidence matrix of fixed effects

$\mathbf{e}$ = error term

Results

	% of herds	Ø Genetic level (mean EBV*)	Ø Production level (milk yield in kg)
< 2% BoD	23.4	94.6	9278
2-10% BoD	29.3	95.4	9539
11-20% BoD	22.5	95.2	9579
>20% BoD	24.8	95.0	9467

* EBV for longevity: standardized to a mean of 100, SD of 12

- No differences in genetic level of herds
- No differences in production level (management quality) of herds
- **No differences in phenotypic longevity are expected**

Longevity of herds with different proportion of BoD

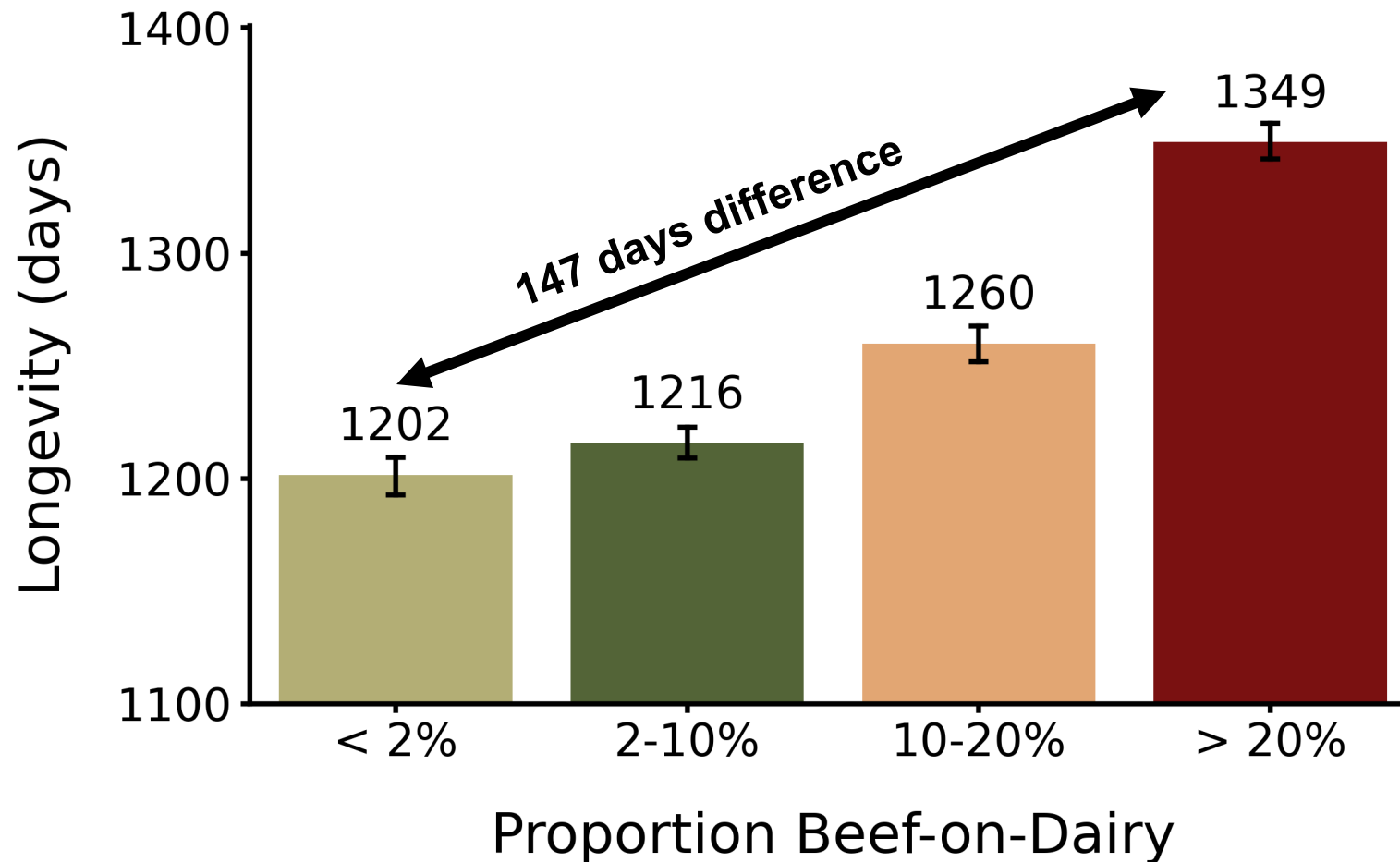
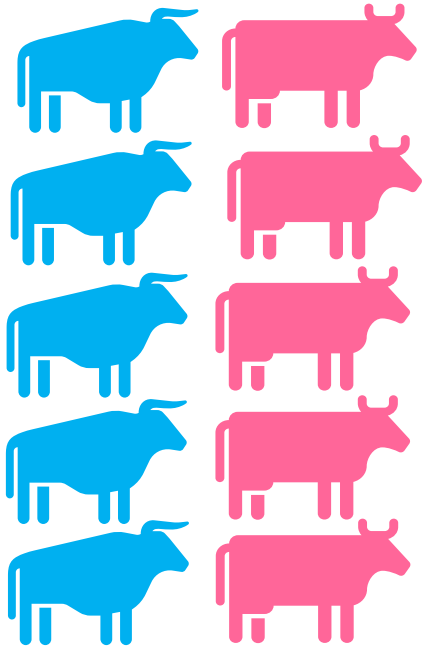


Figure 1 Mean phenotypic longevity per herd per category of proportion of Beef-on-Dairy use per farm. Longevity (in days) is calculated as Intercept + coefficient of category. Black lines represent 95%-confidence intervals.

Heifer pressure

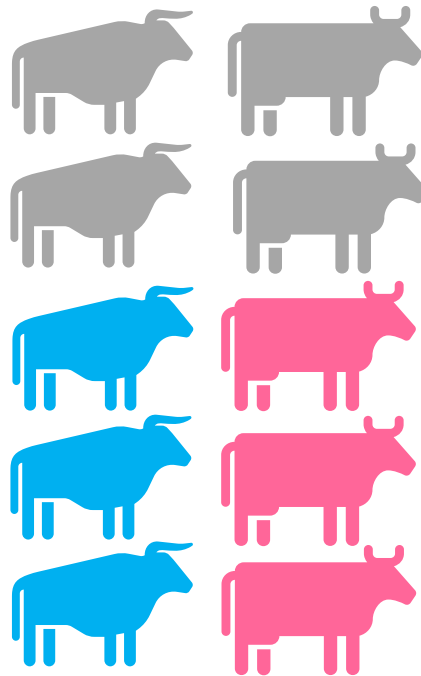
100% Purebred Dairy



Many female calves for replacement

→ High heifer pressure

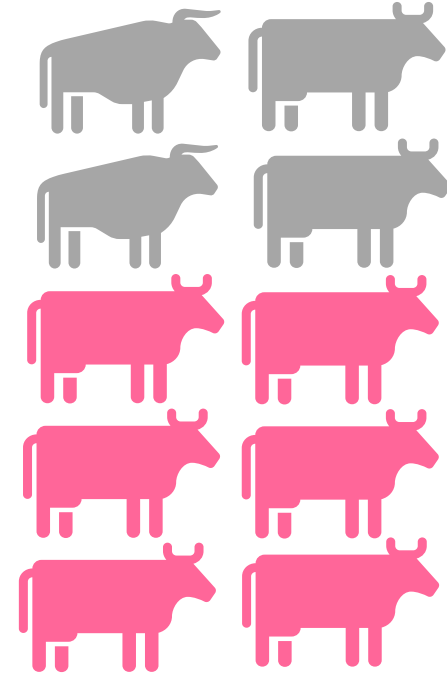
40% Beef-on-Dairy



Few female calves for replacement

→ Low heifer pressure

40% Beef-on-Dairy Sexed semen (Dairy)



Many female calves for replacement

→ High heifer pressure

Proportion of female purebred calves as indicator for heifer pressure

- Categorisation of herds into 3 groups based on their proportion of female purebred calves (→ available replacement heifers)

Proportion female purebred calves	Heifer pressure
< 40%	Low
40-55%	Average
>55%	High

* EBV for longevity: standardized to a mean of 100, SD of 12

- No differences in genetic level of herds
- No differences in production level (management quality) of herds

➤ **No differences in phenotypic longevity are expected**

Longevity of herds with different proportion of female purebred calves

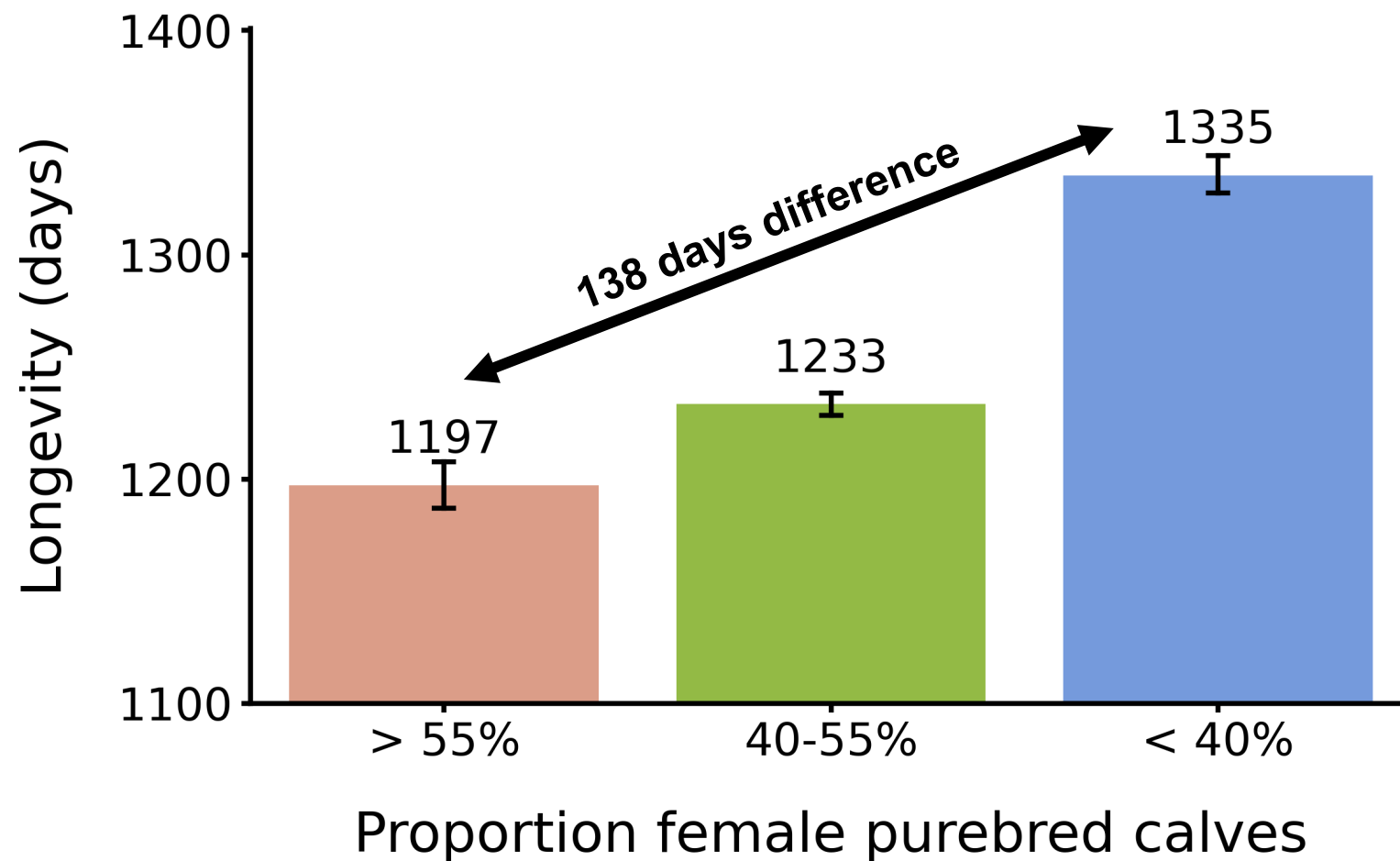


Figure 2 Mean phenotypic longevity per herd per category of proportion of female purebred calves. Longevity (in days) is calculated as Intercept + coefficient of category. Black lines represent 95%-confidence intervals.

Conclusion

- No difference in management level (genetic level & production level)
- Strong difference in phenotypic longevity
 - Availability of replacement heifers has a strong impact on culling decisions
 - Many cows are culled prematurely – **not involuntary**
- „Heifer pressure“ has a strong impact on phenotypic longevity
 - Beef-on-Dairy is a major reason for less female purebred calves

**Cows have the genetic potential to reach high phenotypic longevity.
We must give them the chance to!**

Thank you for your attention!



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Literature

- [1] <https://www.ruweg.de/aktuelles/nachrichten/artikel/grosser-auftrieb-zur-maiauktion> (RUW)
- [2] https://de.m.wikipedia.org/wiki/Datei:Holsteiener_BRW.jpg#filelinks
- [3] RSH, own pictures

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Thank you for your attention!

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