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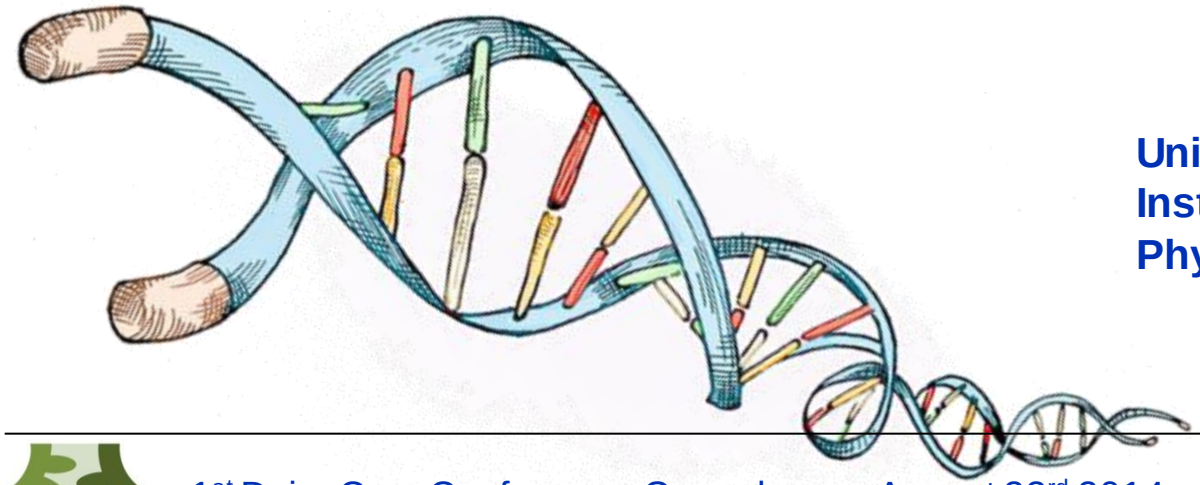
Telomere length:

any perspective as a biomarker for longevity in dairy cows?

Susanne Häußler & Lilian Laubenthal



University of Bonn
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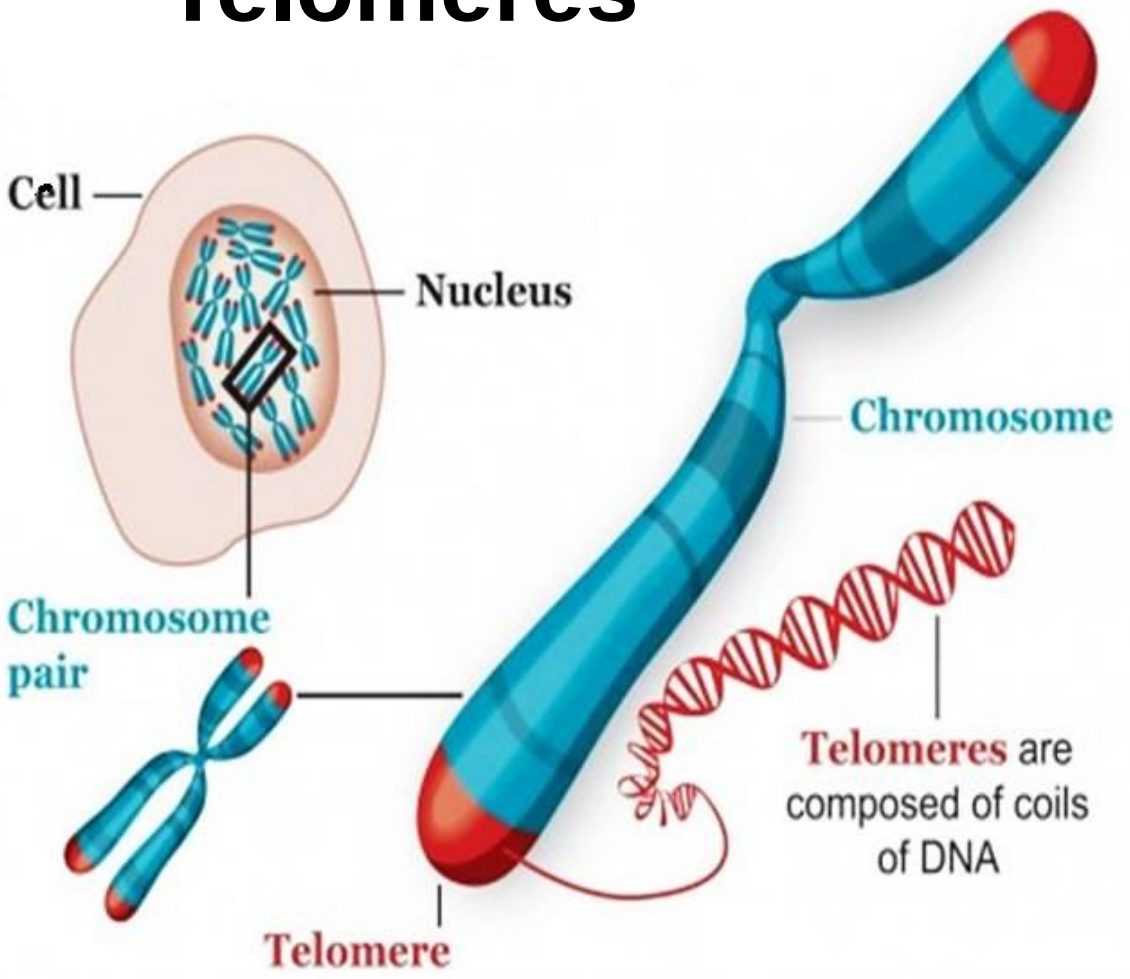
Physiology & Hygiene Unit

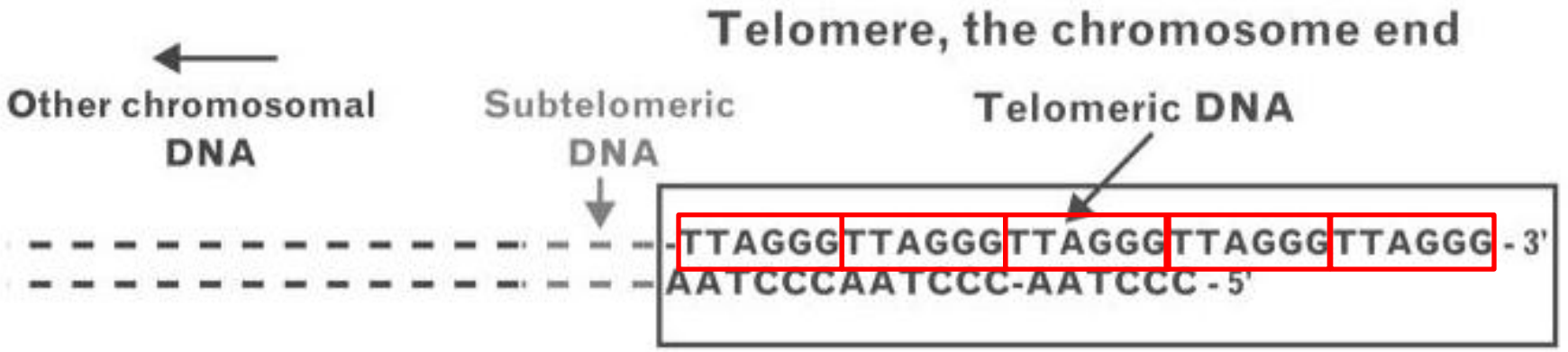
Telomeres



thediagonal.com/2012/11/26/telomere-test-a-date-with-death [access 6.8.2014]

- protect chromosomal integrity
- allow for complete replication of genomic DNA (BROWN ET AL. 2012)

Telomeres

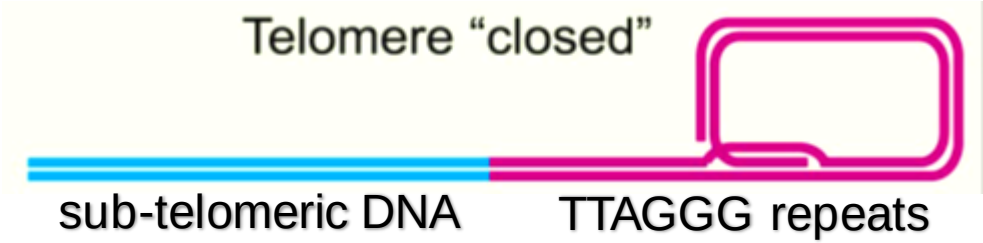


SHAMMAS 2011

- $[TTAGGG]_n$ repeats on the end of chromosomes
- 5 – 15 kilobase pairs of telomere repeats

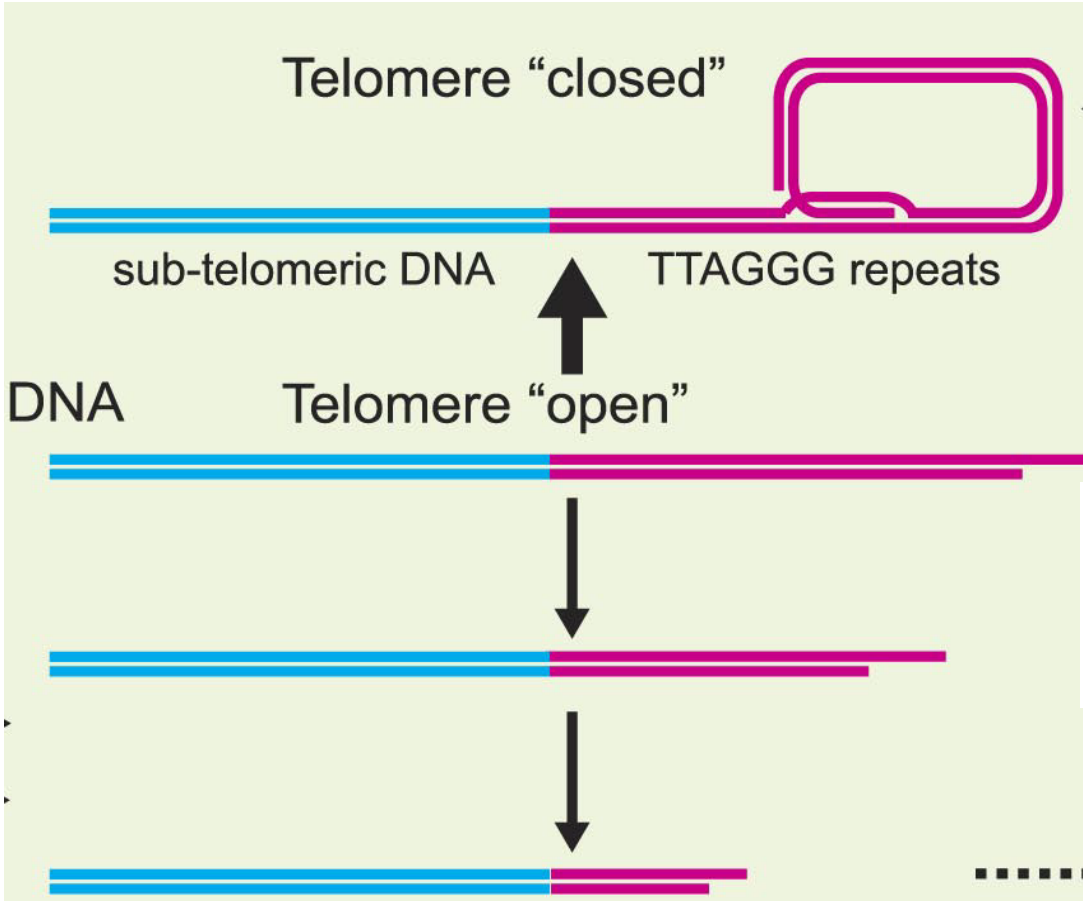
interact with specific proteins

→ looped confirmation



(AUBERT & LANSDORP 2008)

Telomeres

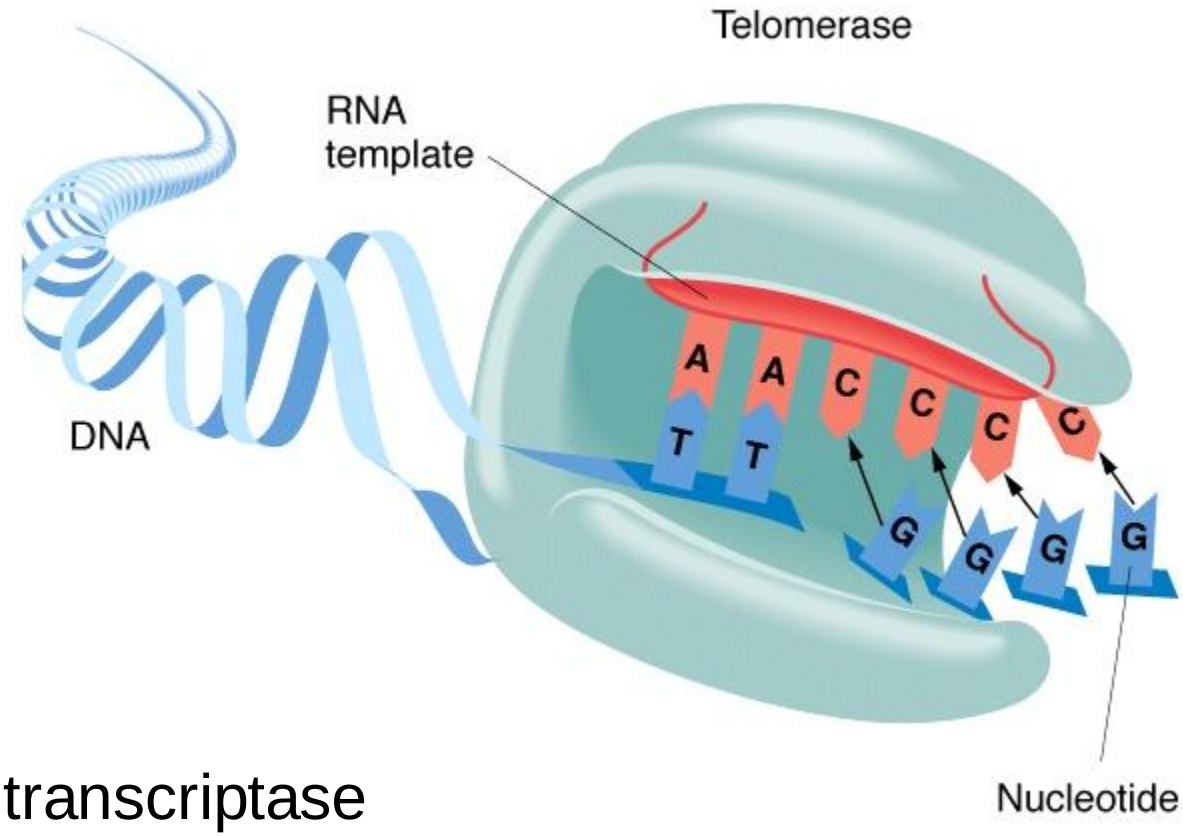


young cells

old cells

(AUBERT & LANSDORP 2008)

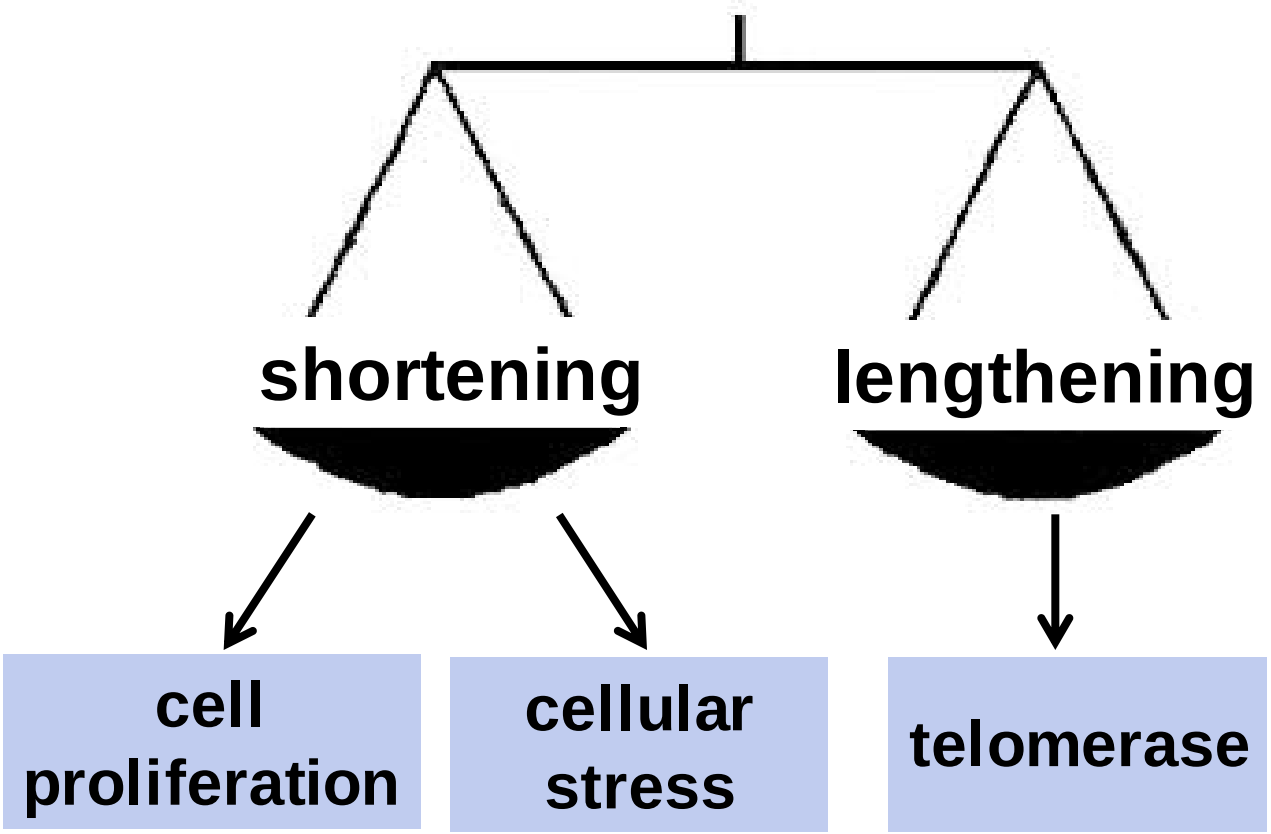
Telomerase



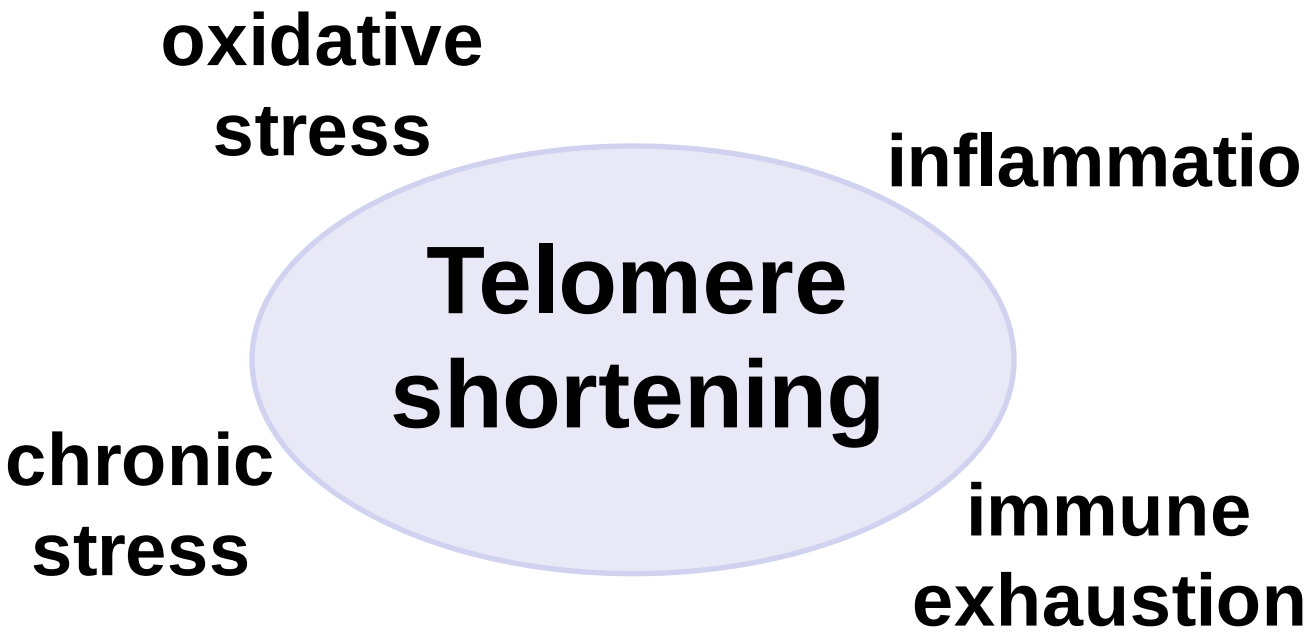
http://www.rechargebiomedical.com [access 11.8.2014]

- reverse transcriptase
- add nucleotides for telomeric DNA
- replenish telomeres (AUTEXIER & LUE 2006)

Telomere length



Causes of telomere shortening

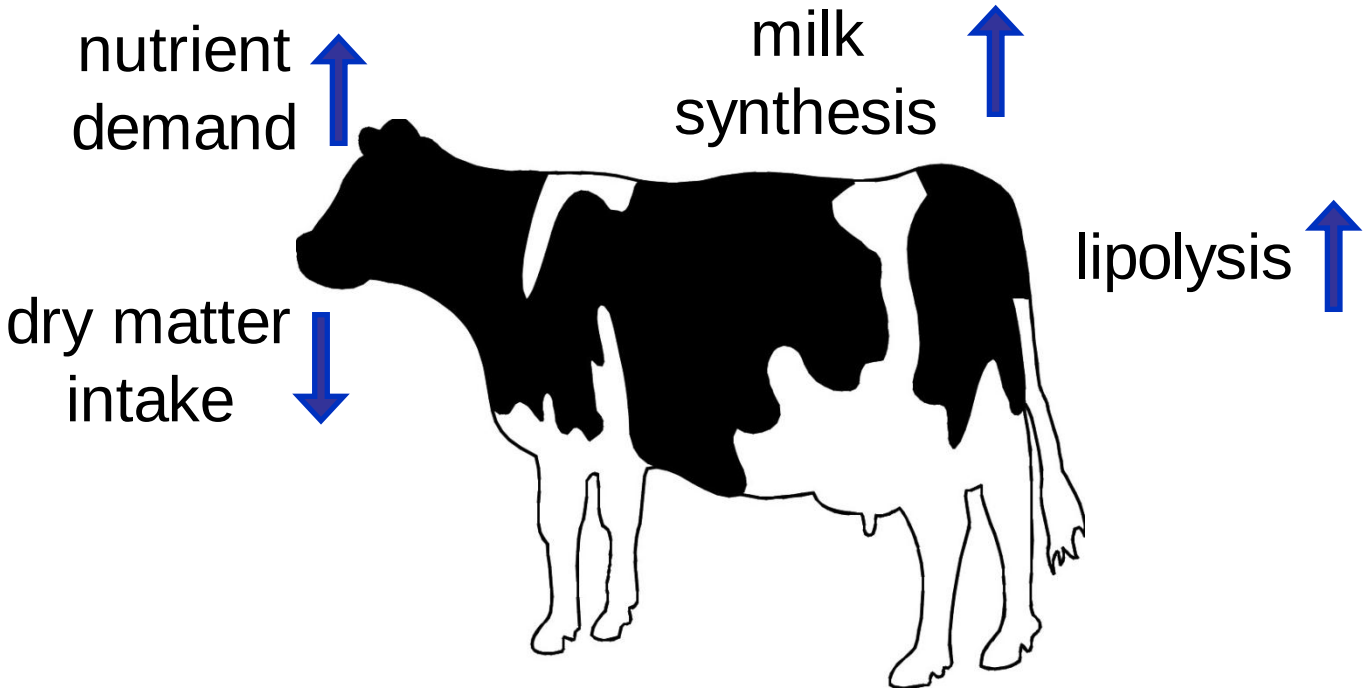


(EITAN ET AL. 2014)

→ Telomere shortening is associated with ageing and age-related pathologies in humans (BLASCO 2007)

High-yielding dairy cows

Early lactation

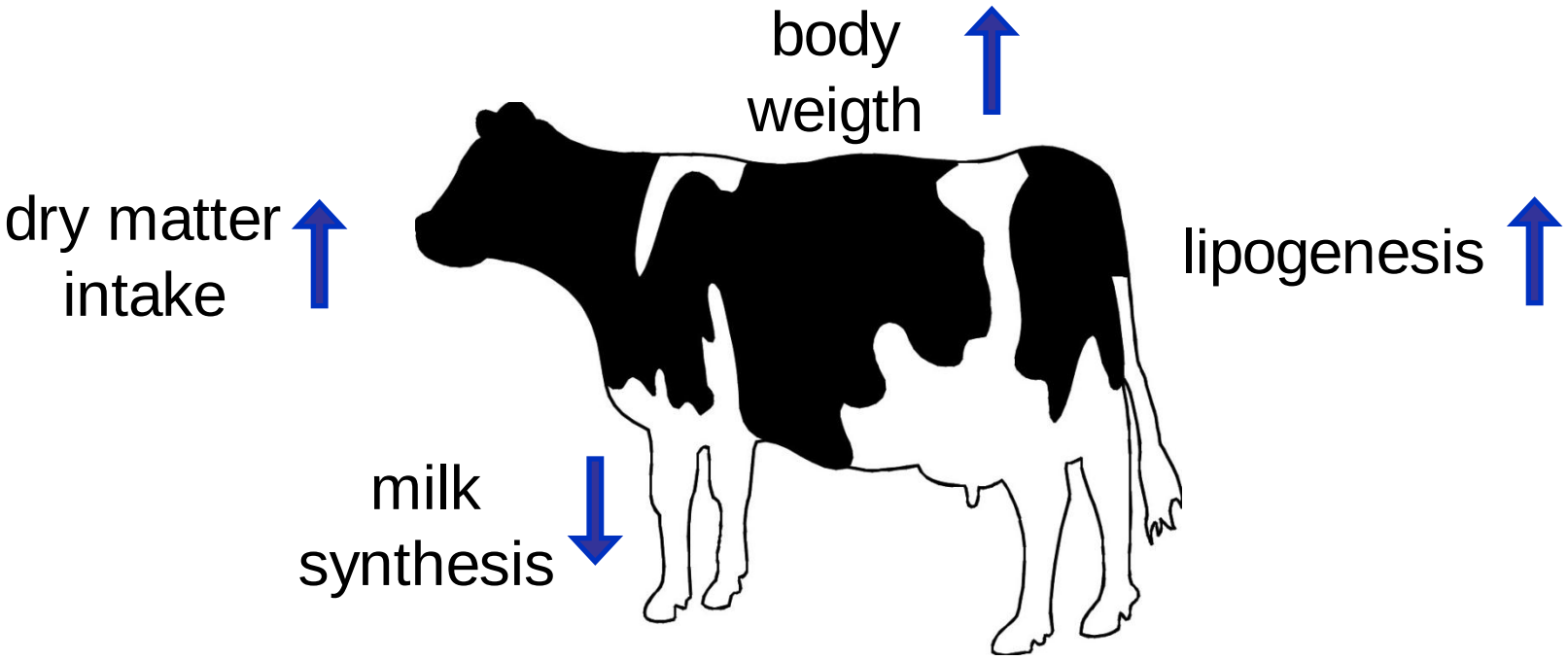


→ increased susceptibility to metabolic disorders

→ compromised immune response (MALLARD ET AL. 1998) and reduced fertility (BUTLER & SMITH 1989)

High-yielding dairy cows

mid to late lactation



over-conditioned versus lean cows:

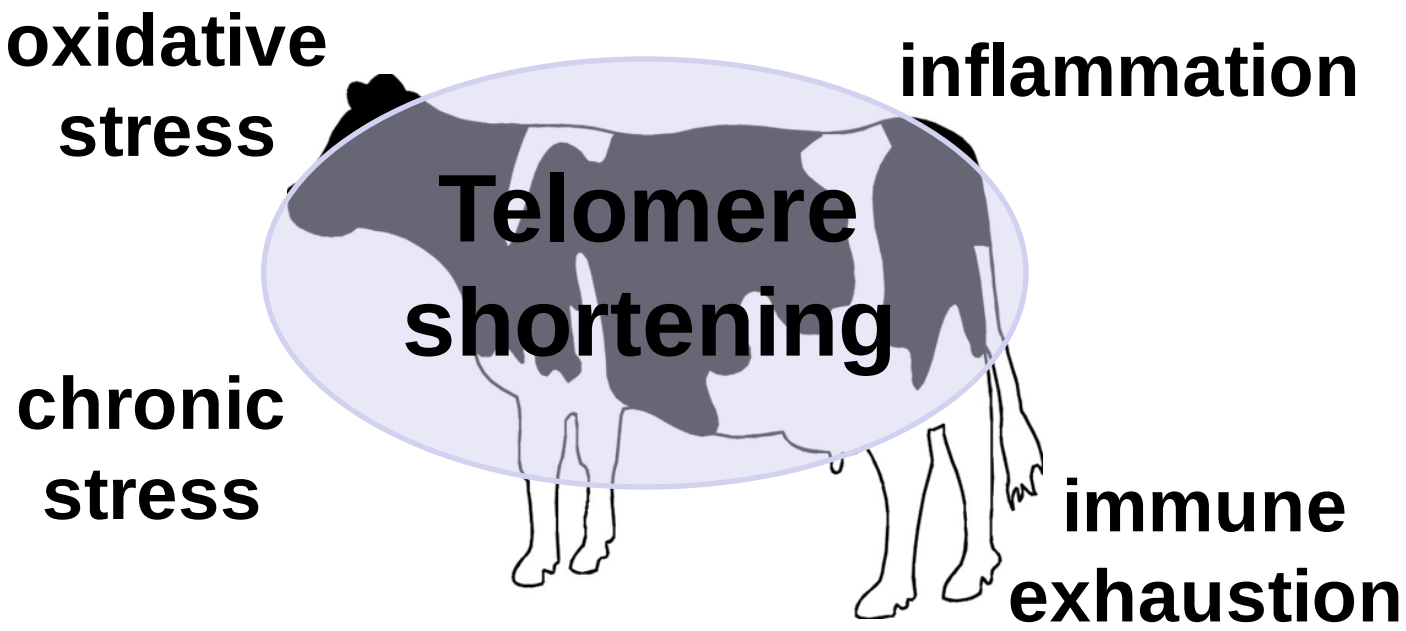
- greater incidence of health problems in the transition period

(reviewed by SORDILLO & RAPHAEL 2013)

Telomere length in dairy cows

→ chronic stress response

- telomeres respond to environmental changes and stressors (THEALL ET AL. 2013)



- reduced telomere length in cattle related to age and herd environment (BROWN ET AL. 2012)

Hypothesis

Telomeres shorten in bovine adipose tissue in association with increased oxidative stress.

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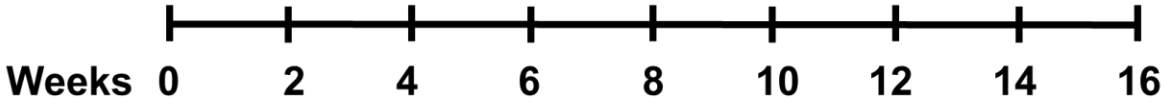
Experimental design

non-lactating; non-pregnant; 4-6 years; n=8



Sampling: AT biopsy + blood (week 0); AT biopsy + blood (week 14)

540 ± 20	Body weight (kg)	792 ± 29
2.31 ± 0.12	Body condition score	4.53 ± 0.14

Methods

serum samples

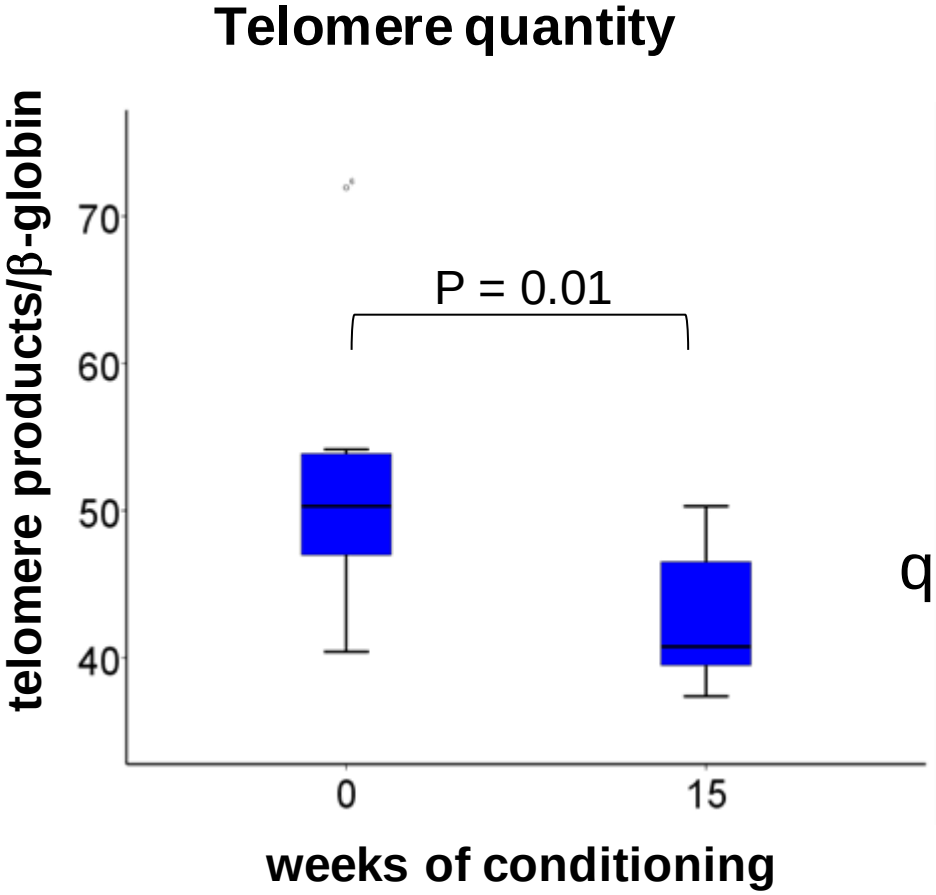
subcutaneous AT
Homogenization + DNA extraction

Derivates of reactive oxygen metabolites (dROM)

Telomere quantitiy

Data analysis:
Mann-Whitney-Test and Spearman correlation (SPSS 22)

Telomeres in bovine adipose tissue



Correlation between quantitiy of telomeres and dROM

r = -0.596; *P* = 0.015

LAUBENTHAL ET AL. 2014

Perspective

Telomeres:

- mirror chronic stress, environmental influences and health disorders
- biomarker for longevity in dairy cows

Catch-All™ buccal swab

Saliva

- non-invasive
- ideal medium to monitor long-term effects of metabolic stress in dairy cows