

Genomic prediction of heat tolerance from rumen sensor data in Australian Holstein cows

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AGRICULTURE VICTORIA



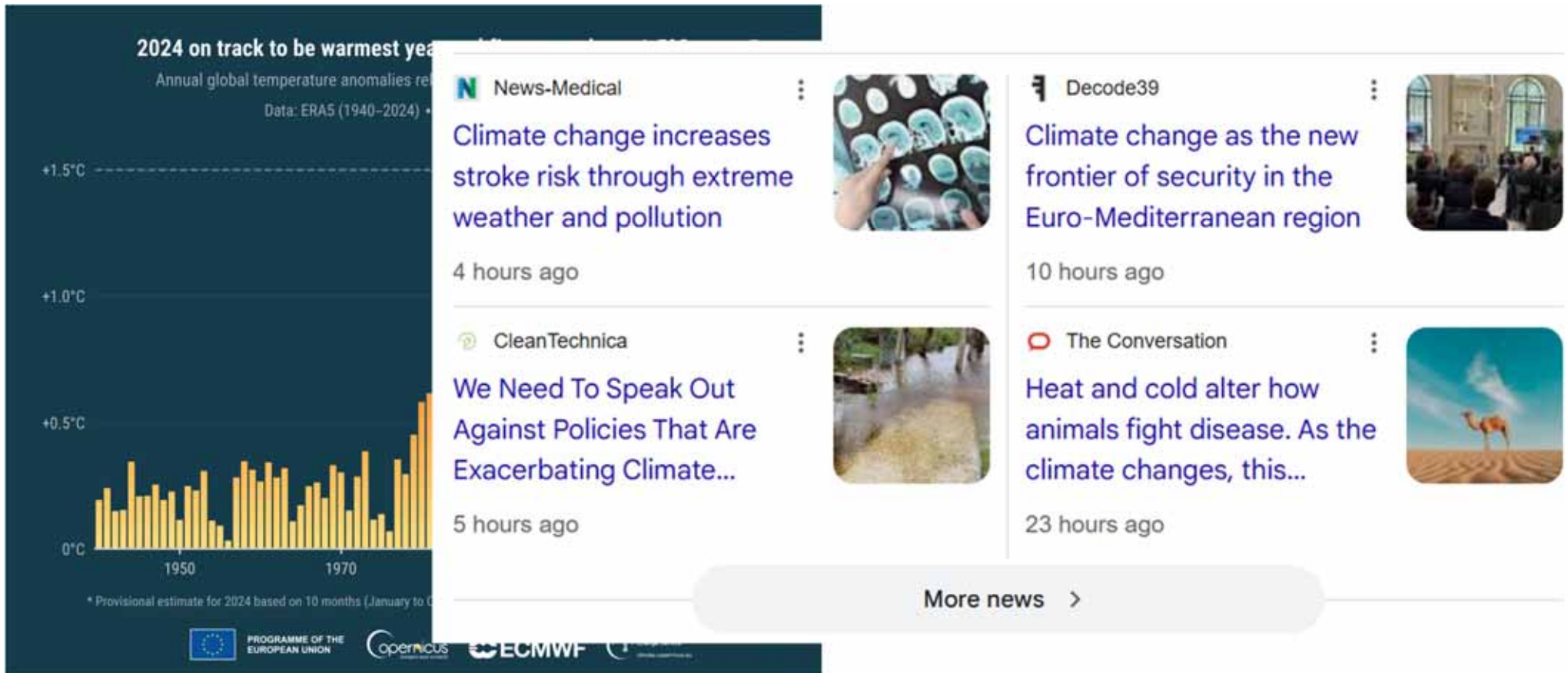
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Are we still talking about climate change?



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Methods

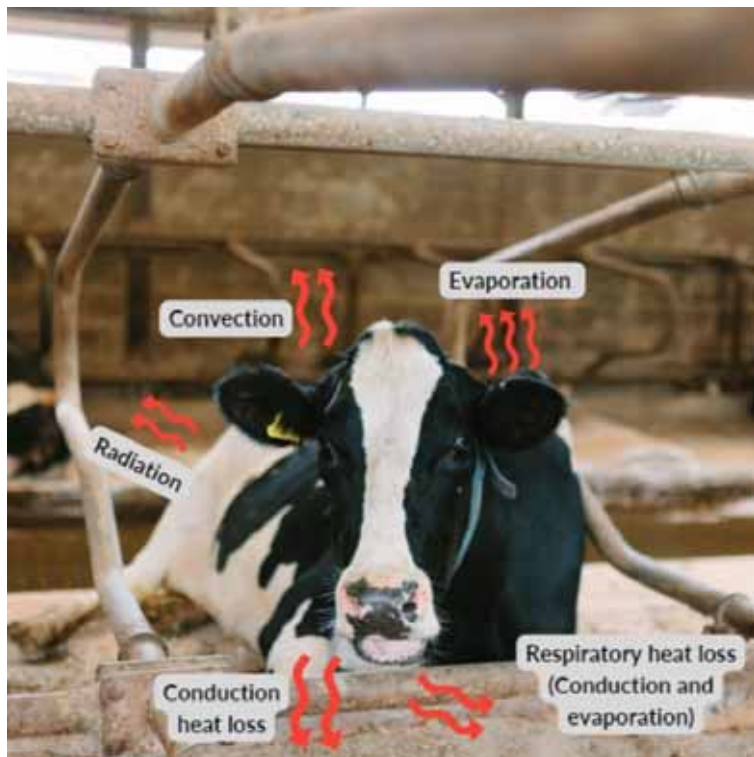
Preliminary Results

Discussion

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Heat tolerance is a complex biological trait



- Decreased feed consumption
- Reduced milk production
- Increased body temperature
- Increased respiratory frequency
- Increased sweating
- Behavioural changes

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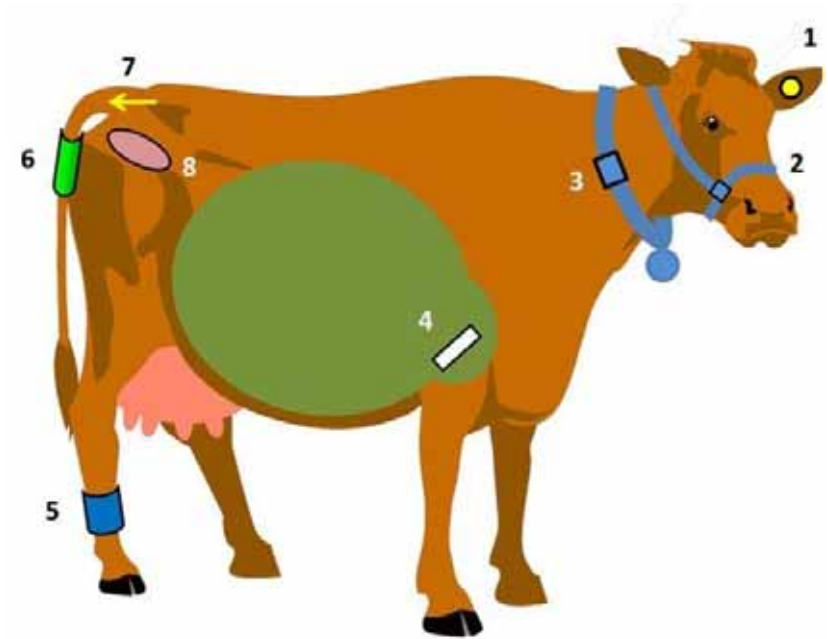
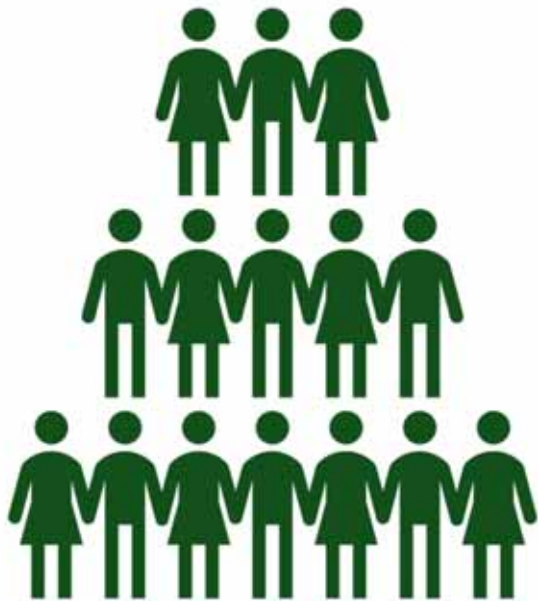
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Wearable sensors increase data access



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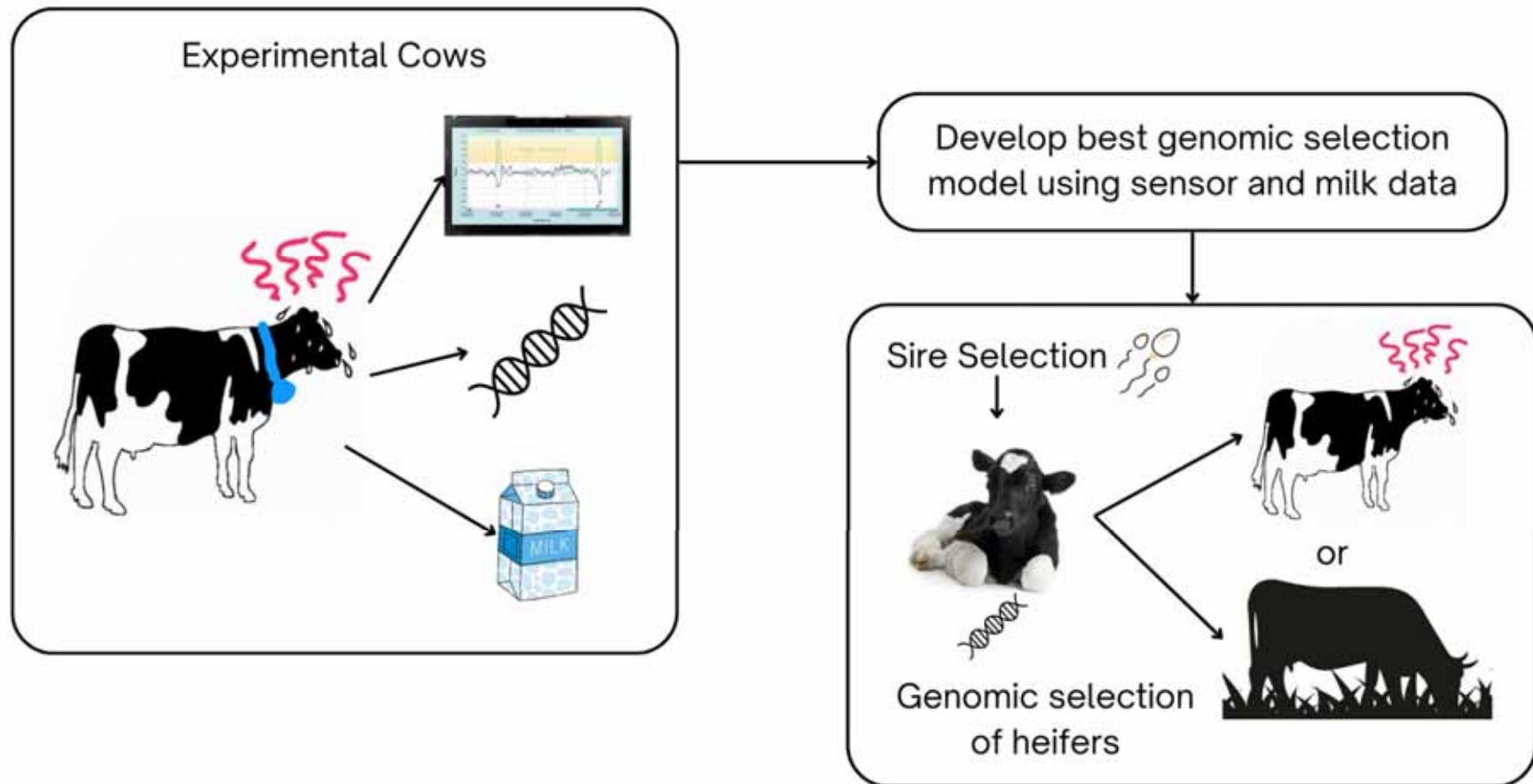
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Can sensors change how we select for heat tolerance?



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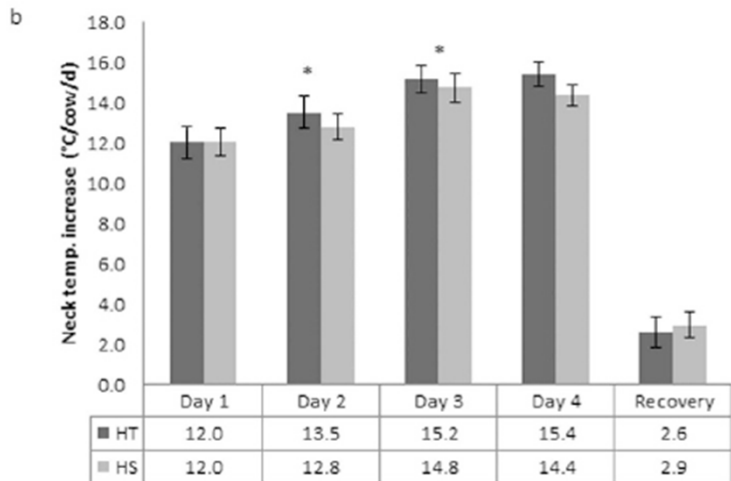
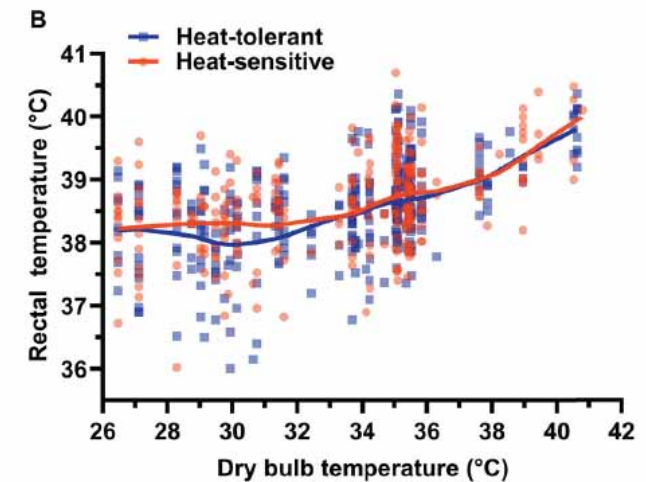
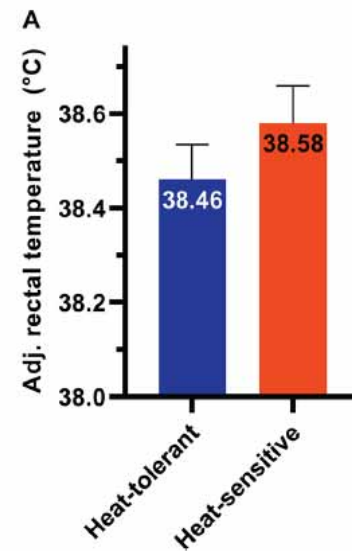
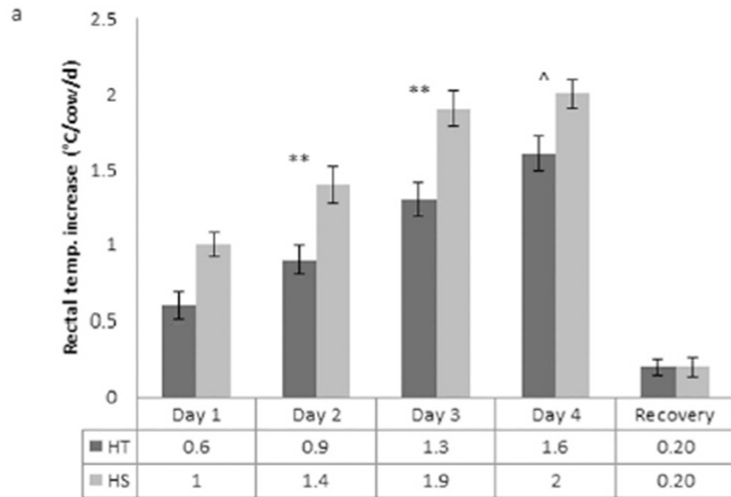
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Hypothesis: Reticulorumen temperature (exclusive of drinking events) can predict heat tolerance in dairy cattle.

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Dairy Up – University of Sydney Collaboration



DairyUP
Unlocking potential



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Data

- 2 Victorian farms
- Grazing
- 372 cows (phenotyped)**
- 827 cows (genotyped)



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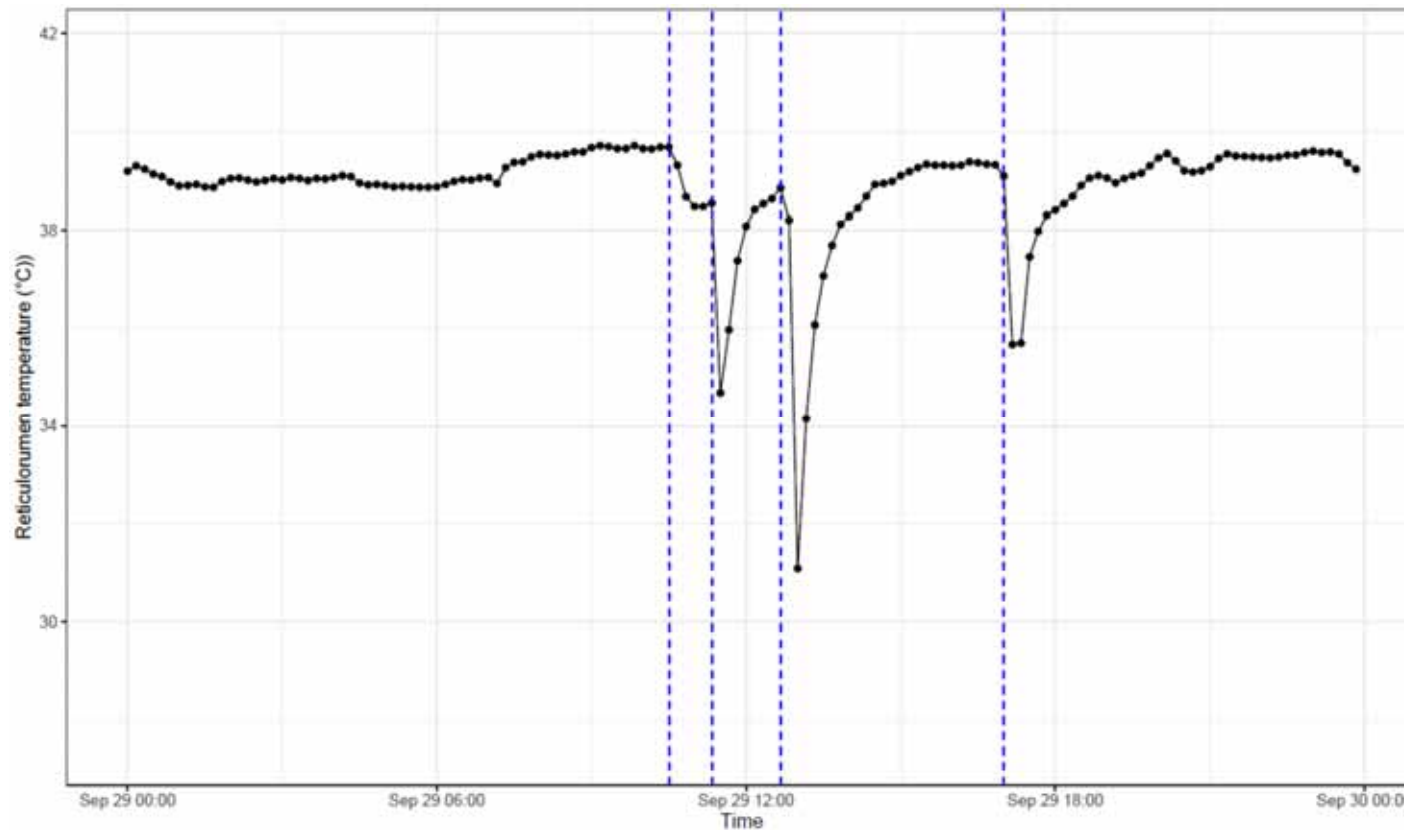
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Phenotype Development



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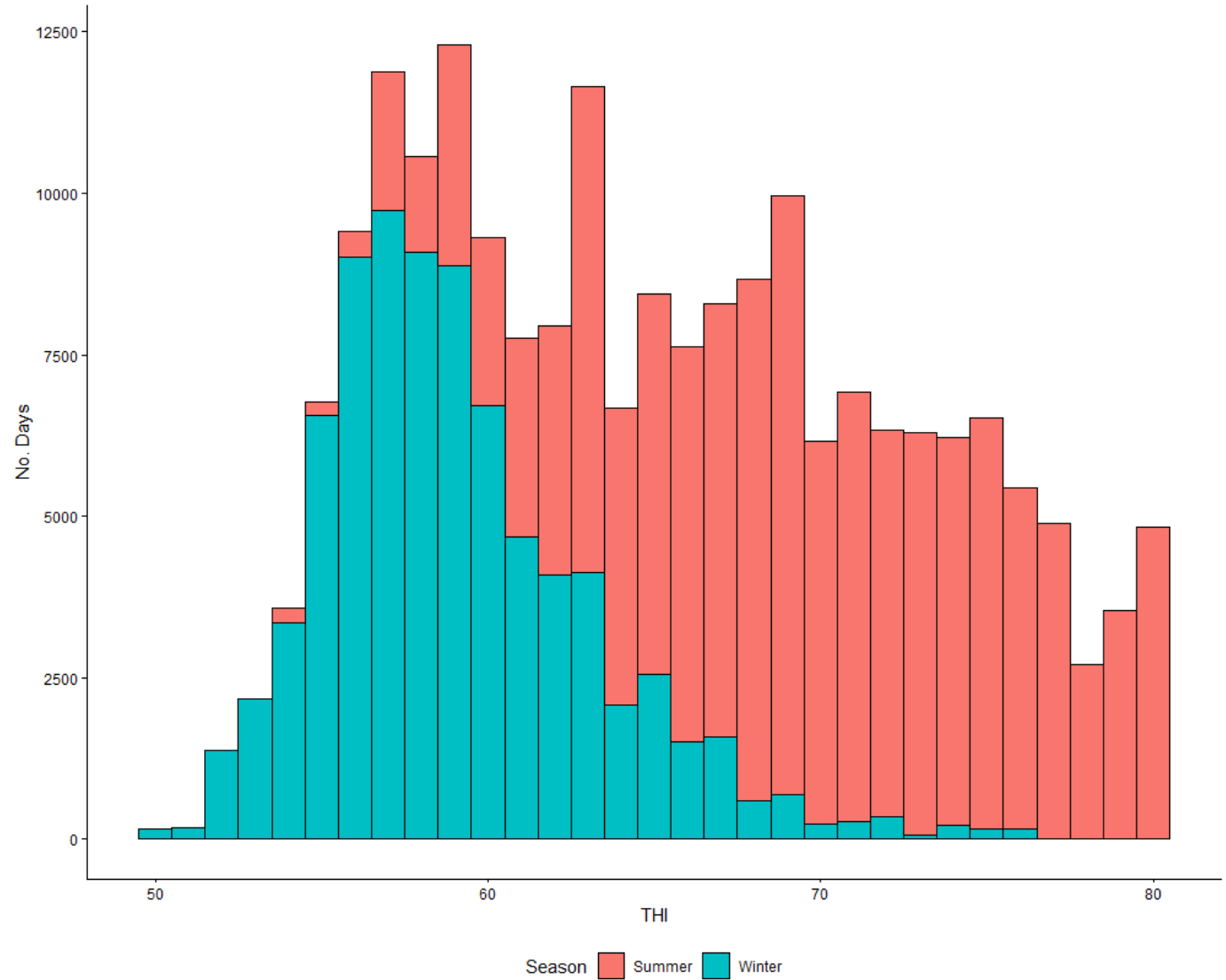
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Seasonal THI Frequency



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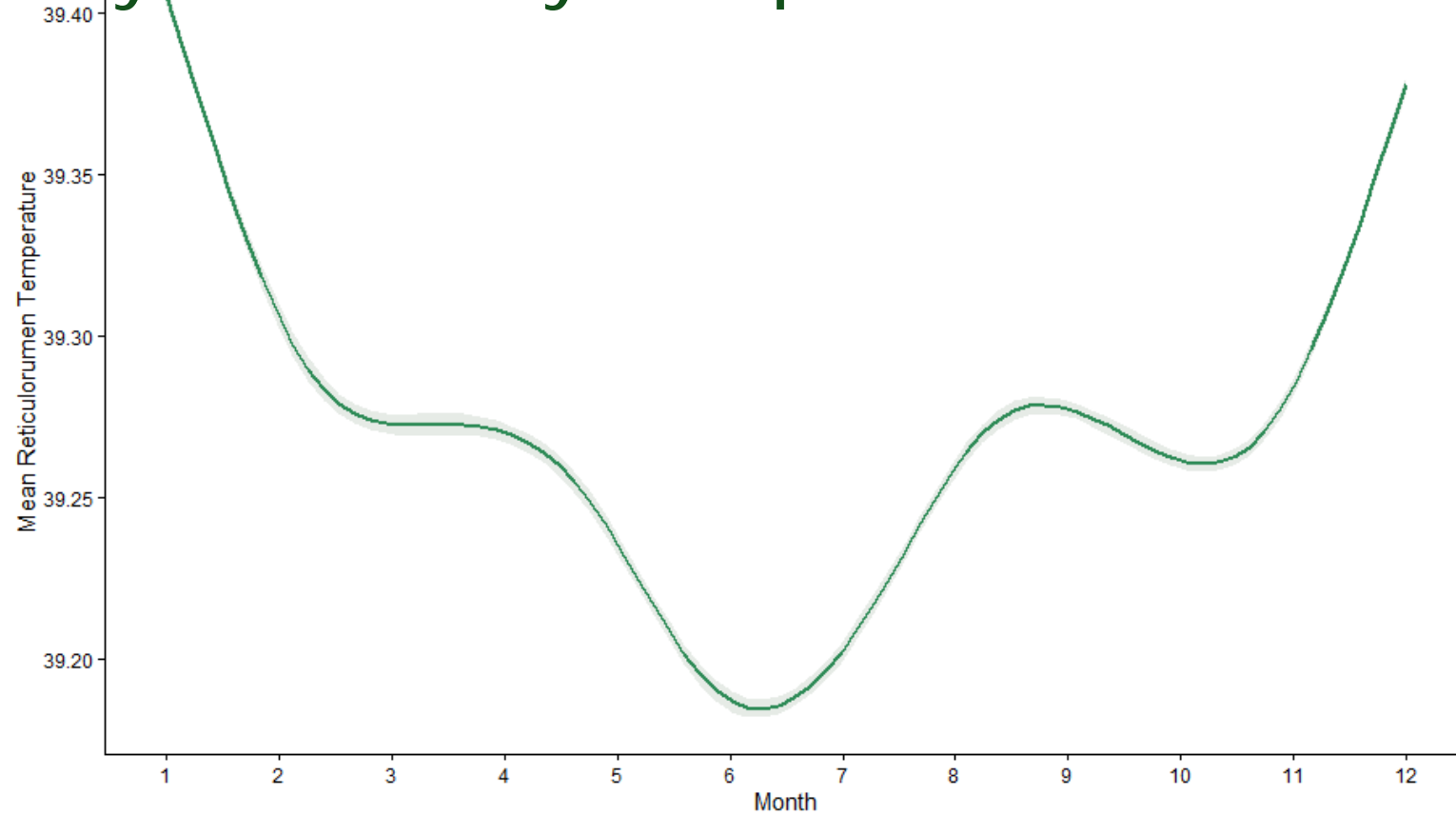
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Monthly Core Body Temperature



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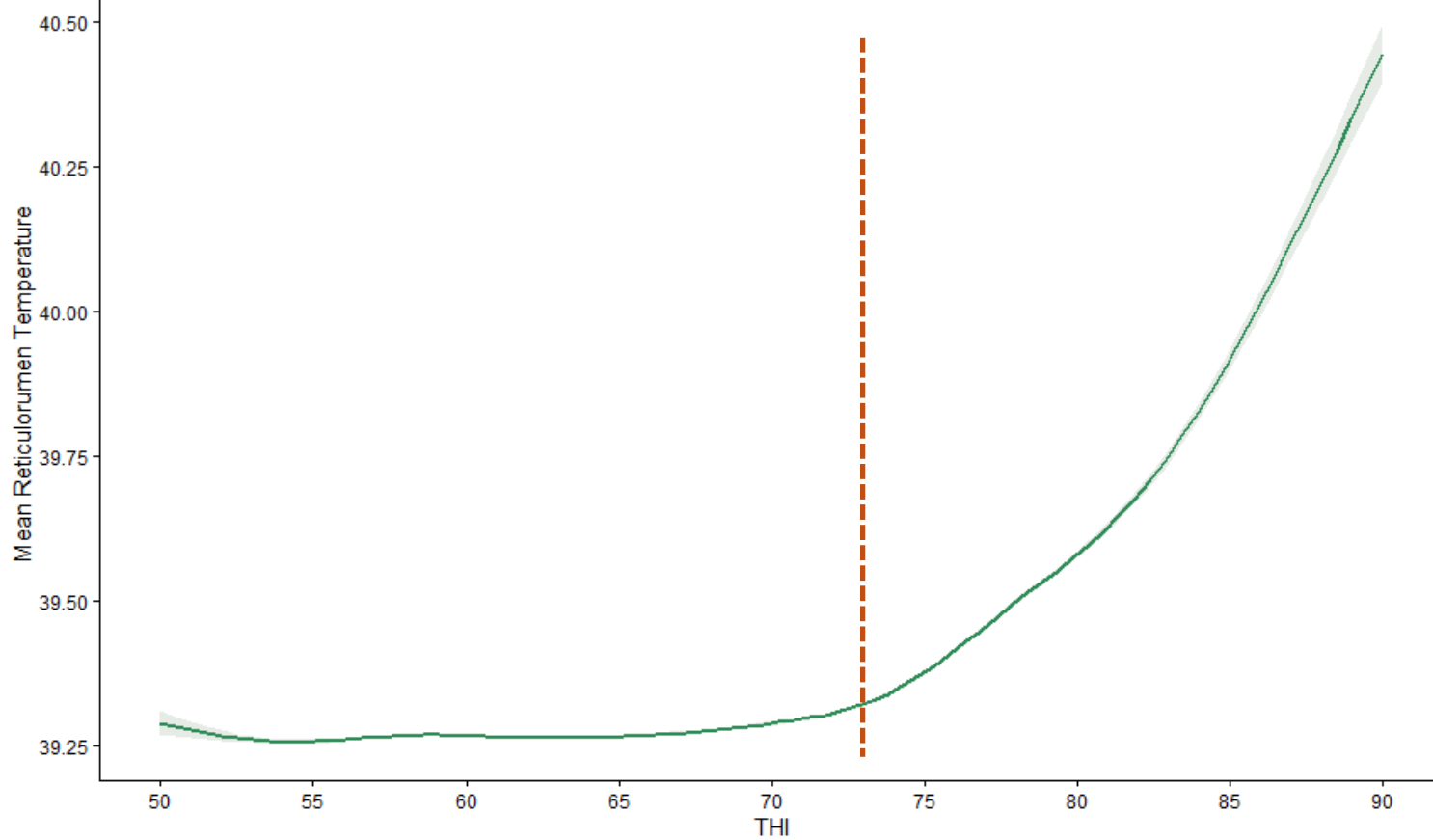
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THI Threshold



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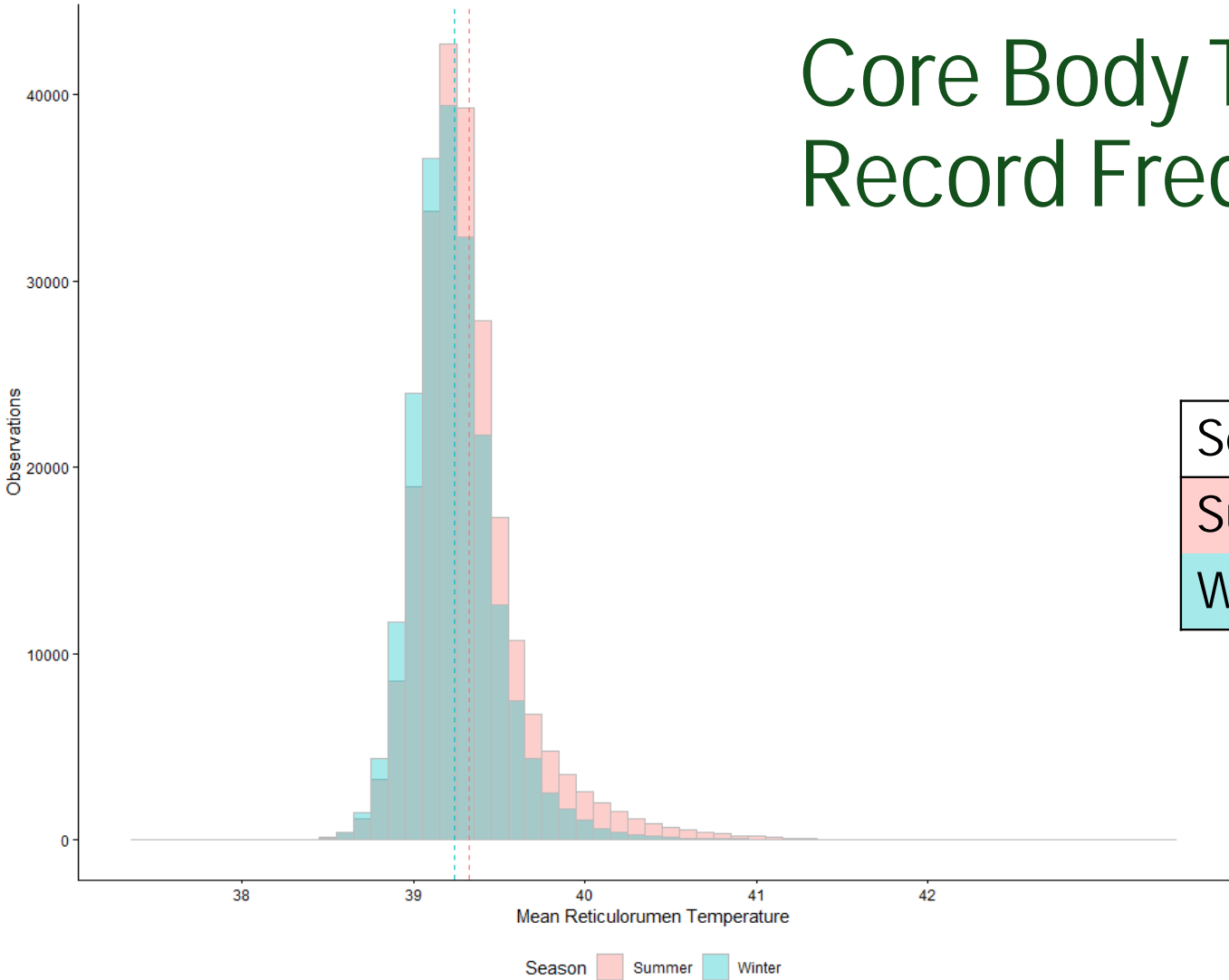
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Core Body Temperature Record Frequency



Season	Mean RR Temp
Summer	39.32 °C
Winter	39.24 °C

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Genetic Parameters (ASReml, v.4.2.1)

Model: $y = \text{Herd} + \text{Date} + \text{THI} + \text{Animal} + \text{ID}$

Fixed effects:

Herd (2 classes)

Date (1408 classes)

THI (daily THI covariate)

Random effects:

Animal (G Matrix)

ID (cow ID, repeated records)

Heritability | 0.17

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Limitations of sensor data

1010
1010

Forced binary



Private Algorithms



Recording
Frequency

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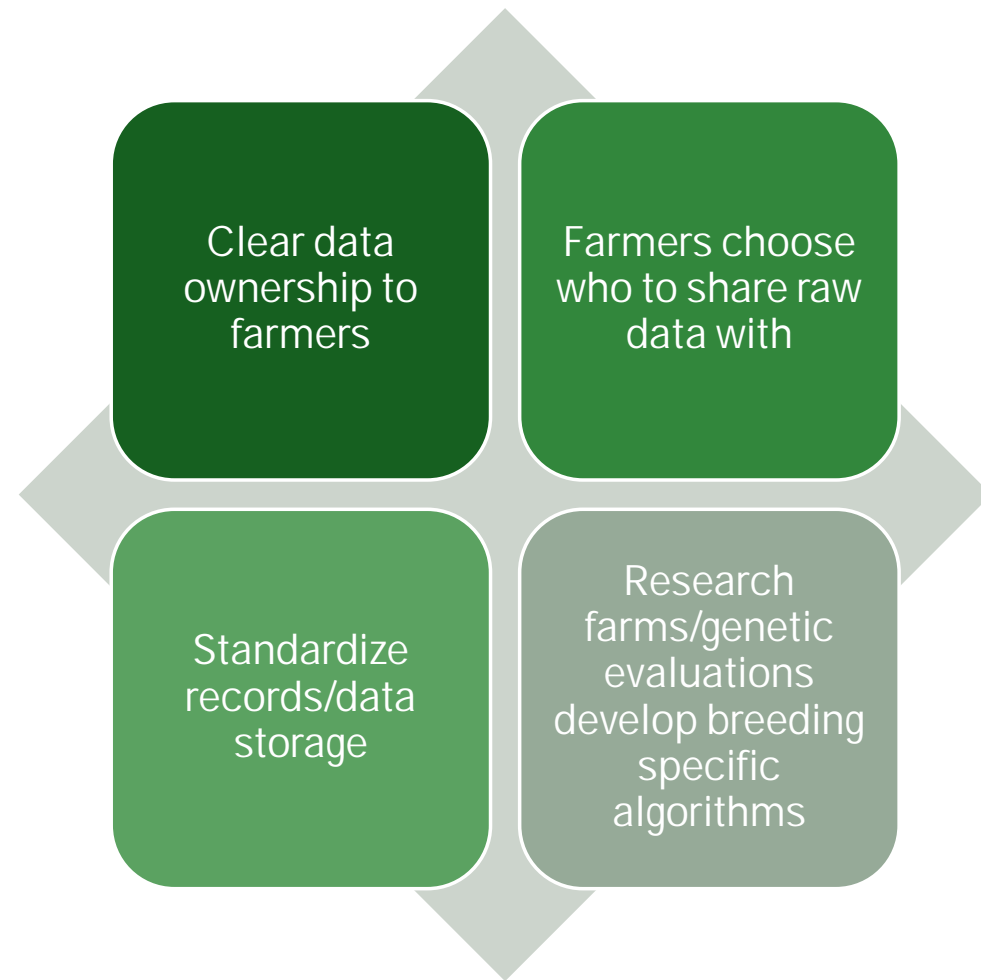
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How can we improve sensor phenotypes?



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Key Messages and Future Directions



Core body temperature is heritable



Sensor measured traits have potential to be used in genetic evaluations



Comparing core body temperature heat tolerance EBV to current Australian EBV

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THANK YOU
ANY QUESTIONS?

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DataGene (Leanne and Jason)

