Milk production and urine excretion patterns of dairy cows grazing chicory based pastures

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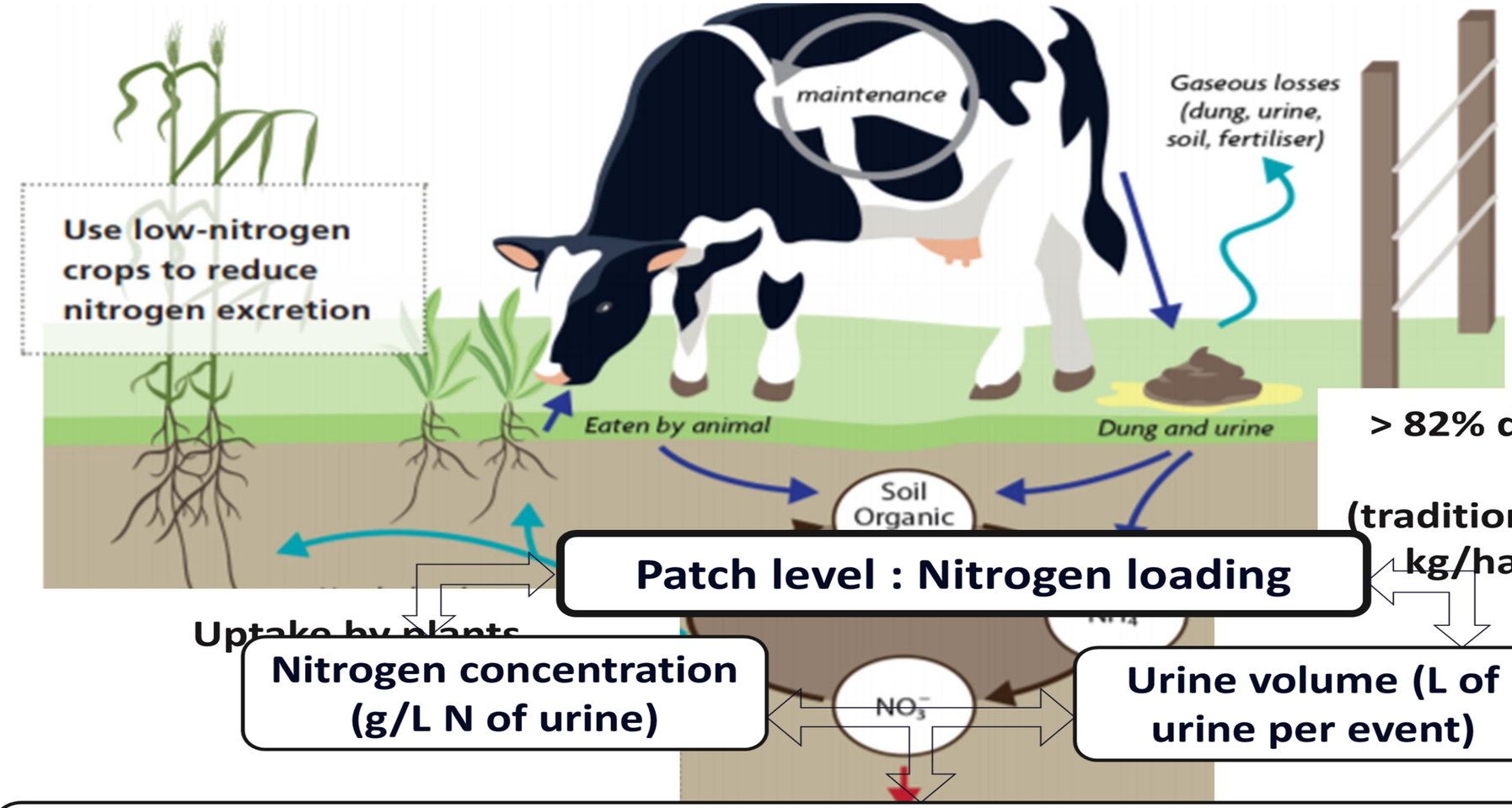
Why urination patterns matter?



> 82% discharged onto pasture (traditional pasture ~700 kg/ha N per event)

Patch level : Nitrogen loading

Nitrogen concentration (g/L N of urine)

Urine volume (L of urine per event)

High N loading results to an exponential increase in nitrate leaching rates

Why chicory??

- 2nd study in a series of experiments
- 1st study tested proof of concept that high moisture, herb diets could alter milk composition and reduce urinary N load via urine dilution

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Forage herbs as an alternative to ryegrass-white clover to alter urination patterns in grazing dairy systems

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RESEARCH ARTICLE

Previous

Grazed chicory, plantain or ryegrass–white clover alters milk yield and fatty acid composition of late-lactating dairy cows

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- Sole diets of chicory increased urination frequency and diluted N concentration in urine
- Proof of concept studies rarely reflect practices which are adoptable by farmers
- Designed the current study on the basis that environmental benefits would still be observed when chicory was offered at a lower proportion of the diet

OBJECTIVE

To investigate the effects of inclusion and time of chicory allocation on milk production and urine excretion patterns of mid-lactating dairy cows

Treatments and management

Chicory PM

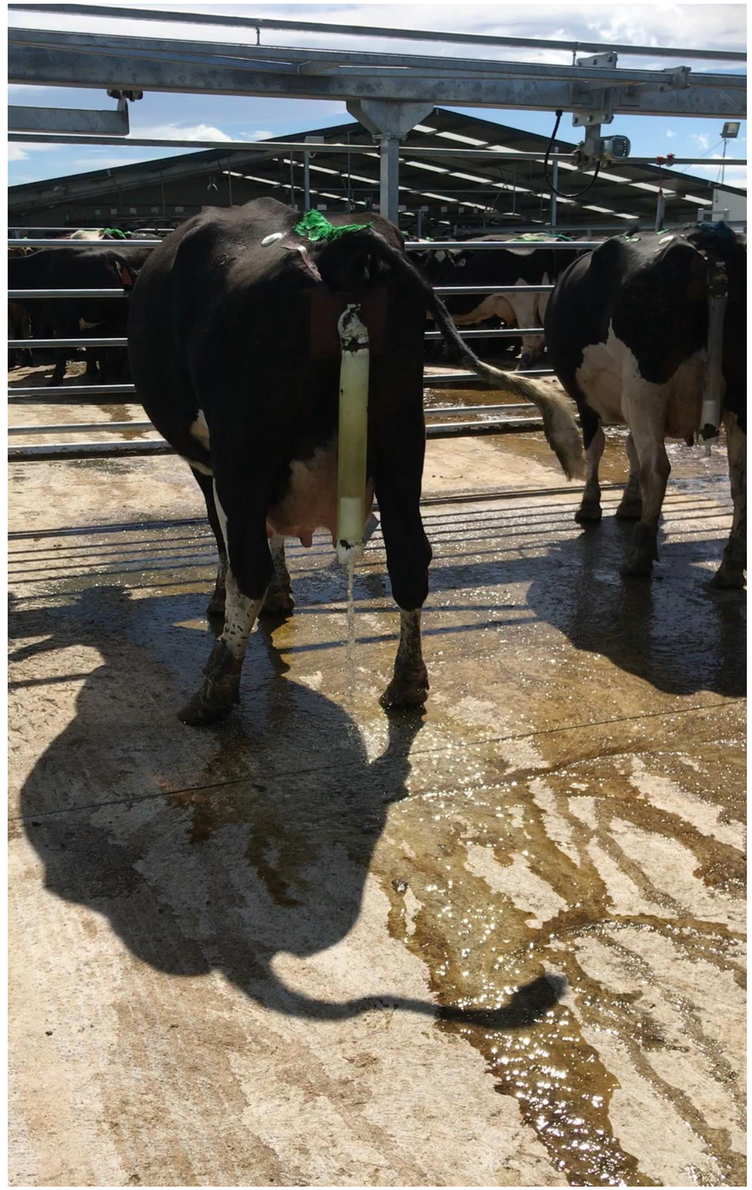
Chicory AM

Ryegrass Control

Morning milking

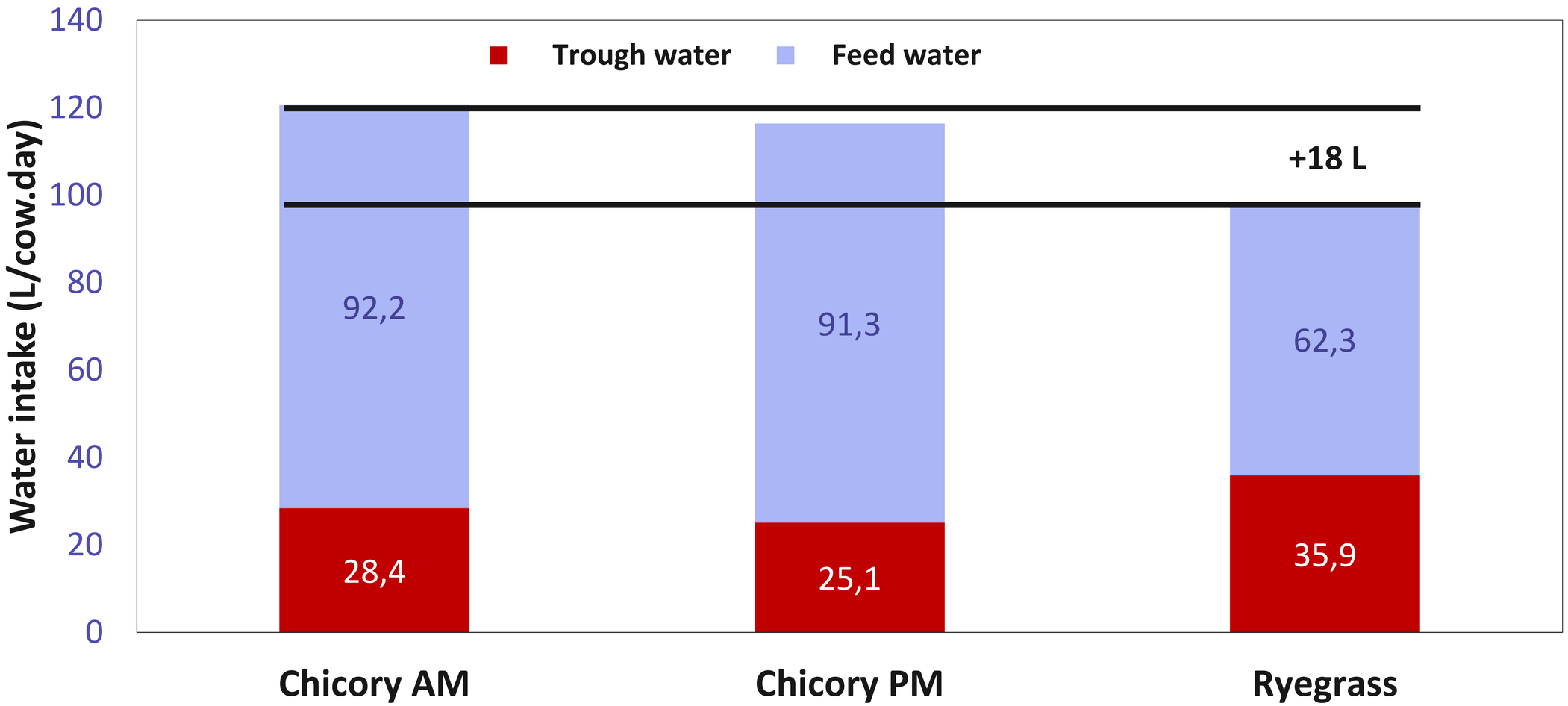
Afternoon milking

2130 hours

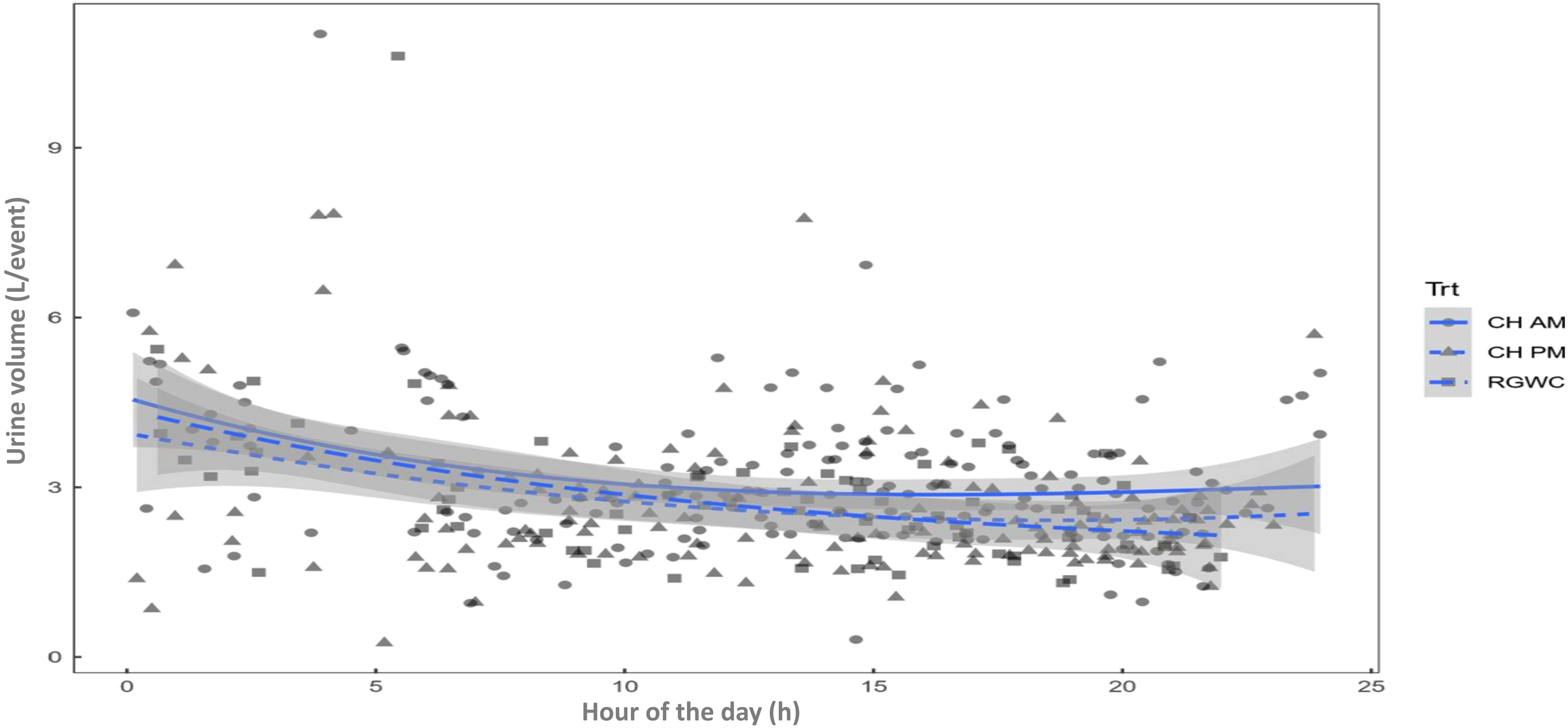


- Four- hourly urine spot sampling
- Attached a Sensor sleeve over the vulva
- Ventilated 3D printed mould secured by a glue

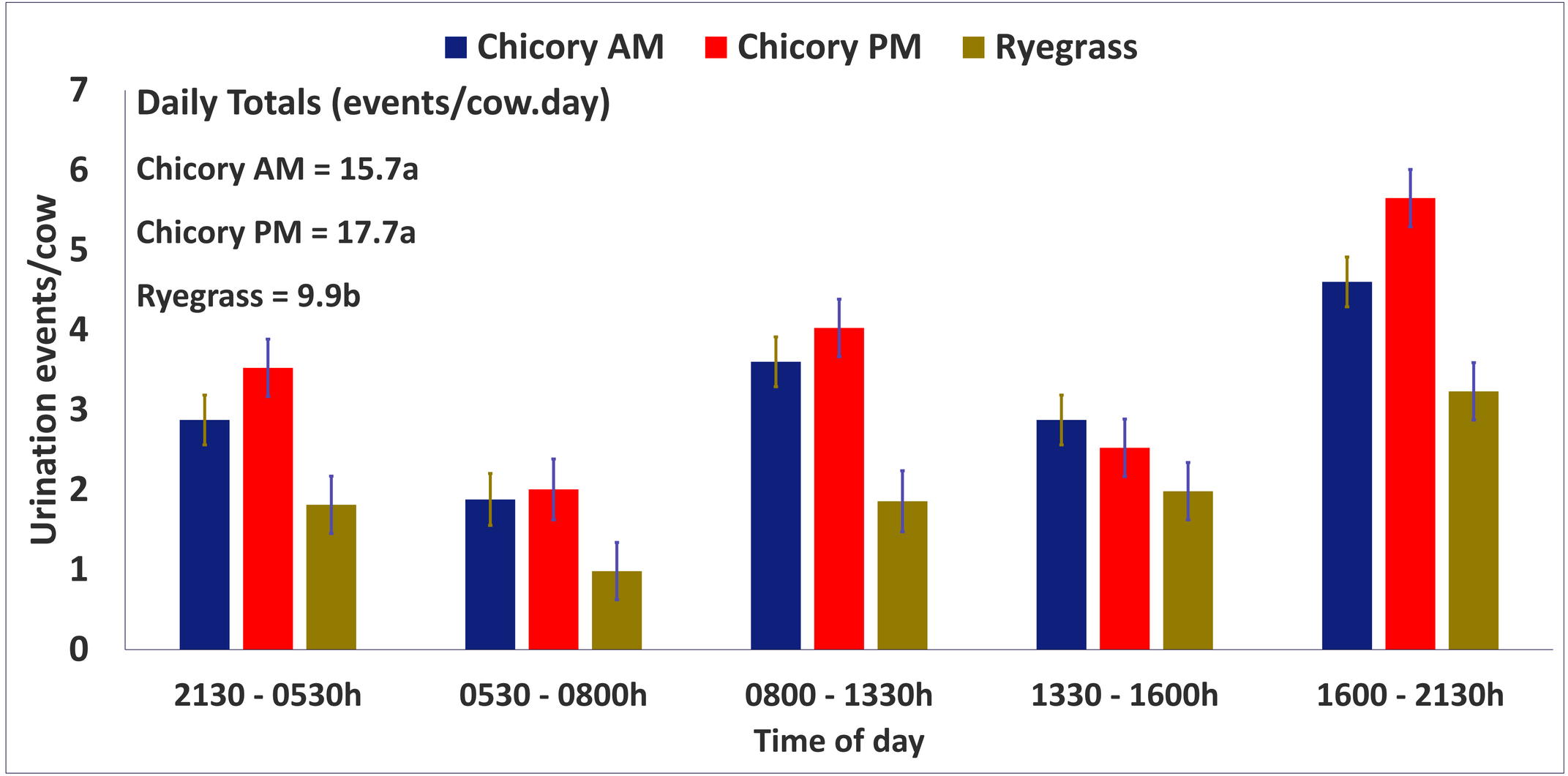
Cows fed chicory ingested more water than cows fed ryegrass



Urine volume per event was similar for all cows (3±0.31 L/cow.event)



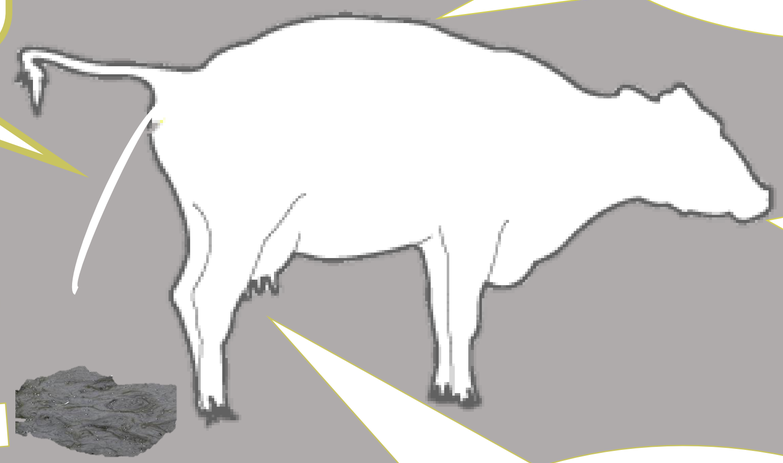
Cows on chicory urinated more frequently through out the day



Water balance (L/cow.day)

Urine volume
Chicory AM = 48.5a
Chicory PM = 48.1a
Ryegrass = 28.1b

Balance
Chicory AM = 15
Chicory PM = 10.2
Ryegrass = 8.2

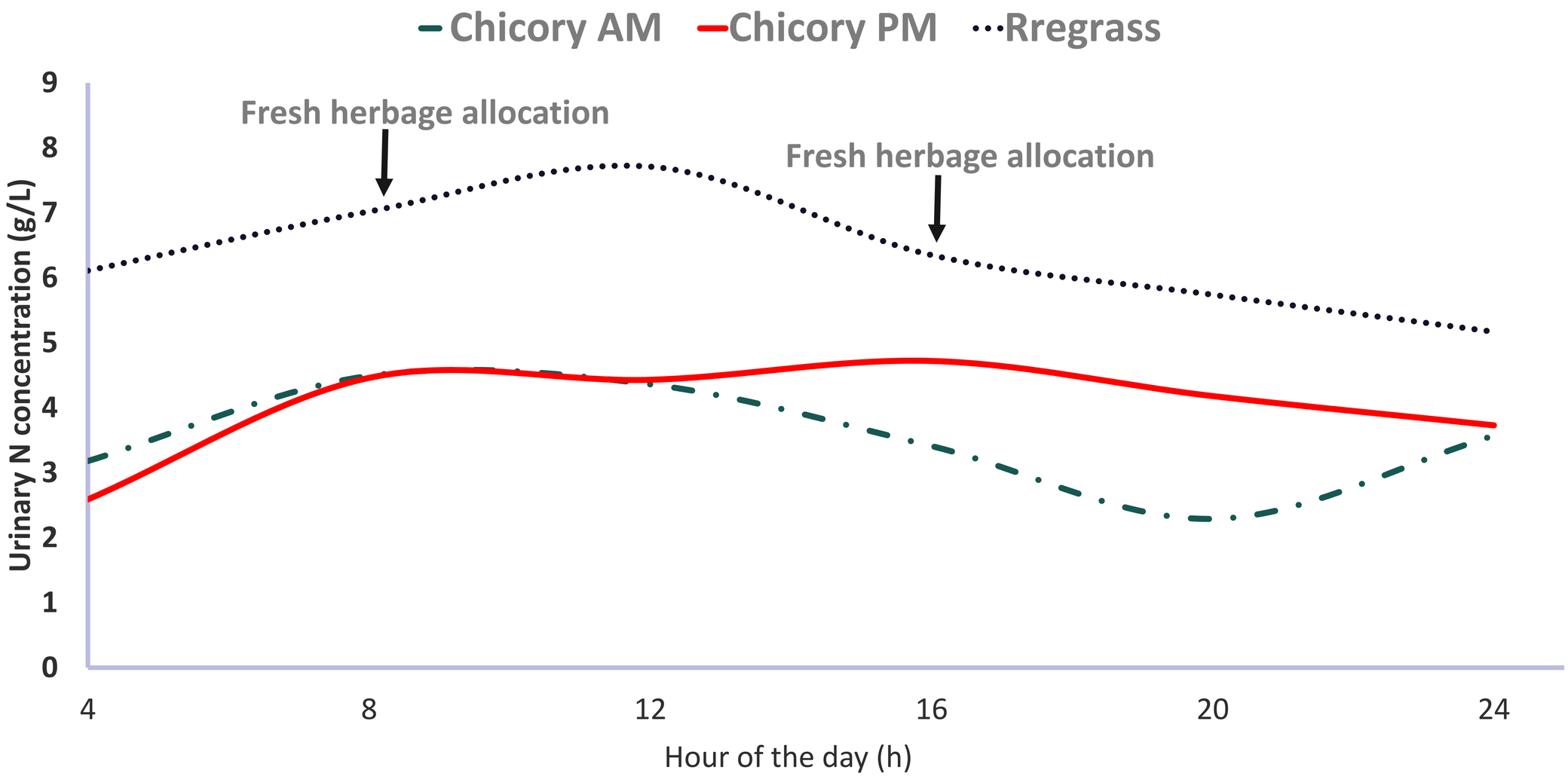


Faecal water
Chicory AM = 39.4
Chicory PM = 39.8
Ryegrass = 44.5

T.water intake (L/c.d)
Chicory AM = 121a
Chicory PM = 117a
Ryegrass = 98b

Milk water
Chicory AM = 18.1a
Chicory PM = 18.9a
Ryegrass = 17.2b

Chicory inclusion consistently reduced UN concentration



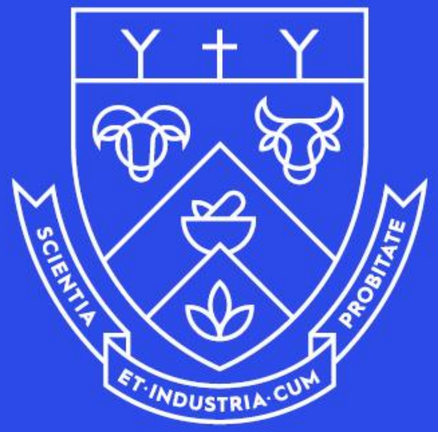
Chicory inclusion increased milk production

Item	Chicory AM	Chicory PM	Ryegrass	SEM
Total DMI (kg/cow.day)	16.3	16.1	16.6	0.25
Milk yield (kg/cow.day)	21ab	22a	19.9b	0.43
Milk solids (kg/day)	1.84b	1.96a	1.71c	0.03
Fat yield (kg/day)	1.04b	1.13a	0.97b	0.02
Protein yield (kg/day)	0.82a	0.83a	0.74b	0.02
Lactose yield (kg/day)	1.06ab	1.11a	1.01b	0.02

Discussion & Conclusions

Chicory inclusion

- Increased urination frequency & urine volume per day
  - High moisture content
  - High mineral content
- Reduced urinary nitrogen concentration
  - Expected to reduce nitrogen loading at patch level
- Increased milk production
- Greater milk response when chicory was allocated in the afternoon



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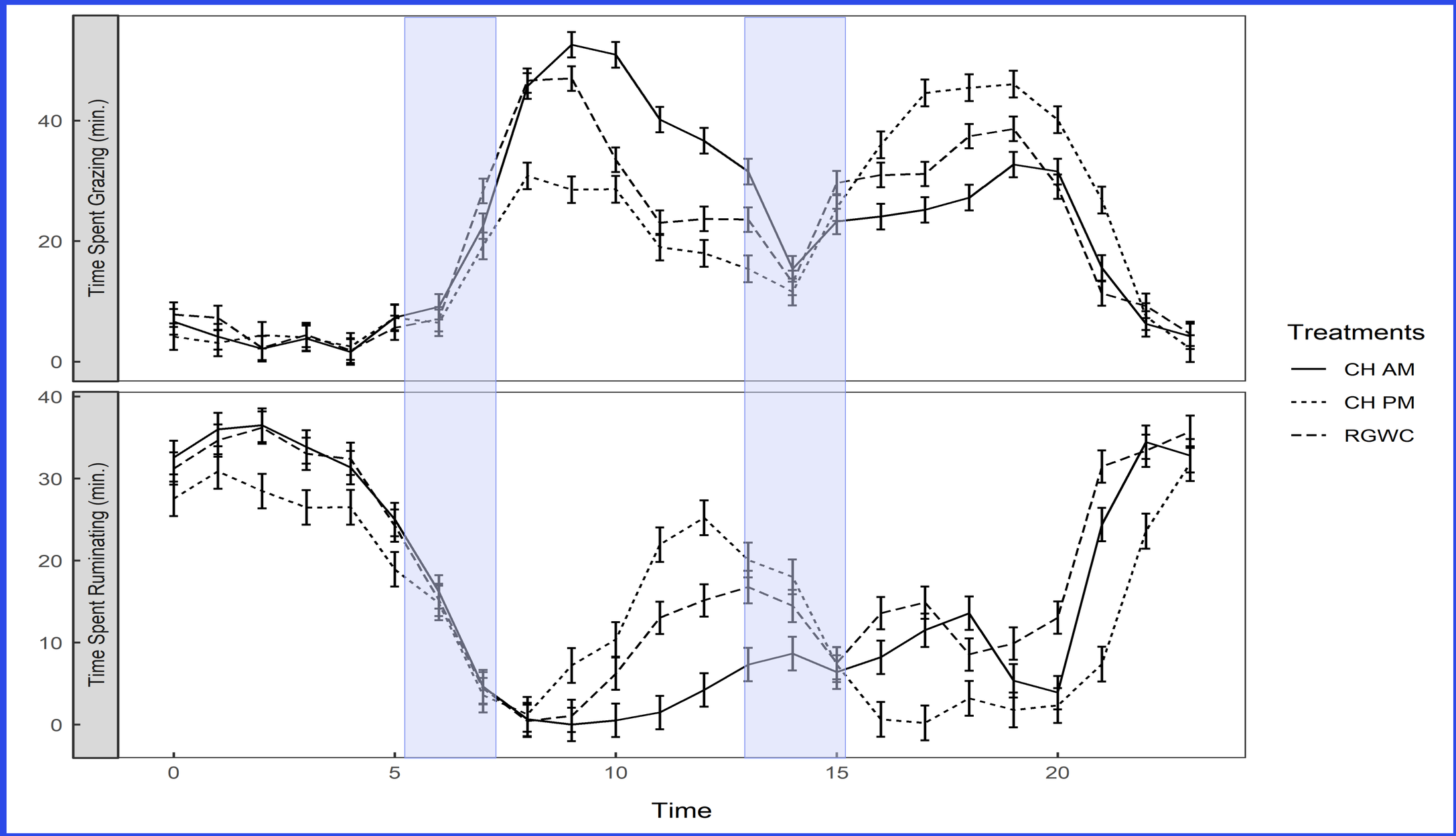
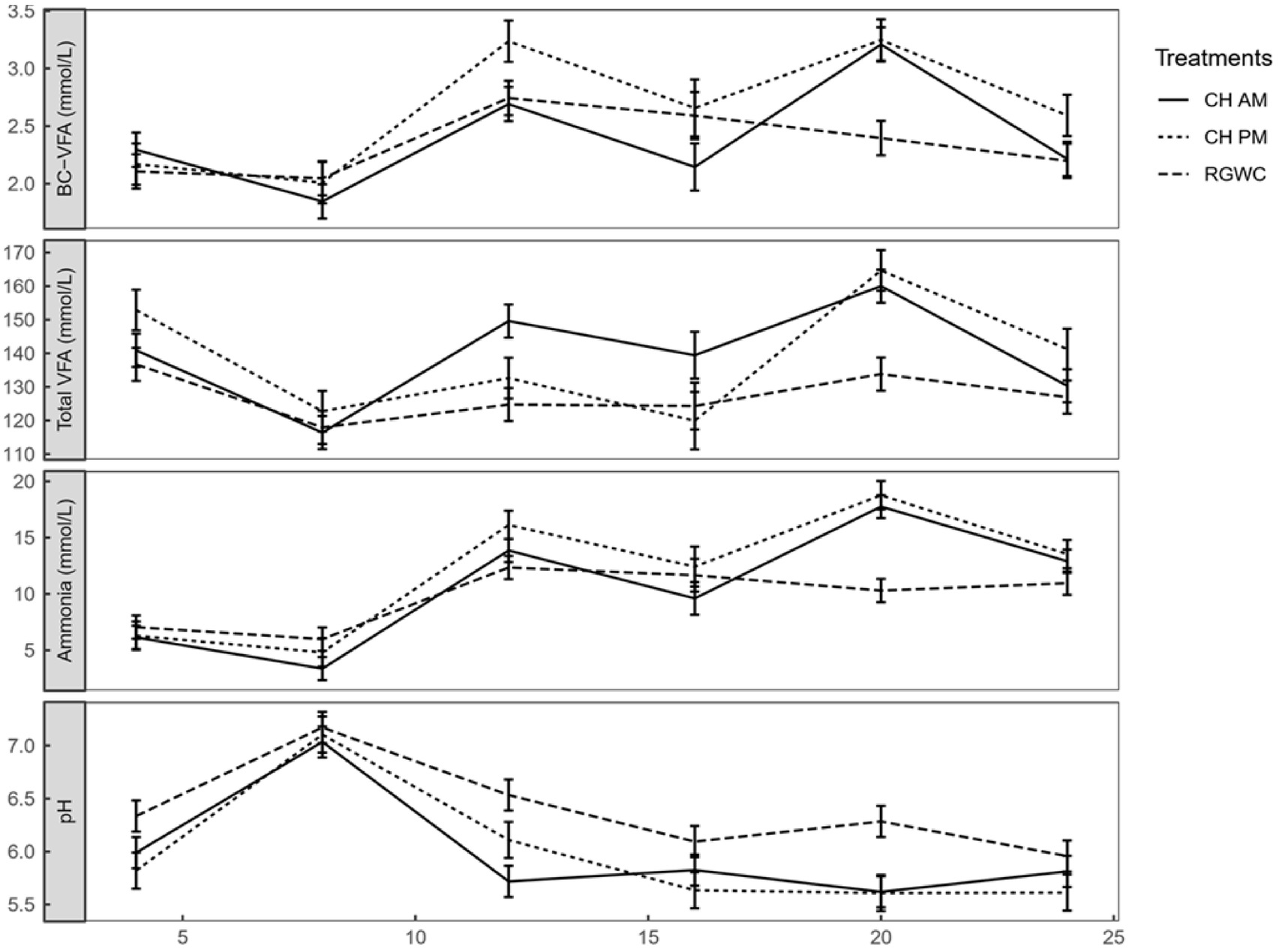

Time Spent Grazing (min.)
Time Spent Ruminating (min.)
0
20
40
10
30
0
5
10
15
20
Time
Treatments
CH AM
CH PM
RGWC


BC−VFA (mmol/L)
Total VFA (mmol/L)
Ammonia (mmol/L)
pH
Treatments
CH AM
CH PM
RGWC