Effect of extended photoperiod on ovulatory activity and milk yield in dairy goats

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Background

- Short day length is associated with reduced milk yield from dairy animals

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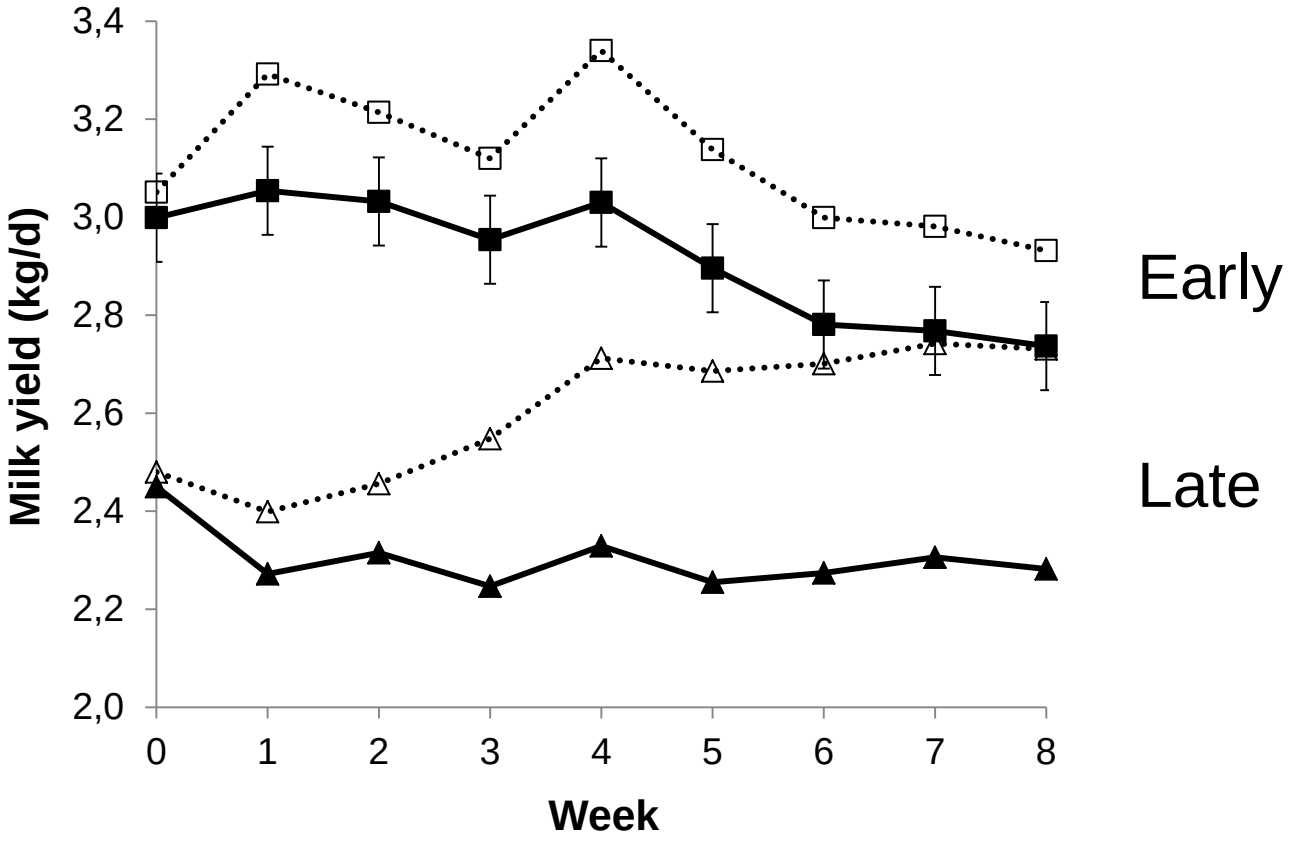
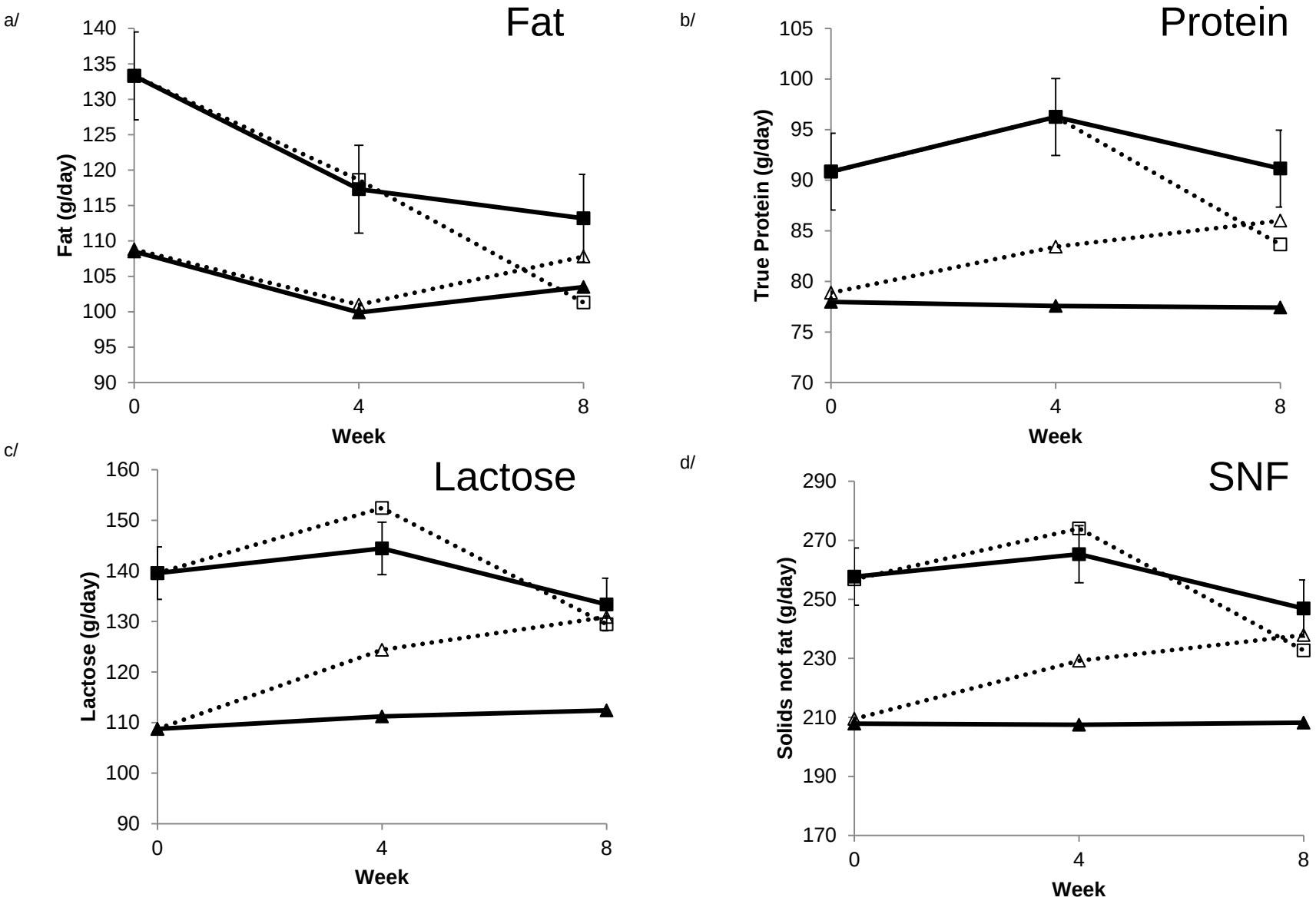
- Short day length is associated with reduced milk yield from dairy animals
- Extended photoperiod in winter/spring has been shown to increase milk production in lactating goats, particularly during late lactation.

Extended photoperiod increases milk yield in dairy goats



Relationships between milk and week relative to baseline (week 0), for does receiving natural lighting in early (■) or late (▲) lactation and does exposed to LDPP in early (□) or late (•) lactation.

(Russo et al 2013)



Relationships between milk a/ Fat, b/ Protein, c/ Lactose and d/ Solids not fat yield and week relative to baseline (week 0), for does receiving natural lighting in early (■) or late (▲) lactation and does exposed to LDPP in early (☐) or late (•) lactation.

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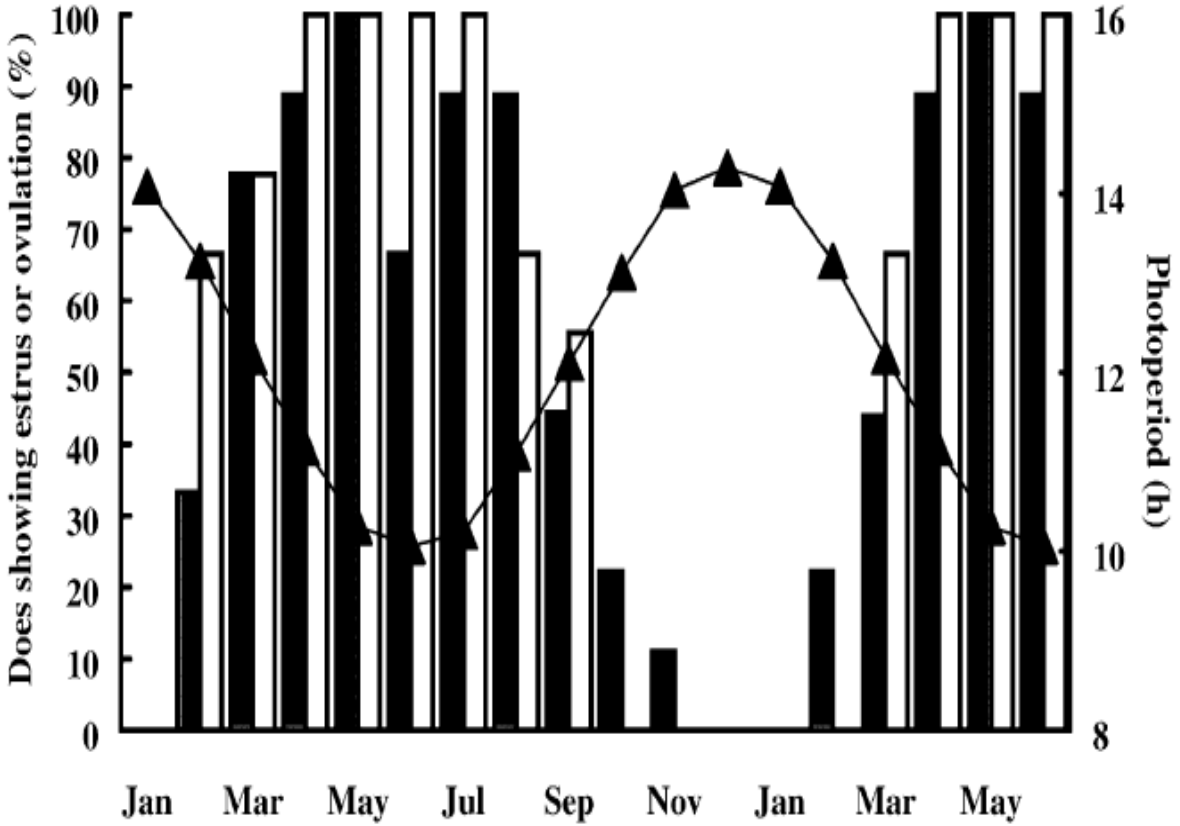
- Ovulation rate and display of oestrus decreases with increasing photoperiod

Ovulation and oestrus decreases with increasing photoperiod

▲ photoperiod % ovulation % oestrus



(Rivera et al 2003)

Background

- Short day length is associated with reduced milk yield from dairy animals
- Extended photoperiod in winter/spring has been shown to increase milk production in lactating goats, particularly during late lactation.
- Ovulation rate and display of oestrus decreases with increasing photoperiod
- Plasma progesterone can be used as a proxy for ovulation rate in synchronised lactating goats (preliminary study)

Question?

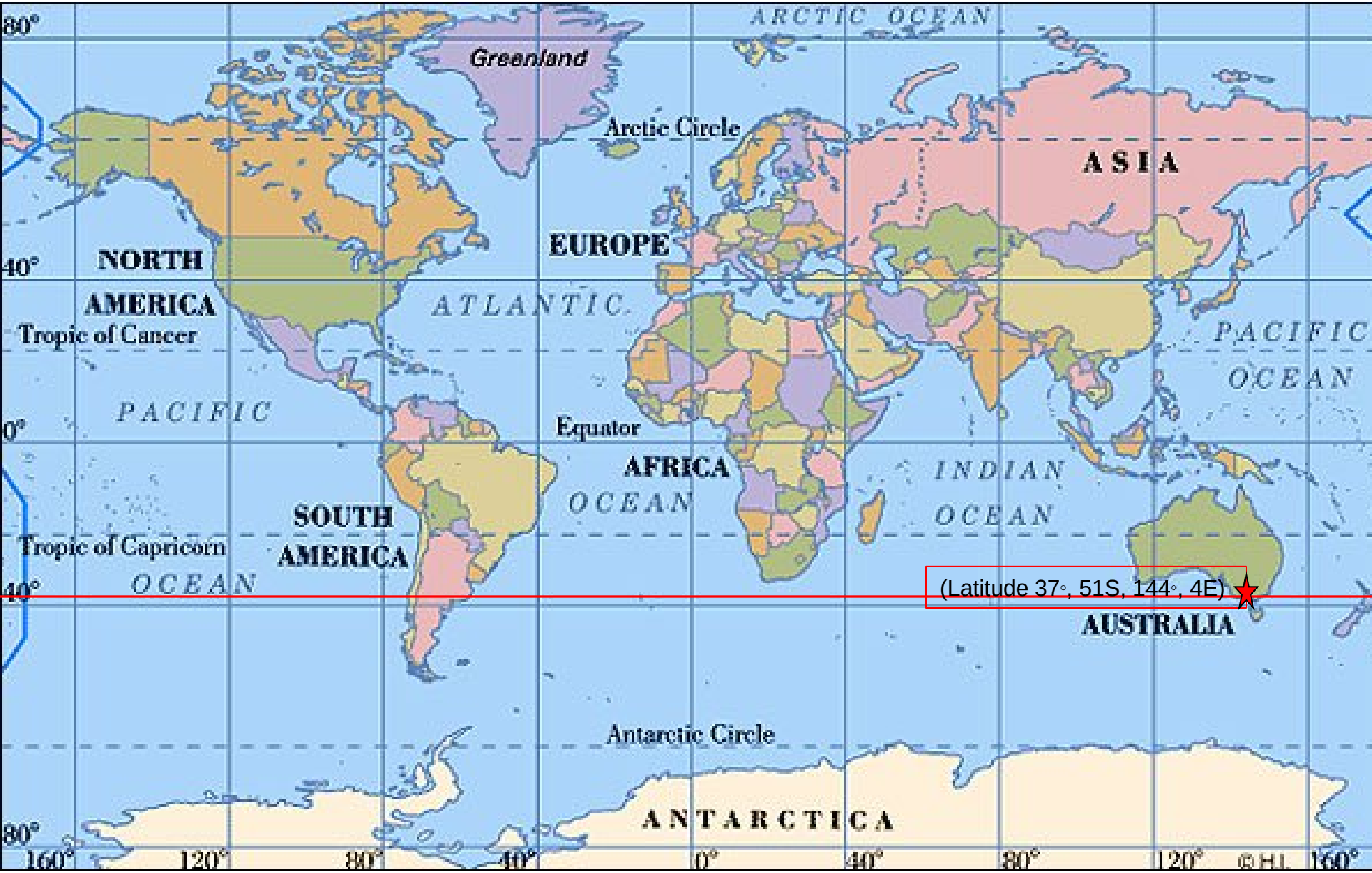
- Can extended photoperiod be used to improve lactation performance and control reproductive performance to allow year round milk/cheese manufacture?

Hypotheses

- That extended photoperiod will increase milk yield in lactating goats
- That extended photoperiod will increase persistence in milk yield in lactating goats
- That extended photoperiod will reduce ovulation rate in lactating goats
- That buck exposure will increase ovulation rate in lactating goats

Experimental design

- 122 non-pregnant lactating (110 days in milk) dairy goats (Latitude 37◦, 51S, 144◦, 4E) housed in open-sided sheds and milked twice daily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Greenland
Arctic Circle
ASIA
EUROPE
NORTH AMERICA
ATLANTIC
Tropic of Cancer
PACIFIC OCEAN
PACIFIC
Equator
AFRICA
INDIAN OCEAN
SOUTH AMERICA
Tropic of Capricorn
OCEAN
(Latitude 37◦, 51S, 144◦, 4E)
AUSTRALIA
Antarctic Circle
ANTARCTICA
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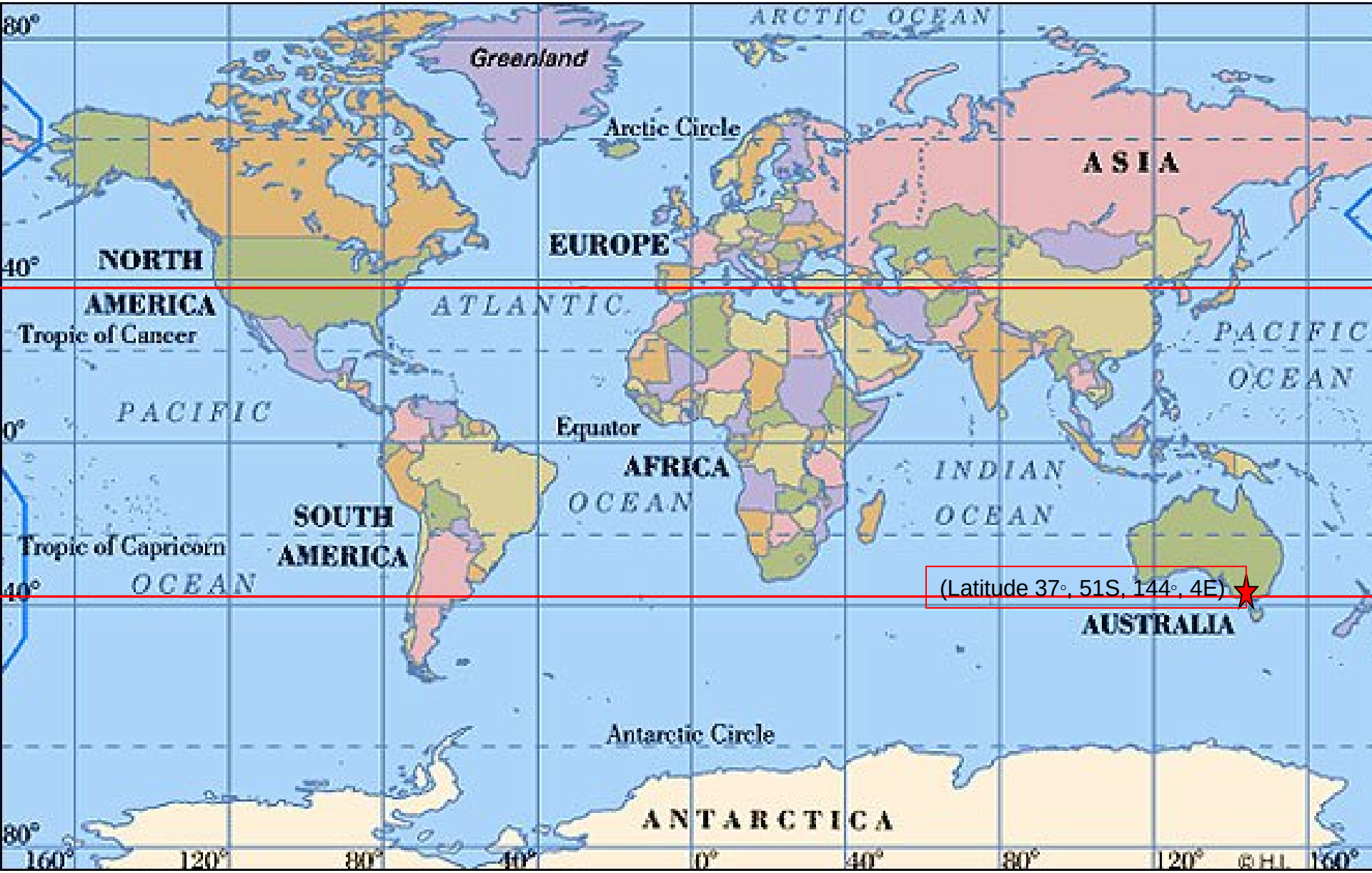
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AUSTRALIA
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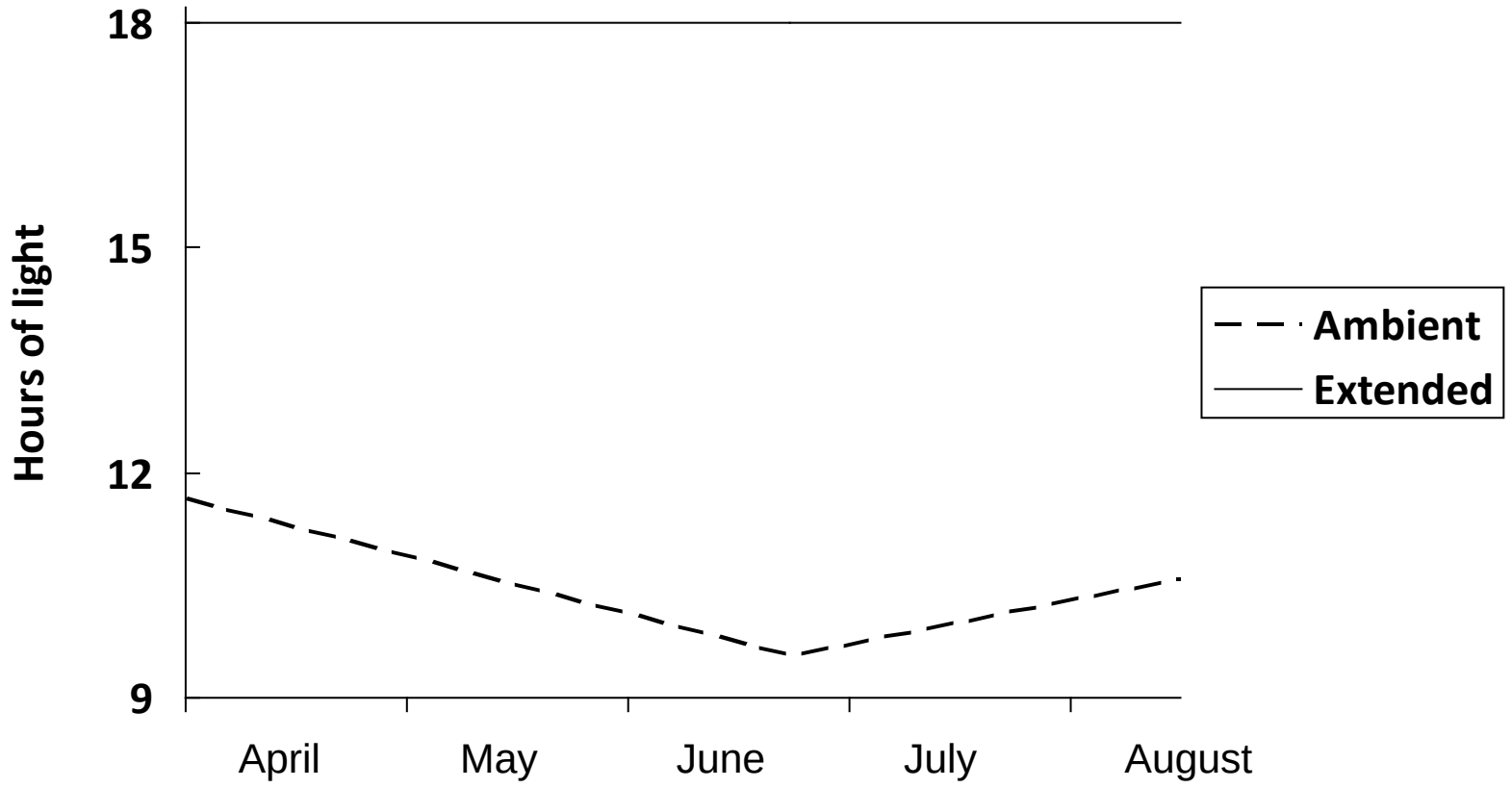
Experimental design

- 122 non-pregnant lactating (110 days in milk) Saanan dairy goats (Latitude 37◦, 51S, 144◦, 4E) housed in open-sided sheds and milked twice daily
- Study ran for 18 week from early April to mid August (autumn and winter in the Southern hemisphere).
- Goats fed ad-libitum a concentrate ration
- Control animals received natural lighting while animals in the extended photoperiod group received 18 hours light (>200 lux at eyelevel) and 6 hours dark

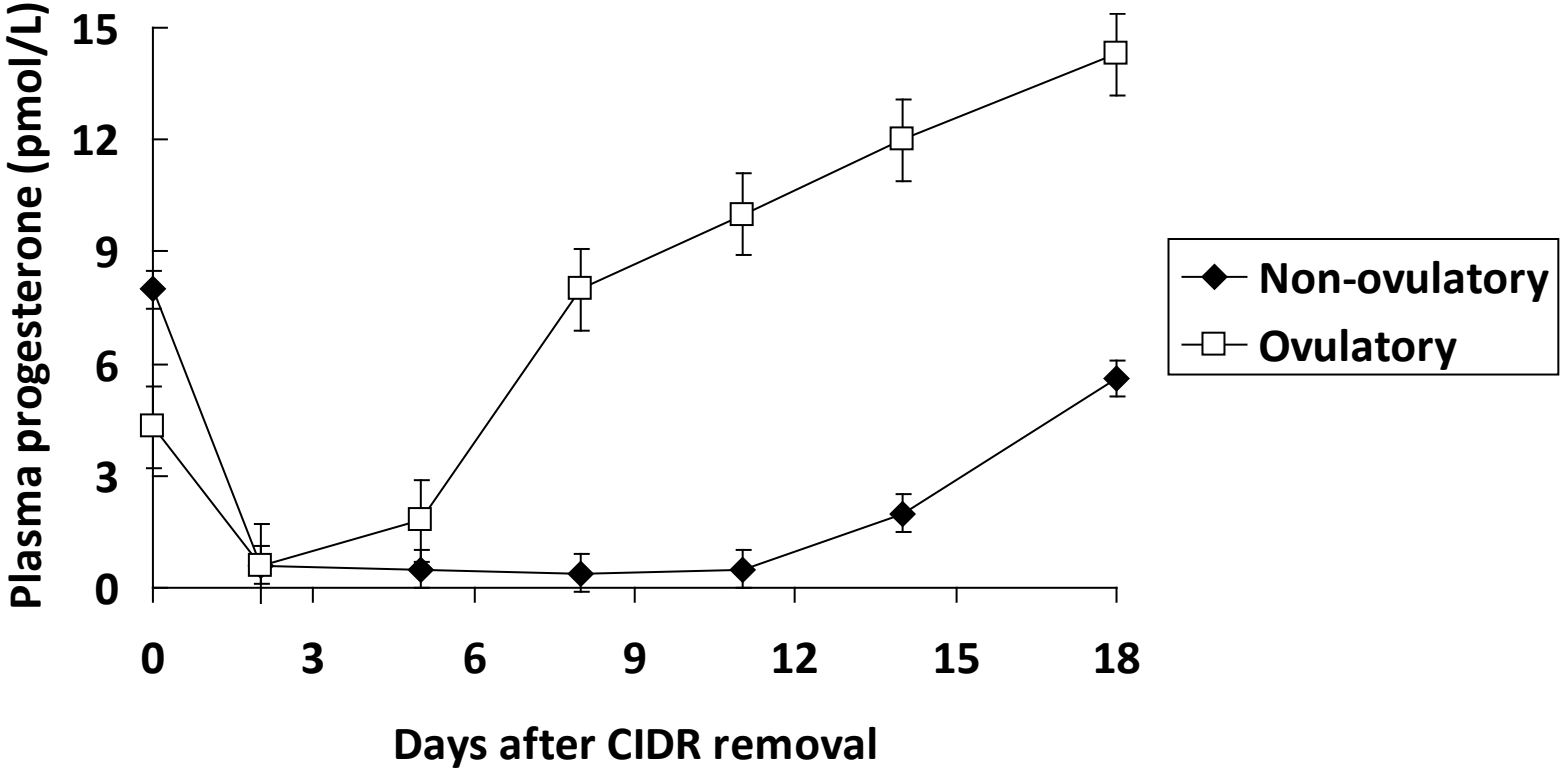
Experimental design (cont.)

- Does had a CIDR device inserted intravaginally for a period of 9 days each month prior to removal on the 1st June, 30th June and the 2nd August.
- At CIDR removal goats were injected with 0.5ml Prostaglandin analogue
- After CIDR removal does were randomly assigned each month to the presence or absence of a buck.
- CIDR and prostaglandin analogue treatment was used in an additional 10 does to determine threshold progesterone levels for ovulatory activity

Hours of light versus month

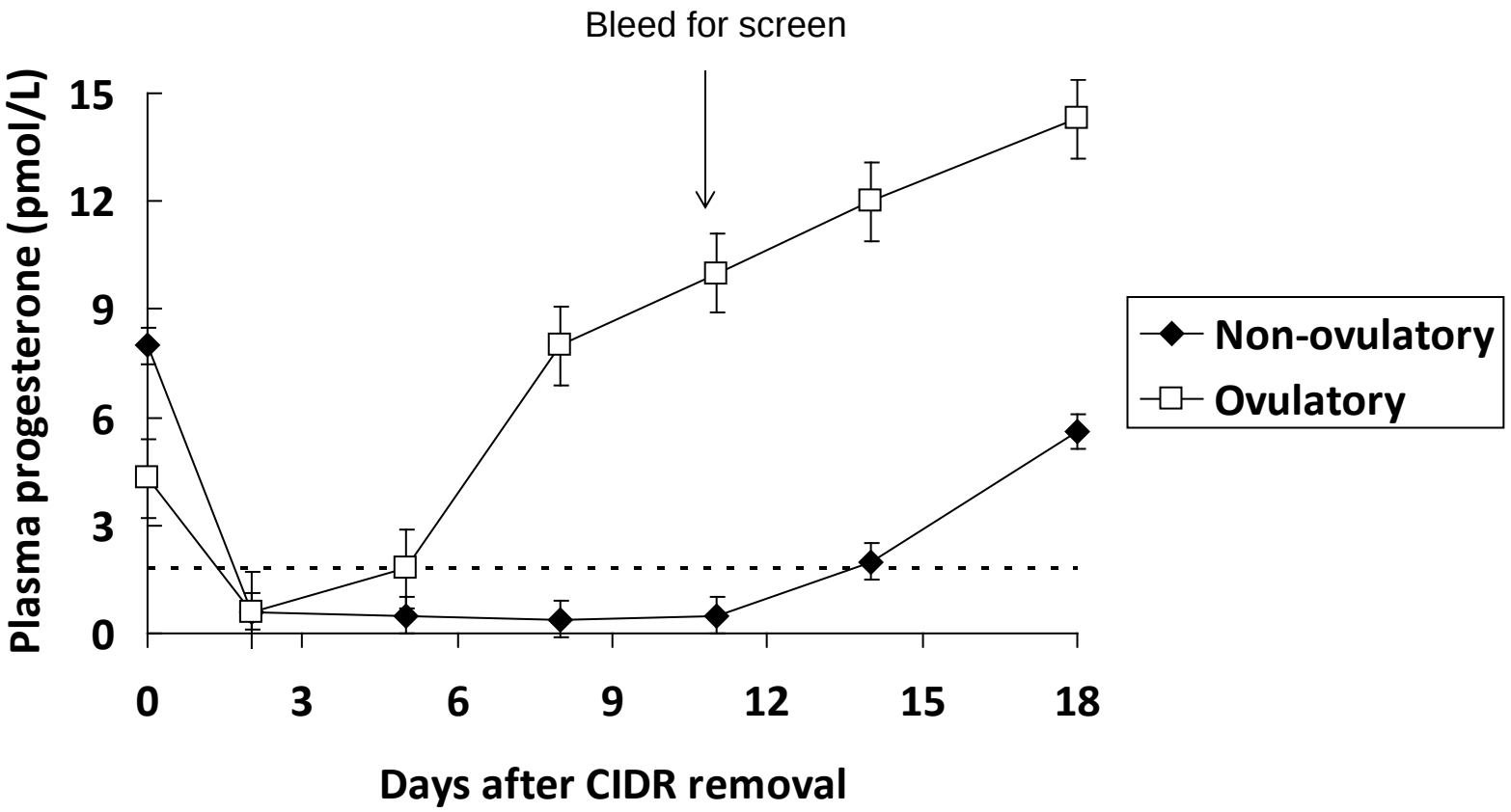


Plasma progesterone increases in ovulating synchronised does



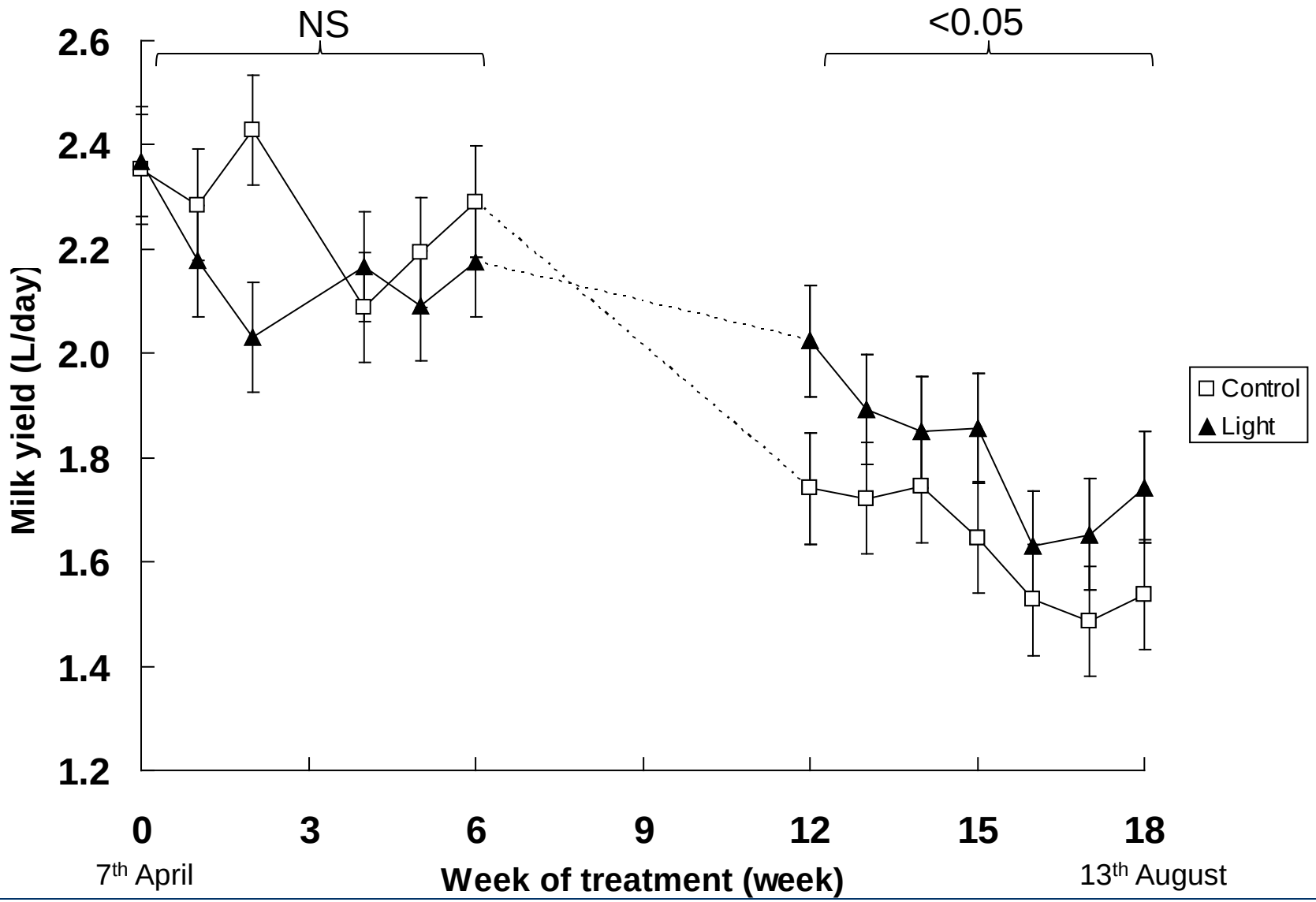
(Cameron unpublished)

Plasma progesterone can screen ovulation in synchronised does



(Cameron unpublished)

Extended photoperiod increased milk yield in late lactation



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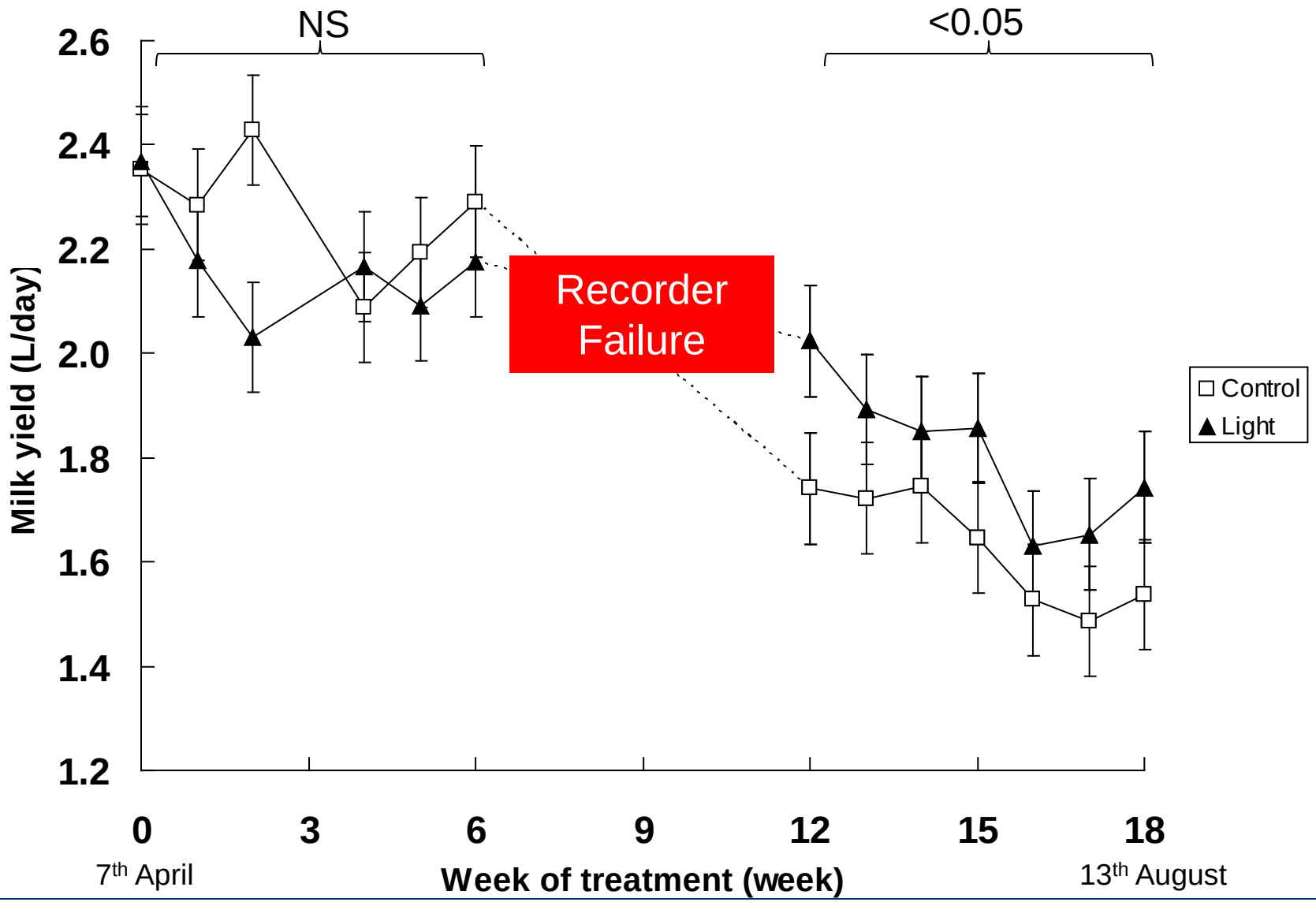
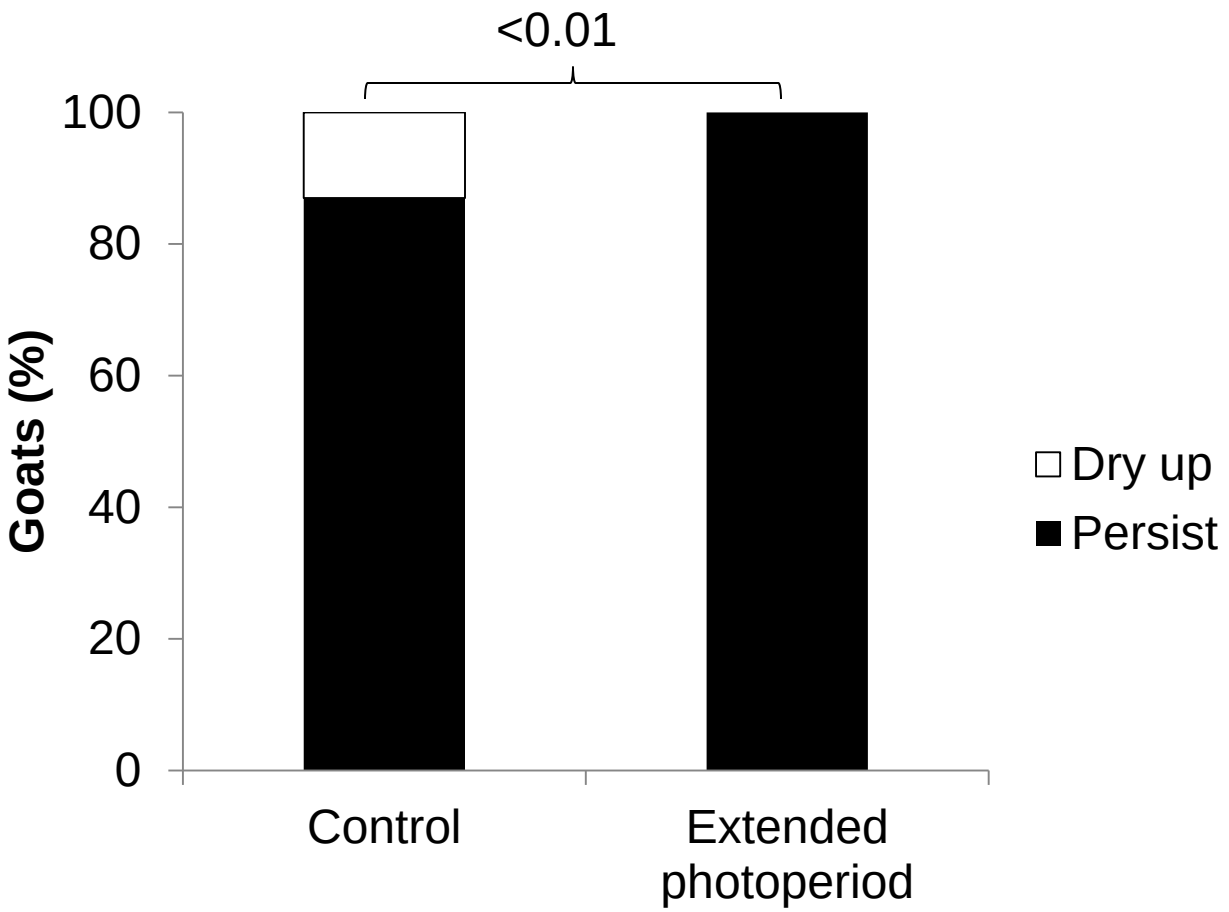
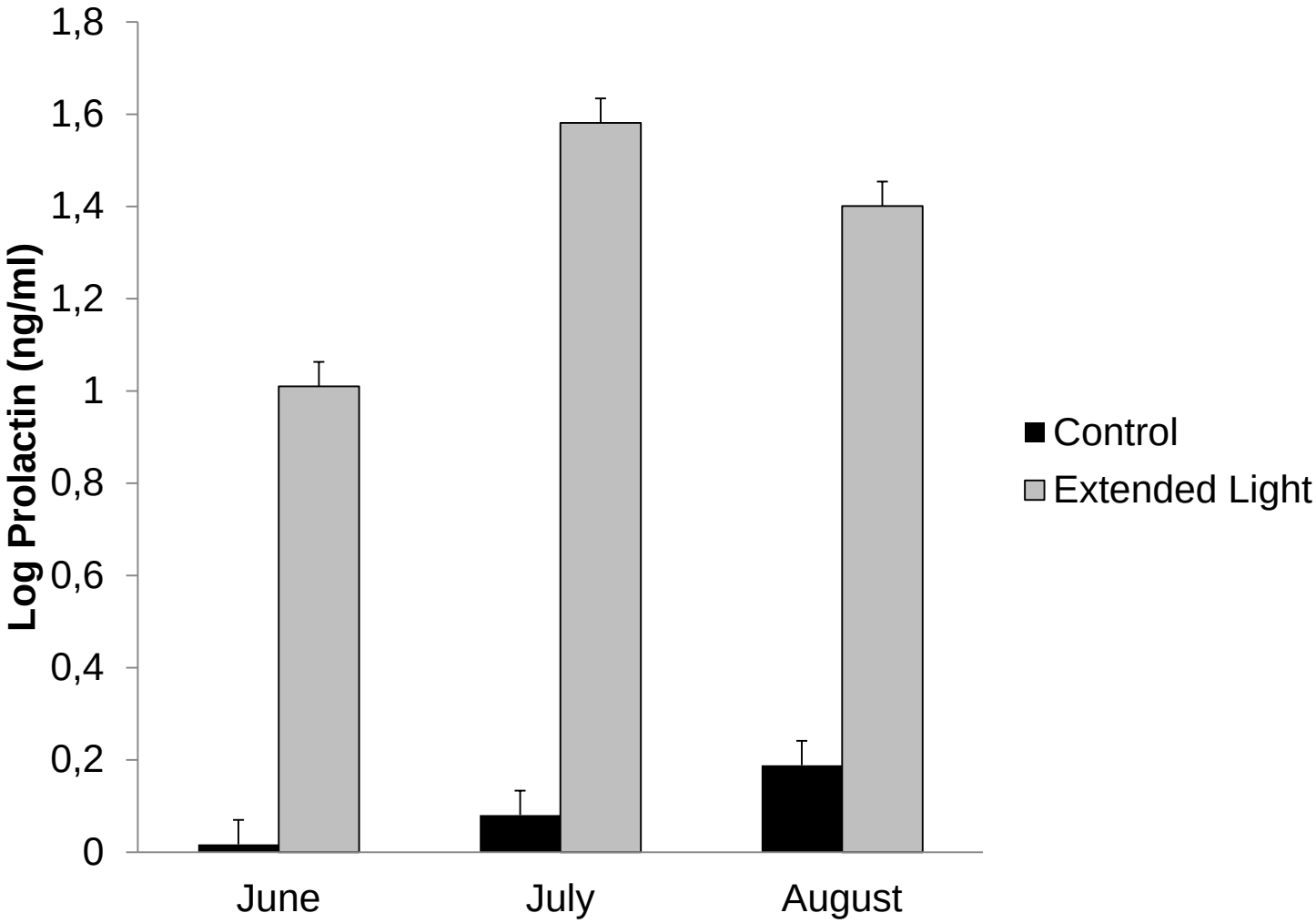


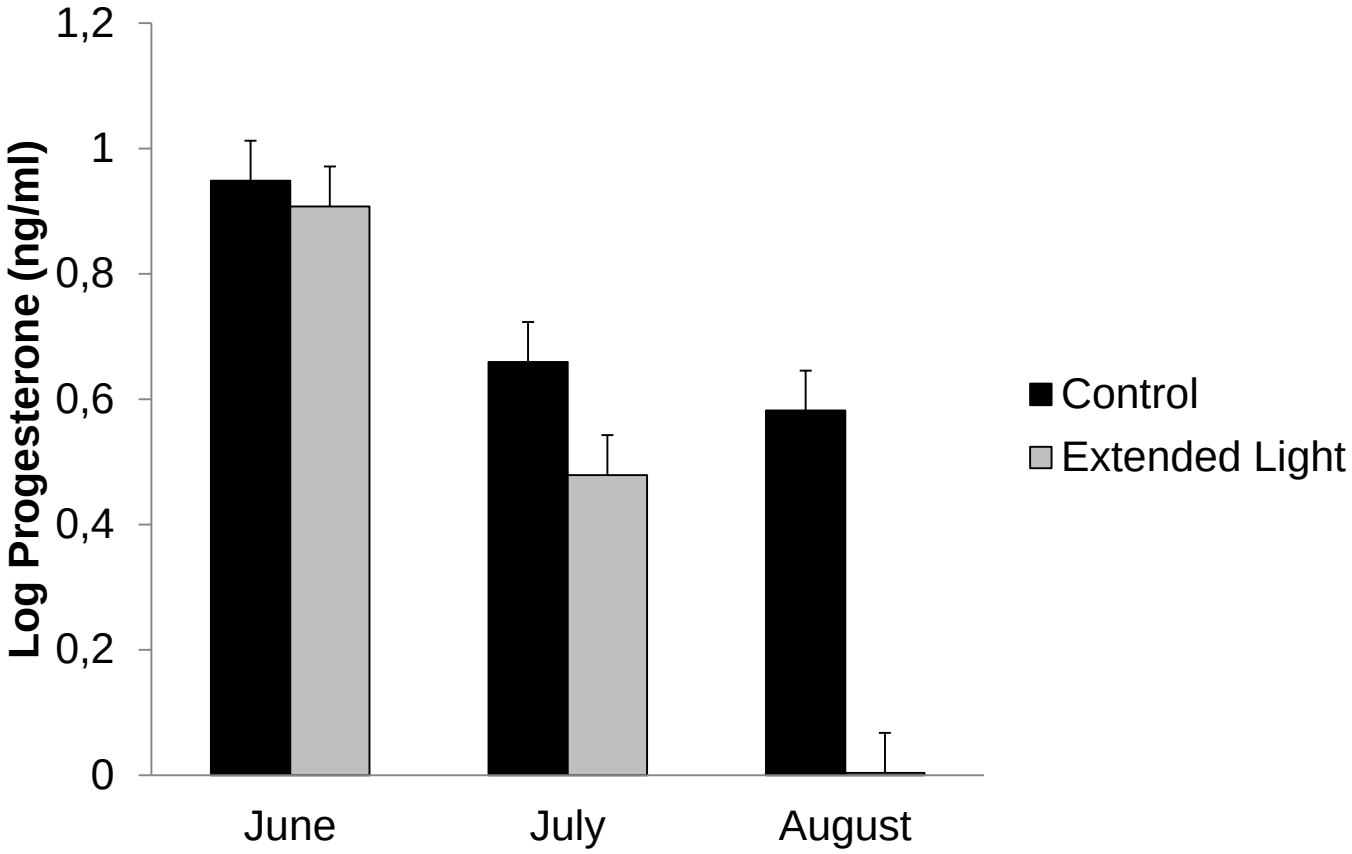
Extended photoperiod increased persistence of milk production



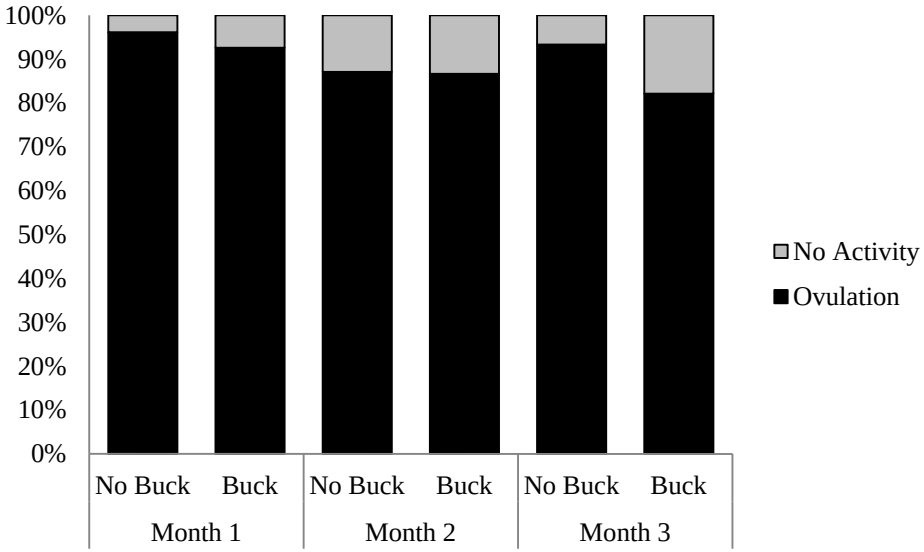
Plasma prolaction increased with lactation and extended photoperiod



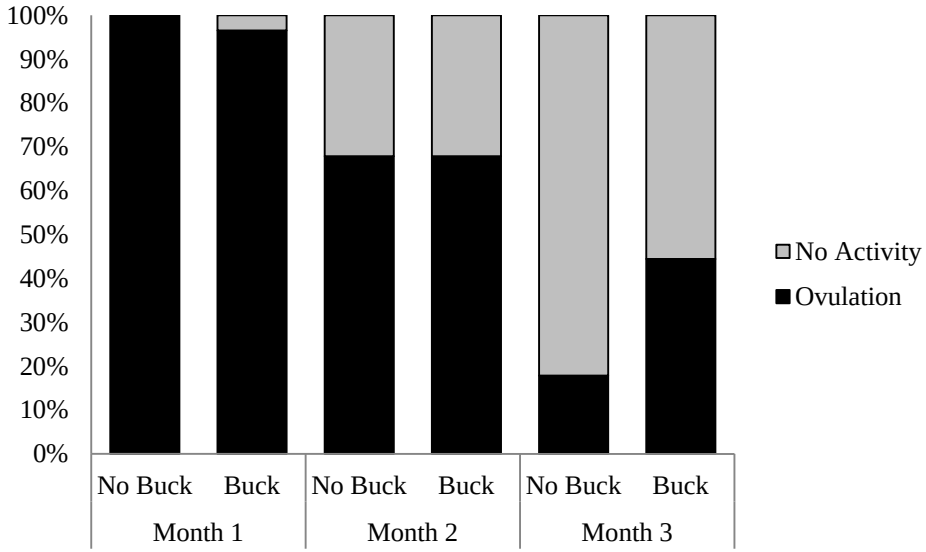
Plasma progesterone decreased with lactation and extended photoperiod



Ovulation declined with extended photoperiod and was only improved with buck exposure in the last month when activity was low



Control



Extended photoperiod

Hypotheses

- That extended photoperiod will increase milk yield in lactating goats √
- That extended photoperiod will increase persistence in milk yield in lactating goats √
- That extended photoperiod will reduce ovulation rate in lactating goats √
- That buck exposure will increase ovulation rate in lactating goats √ after extended long photoperiod

Conclusion

- Extended photoperiod will increase milk yield in lactating goats particularly as lactation advances through winter
- Extended photoperiod will also increase persistence in milk yield in lactating goats and may allow for extended lactations
- Extended photoperiod will inhibit ovulation in lactating goat
  - Can be used to extend kidding interval to ensure year round milk/cheese manufacture
  - May cause undesirable reproductive delays