Nutrition and resistance/resilience to parasitic infection

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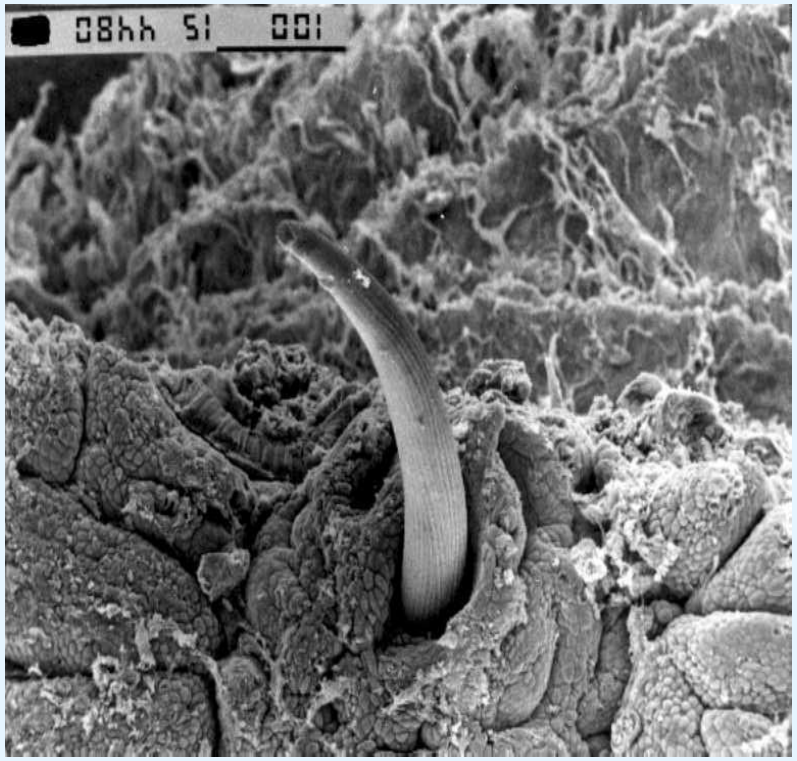
Resistance and resilience to parasitic infection

- Cannot always be clearly distinguished but:
  - Resistance relates primarily to ability of hosts to affect parasite establishment, development, fecundity, etc.
  - Resilience relates to the degree the animal is able to maintain performance despite being infected

Parasites cause damage



Disrupted stomach function

Gut damage in small intestine

Parasites affect welfare and performance

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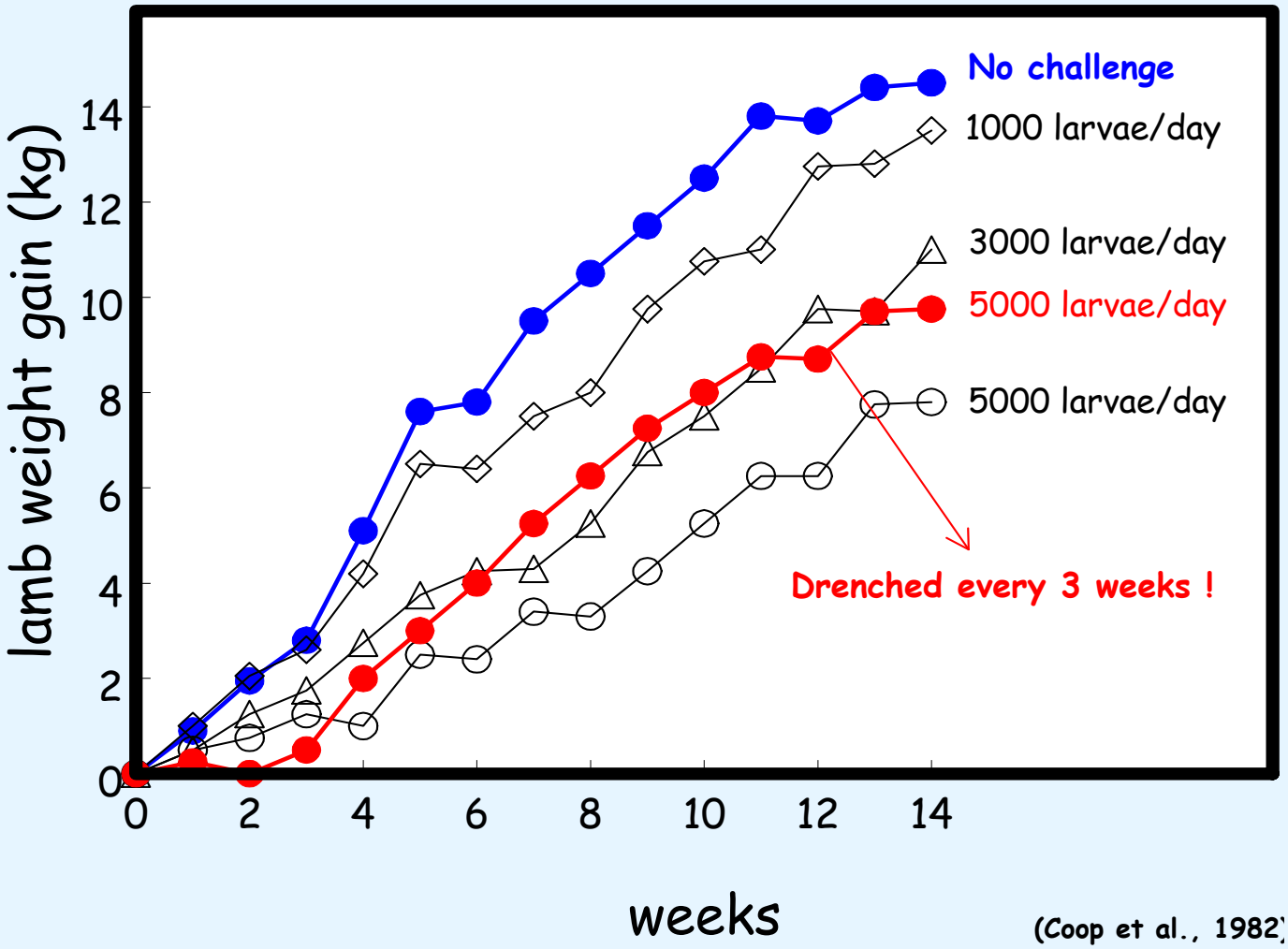
  - reduced food intake
  - impaired food digestion
  - protein leakage (needs replenishment)
  - gut damage (needs repair)
  - immune system requires energy and nutrients

Higher infection rates, larger effects



(Coop et al., 1982)

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- Other approaches are required

Options for non-chemical control

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- nutrient supplementation
- bioactive forages
- vaccination
- biological control
- breeding
- grazing management

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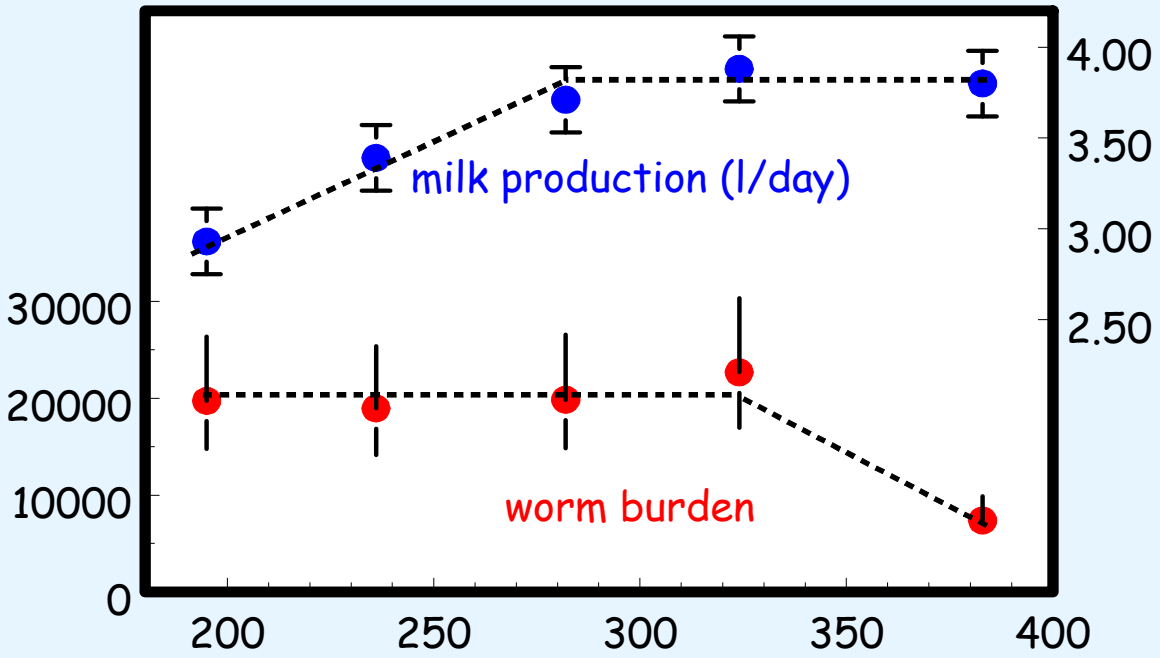
  - protein scarcity during lactation increases PPRI
- Protein scarcity is determined by supply as well as demand
  - increased protein supply and reduced protein demand both decrease the degree of PPRI

Worms and milk yield during protein supplementation

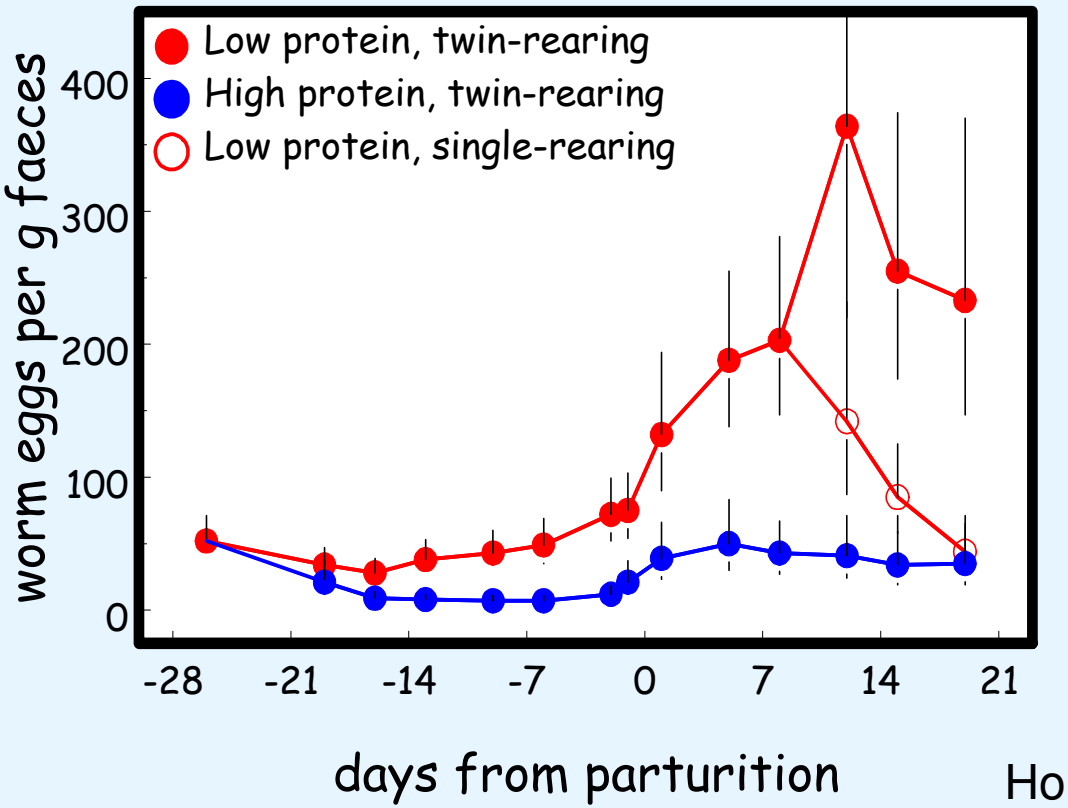
- Protein supplementation can result in more milk and reduced worm burdens



Houdijk et al 2003

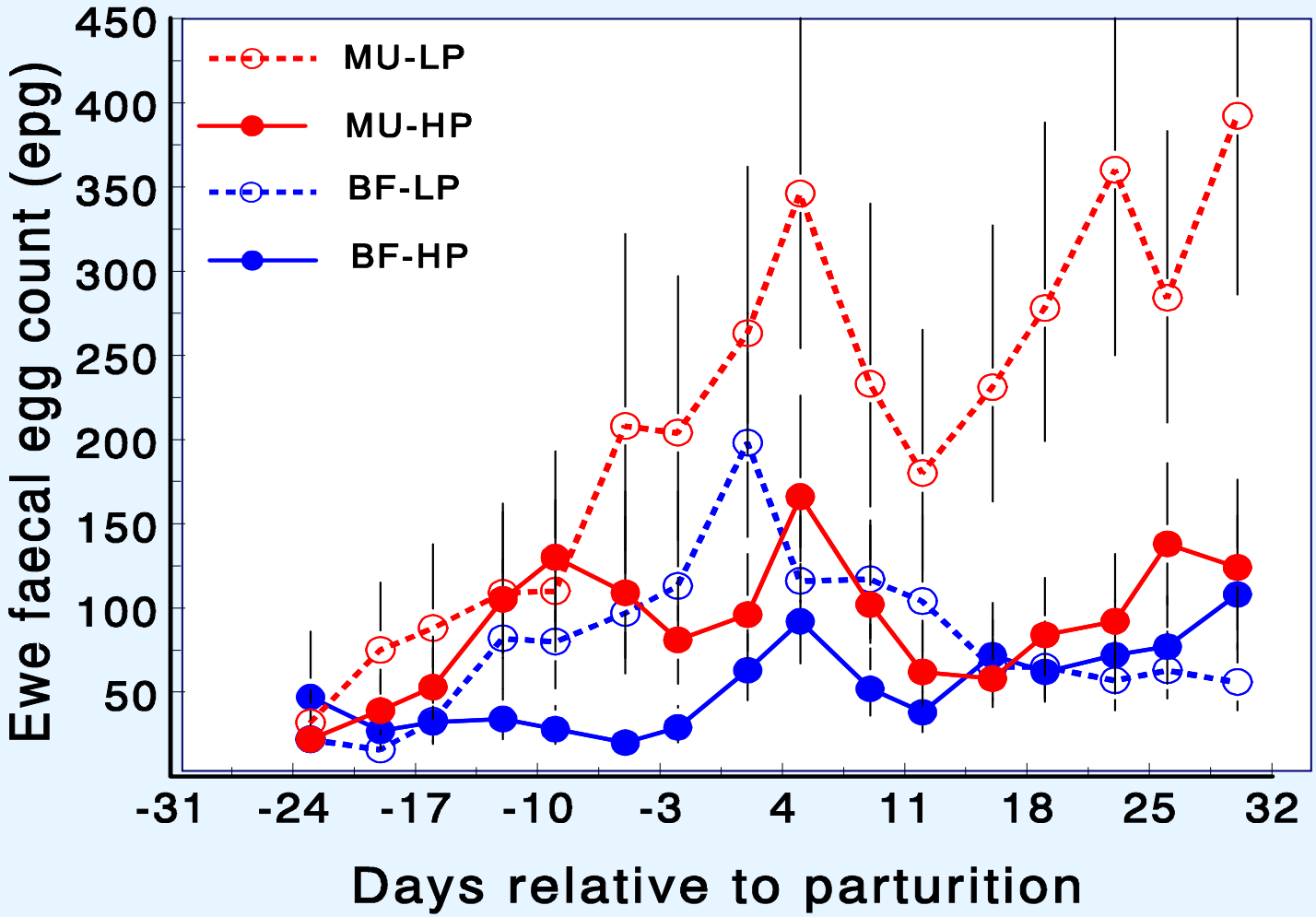
FEC and ewe protein supplementation

- A decrease in protein demand can rapidly reduce worm egg output



Houdijk et al 2006

Breed effects and protein supplementation



Kidane et al 2010

Protein improves immune responses

Globule leukocytes

Houdijk et al 2005

Implication for epidemiology and lamb production

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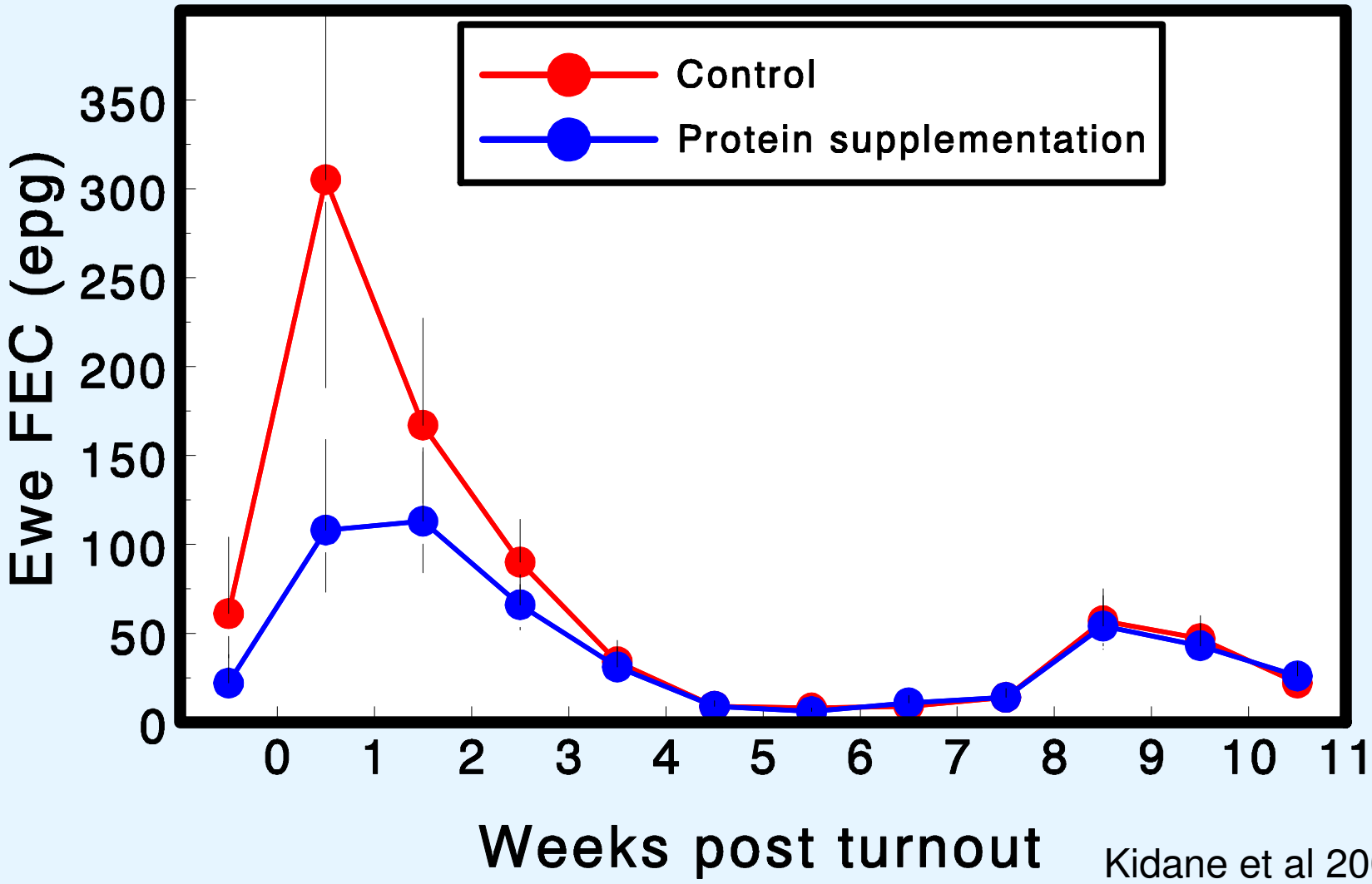
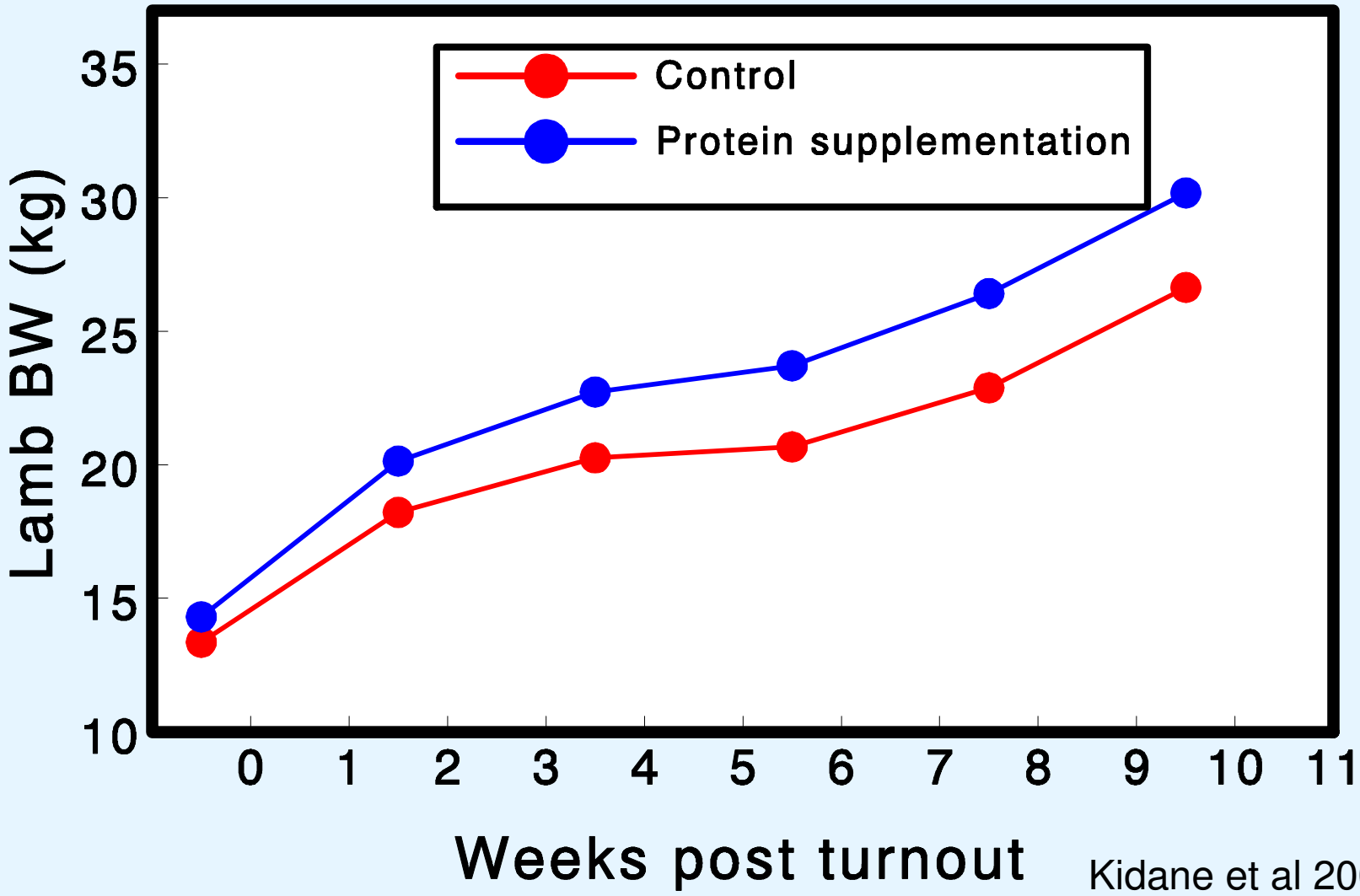
- Optimal MP supply to ewes can reduce the negative effects of exposure to parasites

Ewe FEC during ewe protein supplementation (clean fields)



Kidane et al 2008

Lamb weight during ewe protein supplementation (clean fields)



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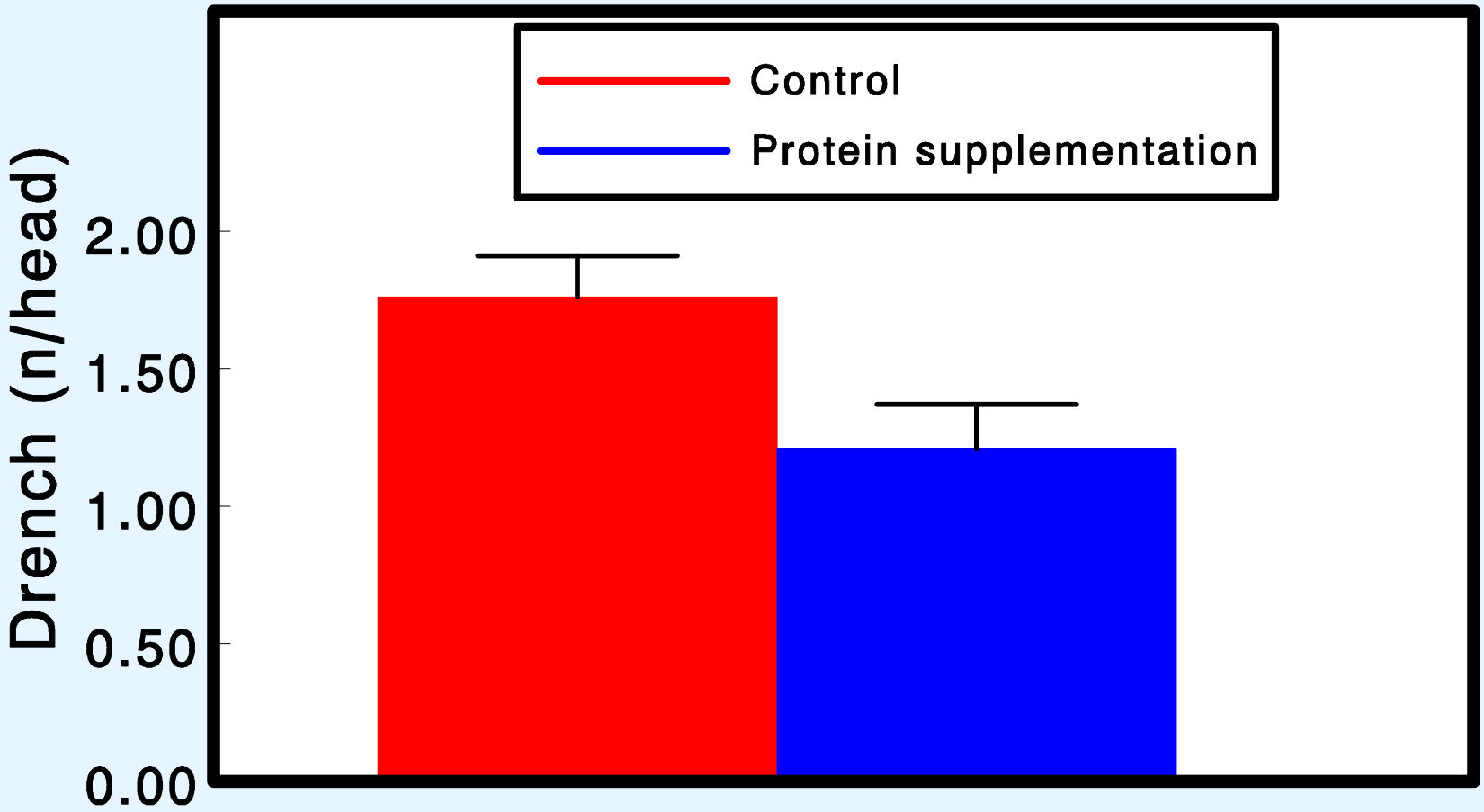
Drench need during ewe protein supplementation (dirty fields)



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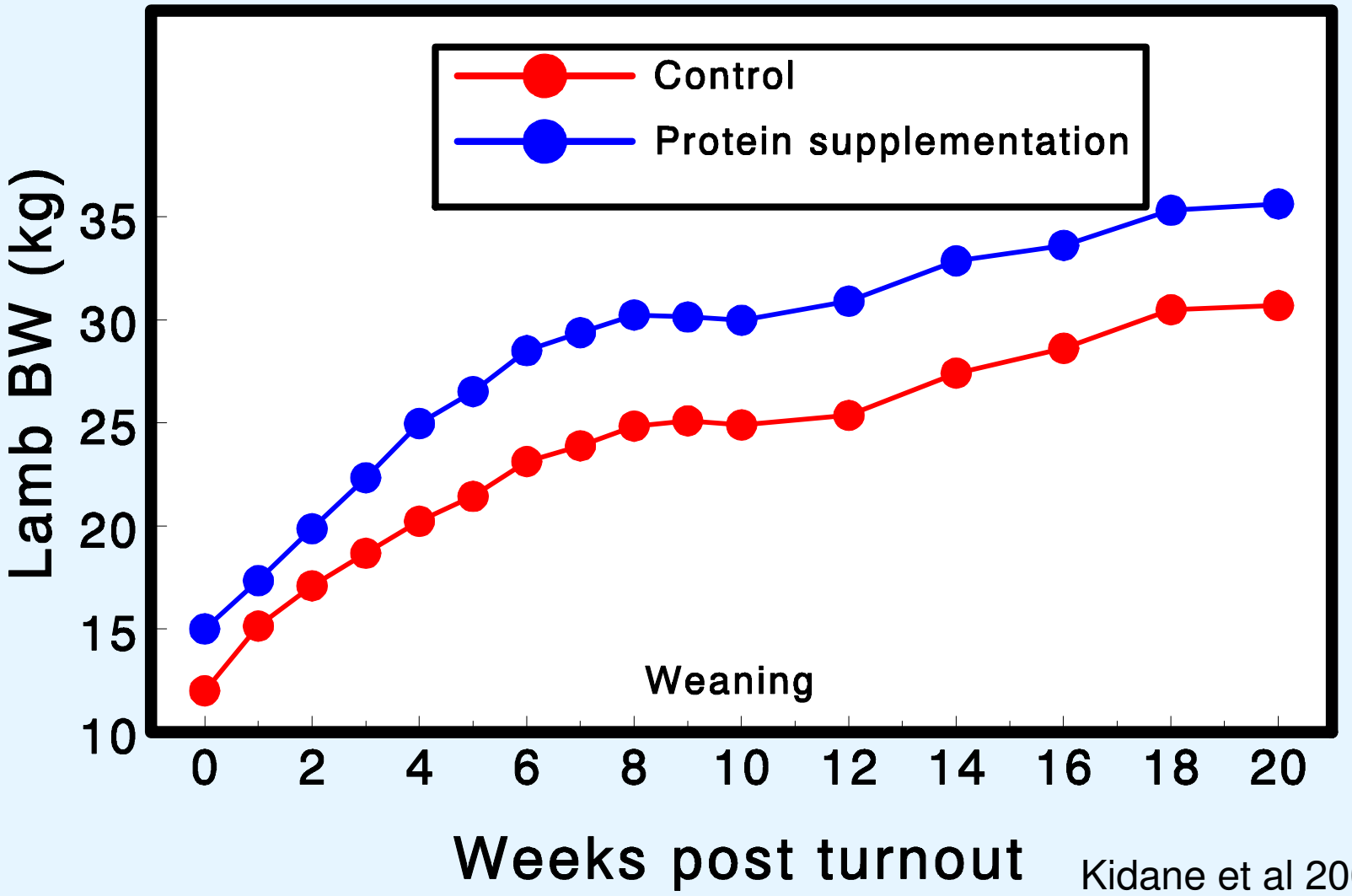

Kidane et al 2009

Conclusions -1-

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- Target most susceptible ewes:
  - thin, multiple rearing (especially gimmers)
  - single-rearing ewes may not benefit from protein

Bioactive forages

Bioactive forage: a definition

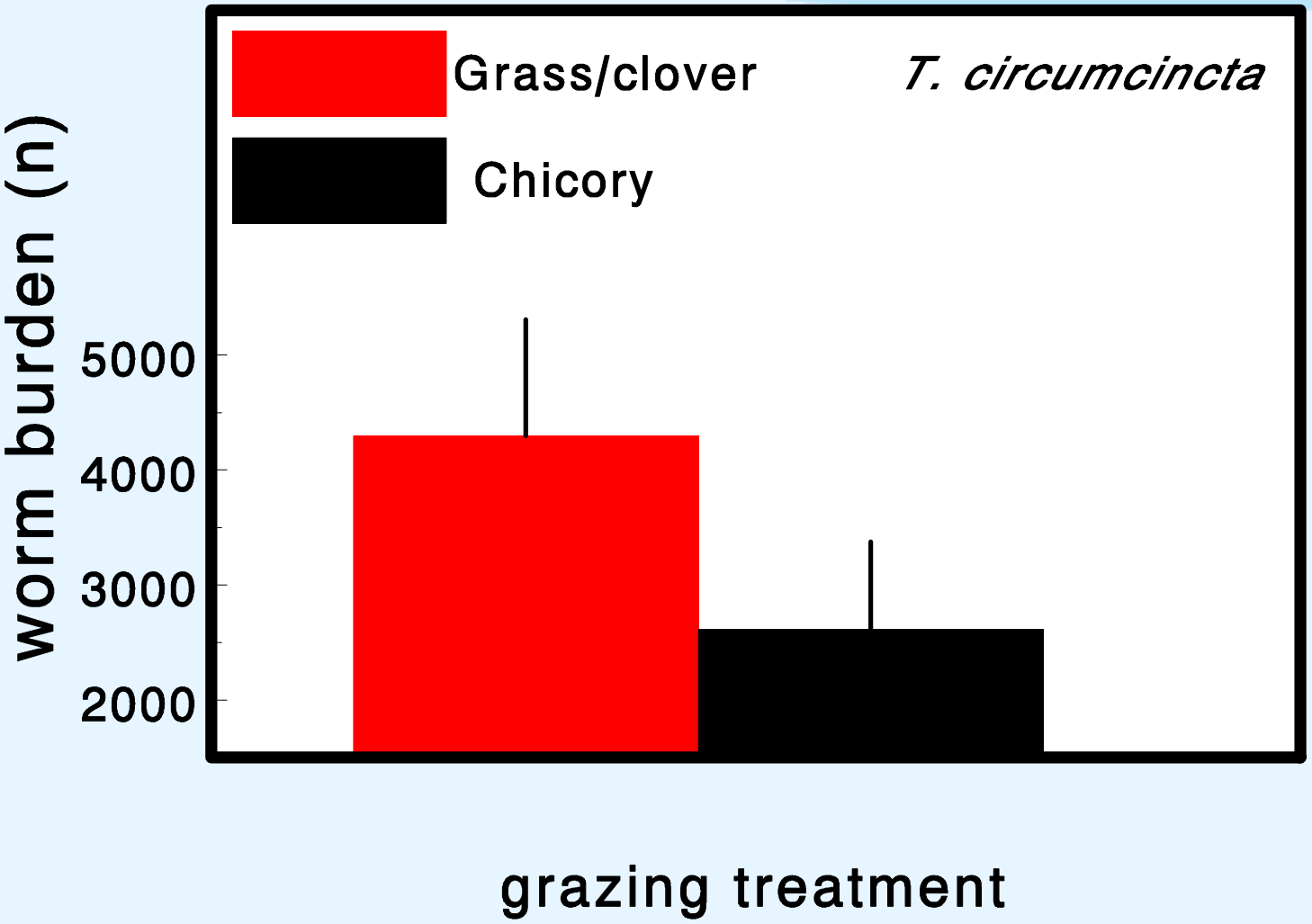
- Plants are referred to as bioactive forages if their consumption results in anti-parasitic activity
- Examples of bioactive forages

chicory sainfoin lotus

Chicory

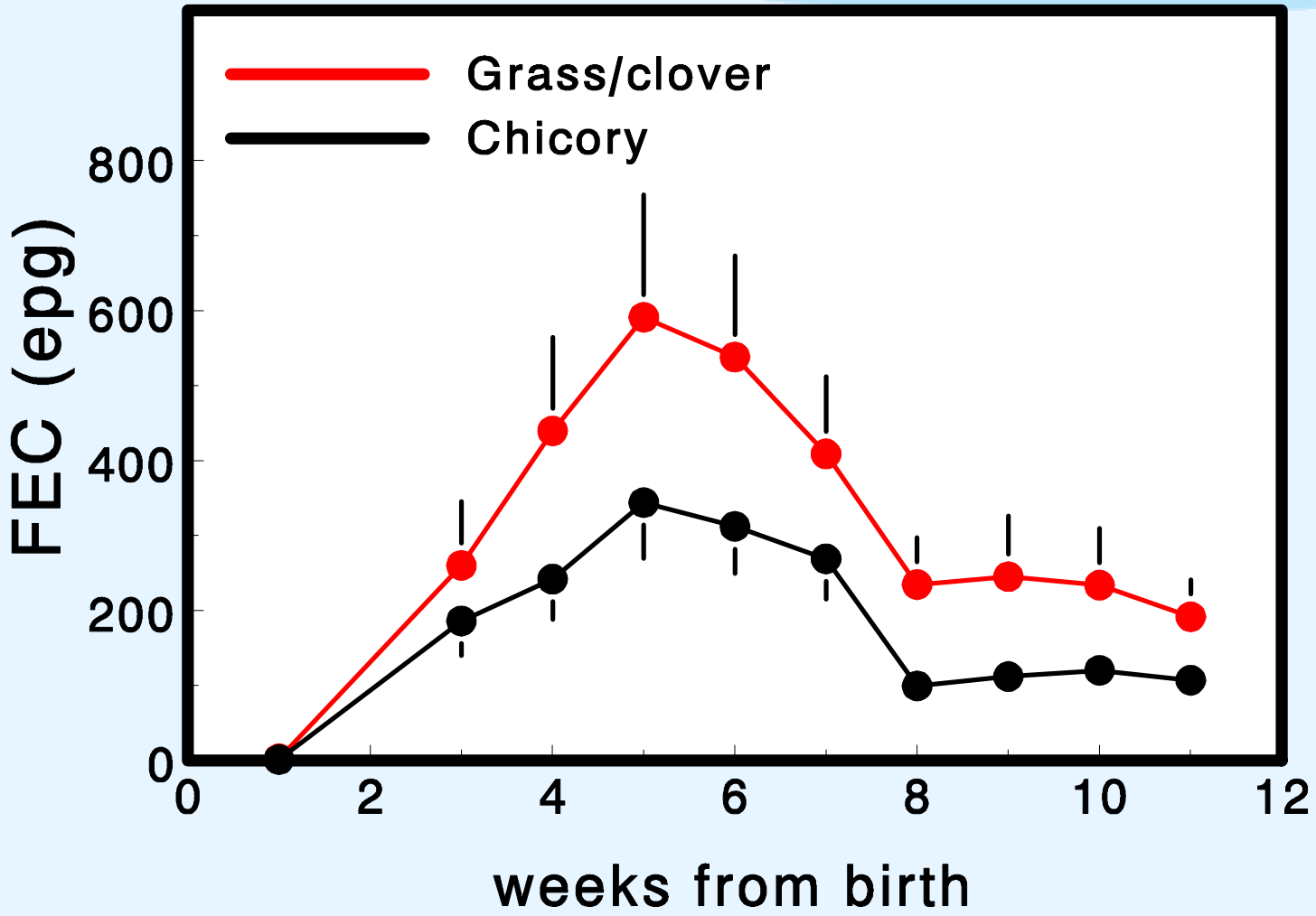
- Highly palatable
- Good nutritional value
  - Dry matter
  - Macro-nutrients
  - Micro-nutrients
- Readily grown in Scotland
- Anti-parasitic properties

Worm burdens following short term grazing on new chicory



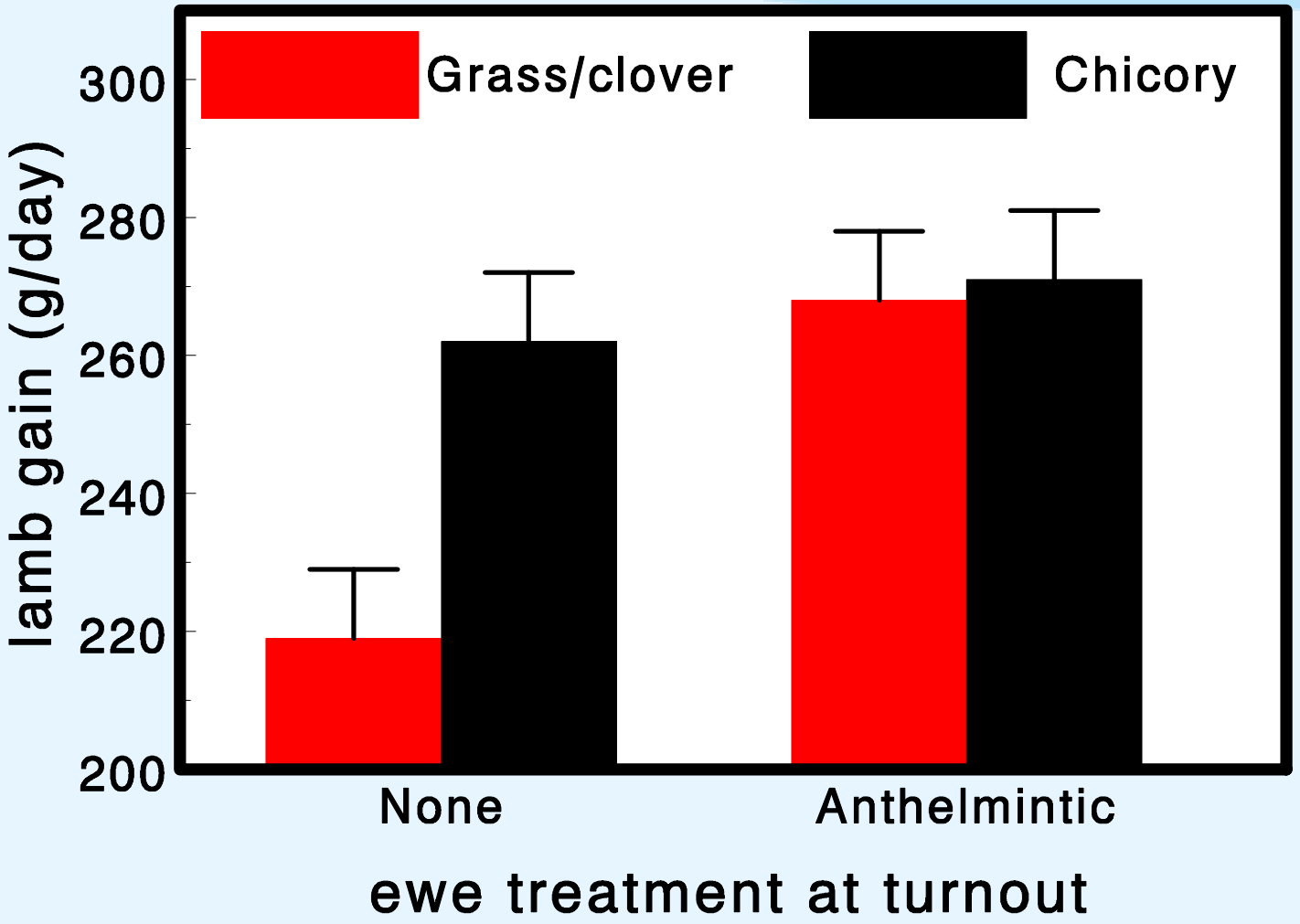
Tzamaloukas et al. (2003)

FEC during long term grazing on new chicory (pre-weaning)



Athanasiadou et al. (2006)

Gain during long term grazing on new chicory (pre-weaning)



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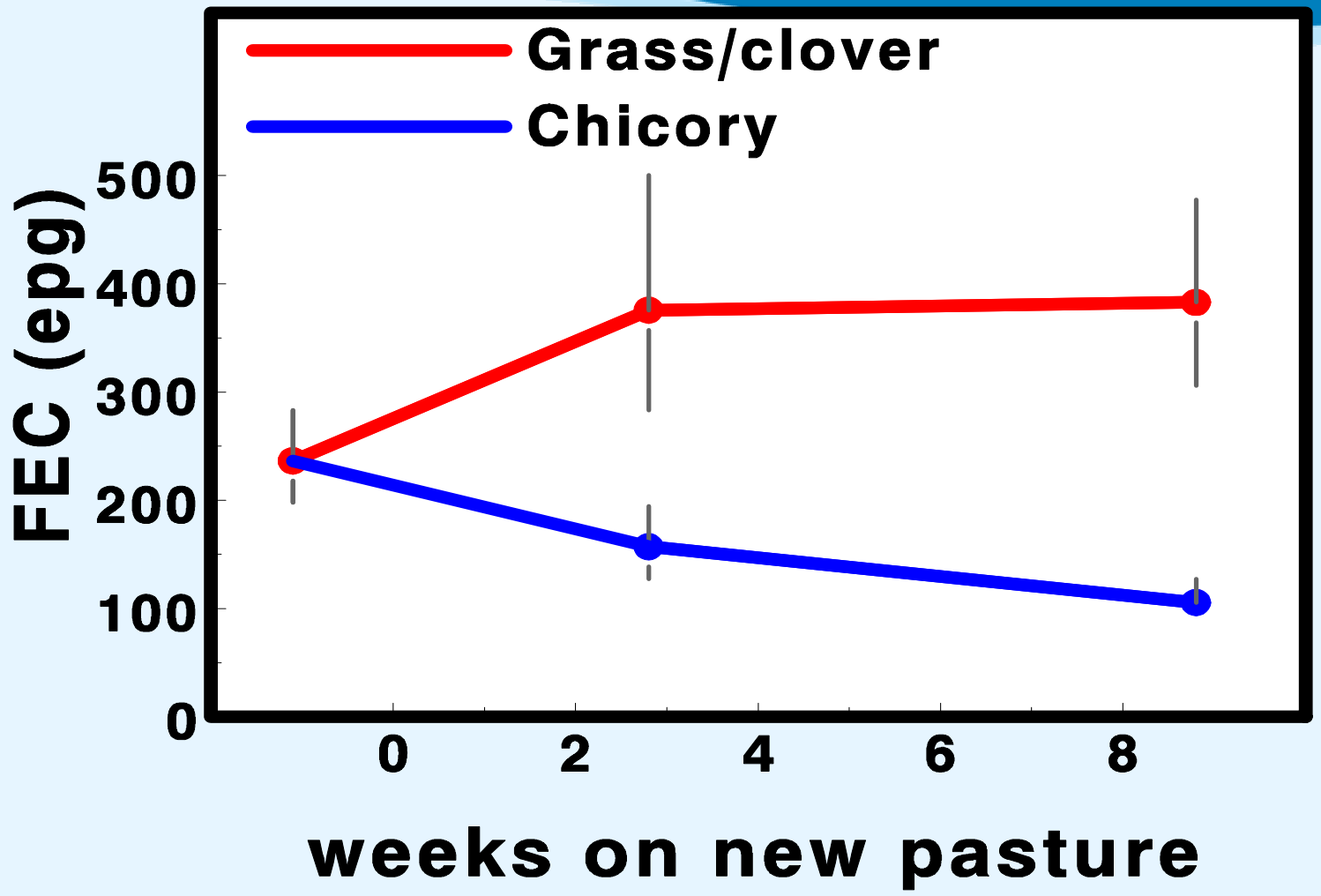
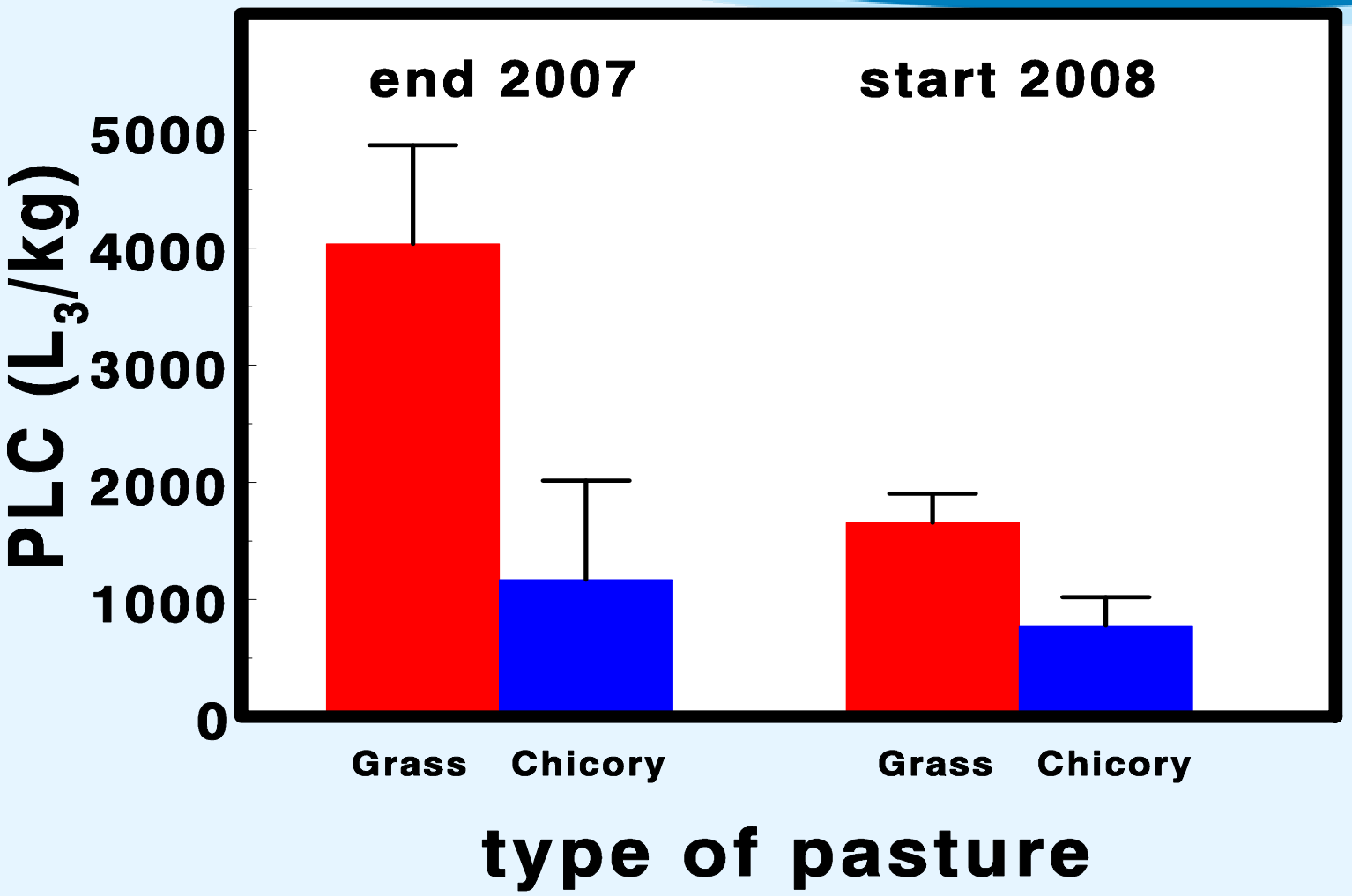
FEC during long term grazing on new chicory (post weaning)



Kidane et al 2009

Pasture larval counts



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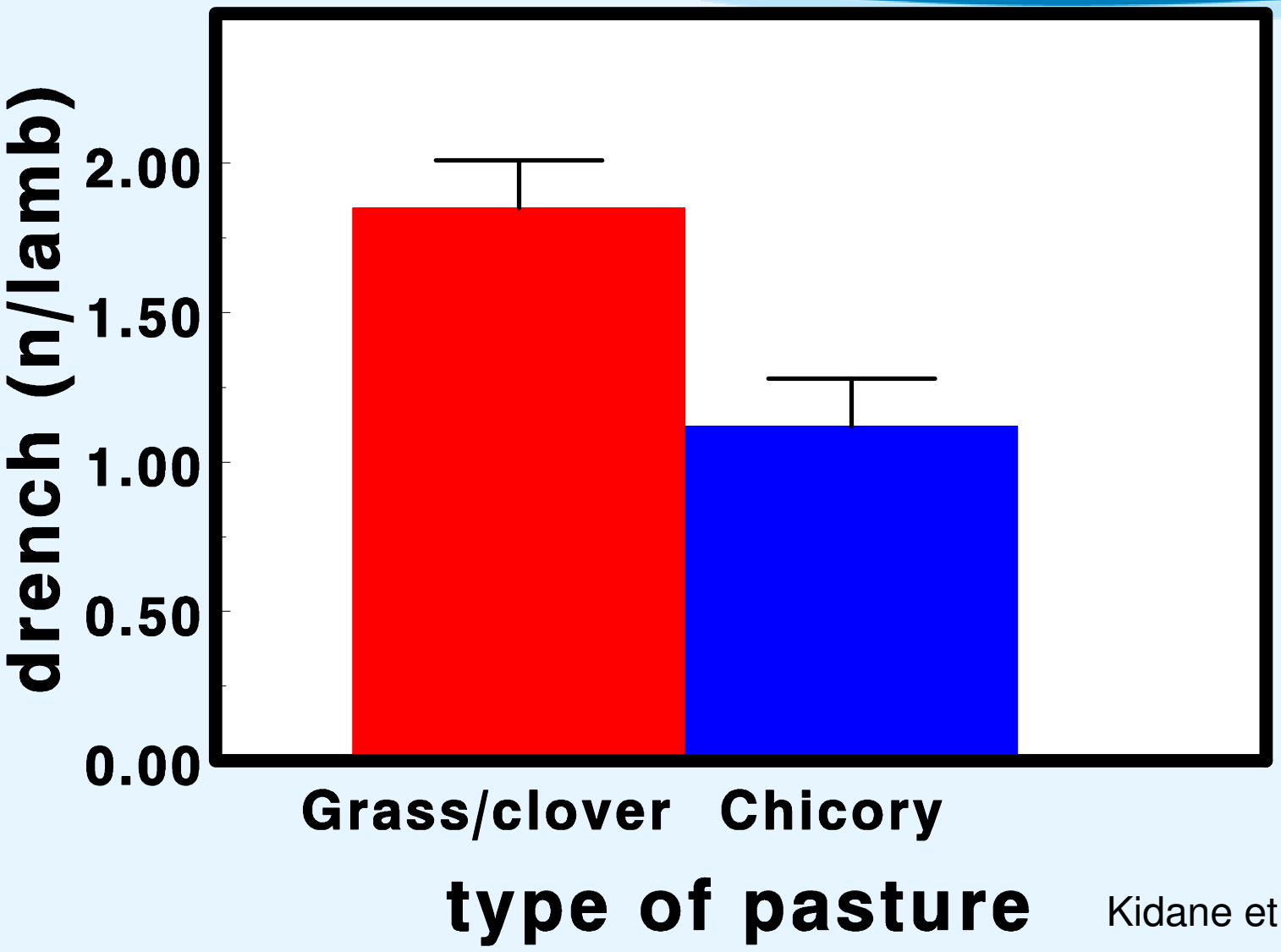
Drench need during long term grazing on dirty chicory



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- Plant structure
  - broad-leaved structure reduces larval migration and hence larval uptake during grazing

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- We need to know more to understand why it works frequently but not always

Using different approaches at the same time

- Nutritional approaches have the potential to reduce parasitism
- The use of bioactive forages has the potential to reduce parasitism
- How can they be optimally combined?

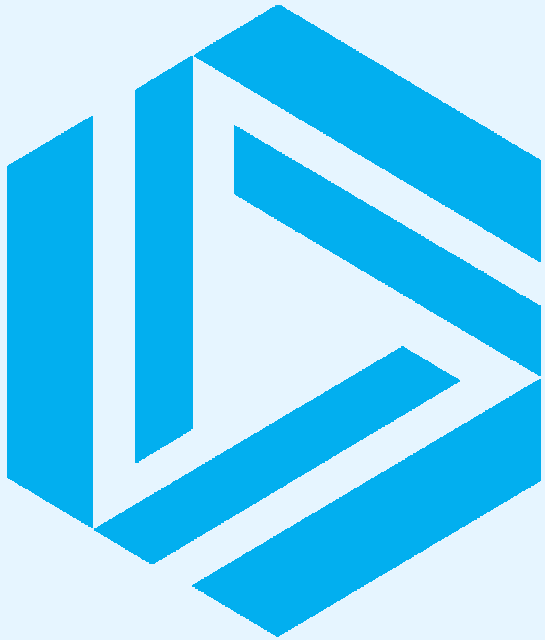
Using different approaches at the same time

- How can they be optimally combined?
  - With each other?
  - With chemical control (drenches)?
  - With other measures, such as:
    - COWP
    - Breeding
    - Vaccination

Conclusions -3-

- There is an urgent need to develop alternatives to chemical (anthelmintic) control of gastro-intestinal parasites
- It is likely that combinations of approaches can be useful in different circumstances
- Supplementation with nutrients (protein) and the use of bio-active forages (PSM) are promising parts of strategies for parasite control in future sustainable systems

Thank you for your attention



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