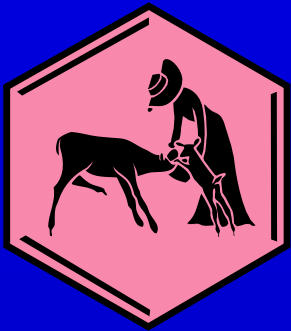


# Cell Biology of Bovine Lameness

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*SERAD and BBSRC funded,  
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Univs. Edinburgh & Aberdeen*

# Introduction



Bovine laminitis is a costly (c £90M pa) and painful disease

It is most prevalent in winter calving cows, hind hooves, outer claws

Risk factors include nutrition, environment and physiological state

Little is known about the underpinning biology

# Philosophy

- ☞ The cow cannot fix defective horn, she must produce healthy horn to replace it

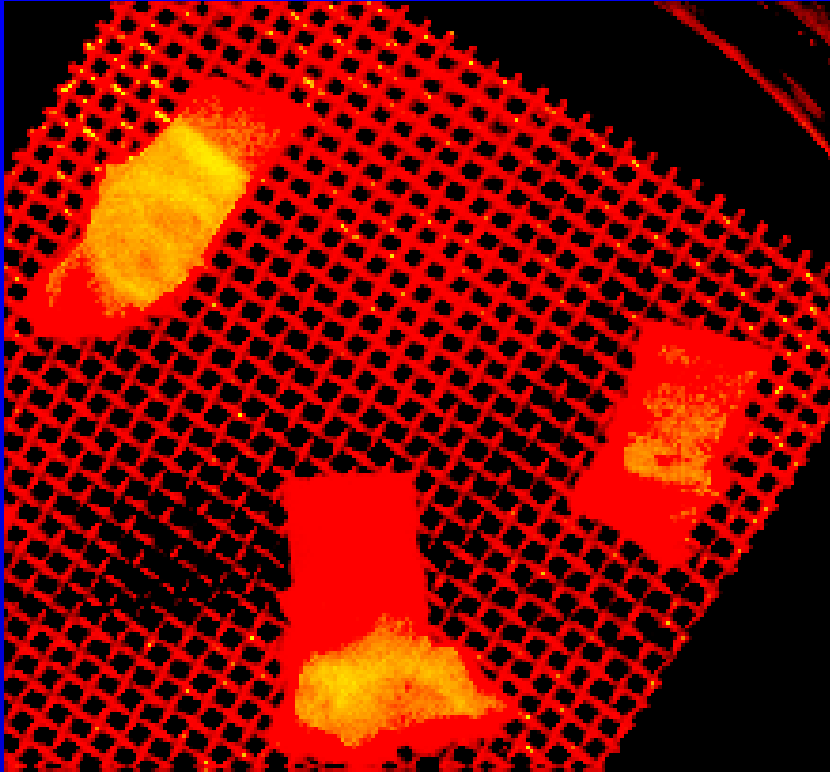


# Objective

- ☞ To determine how the cow makes healthy horn

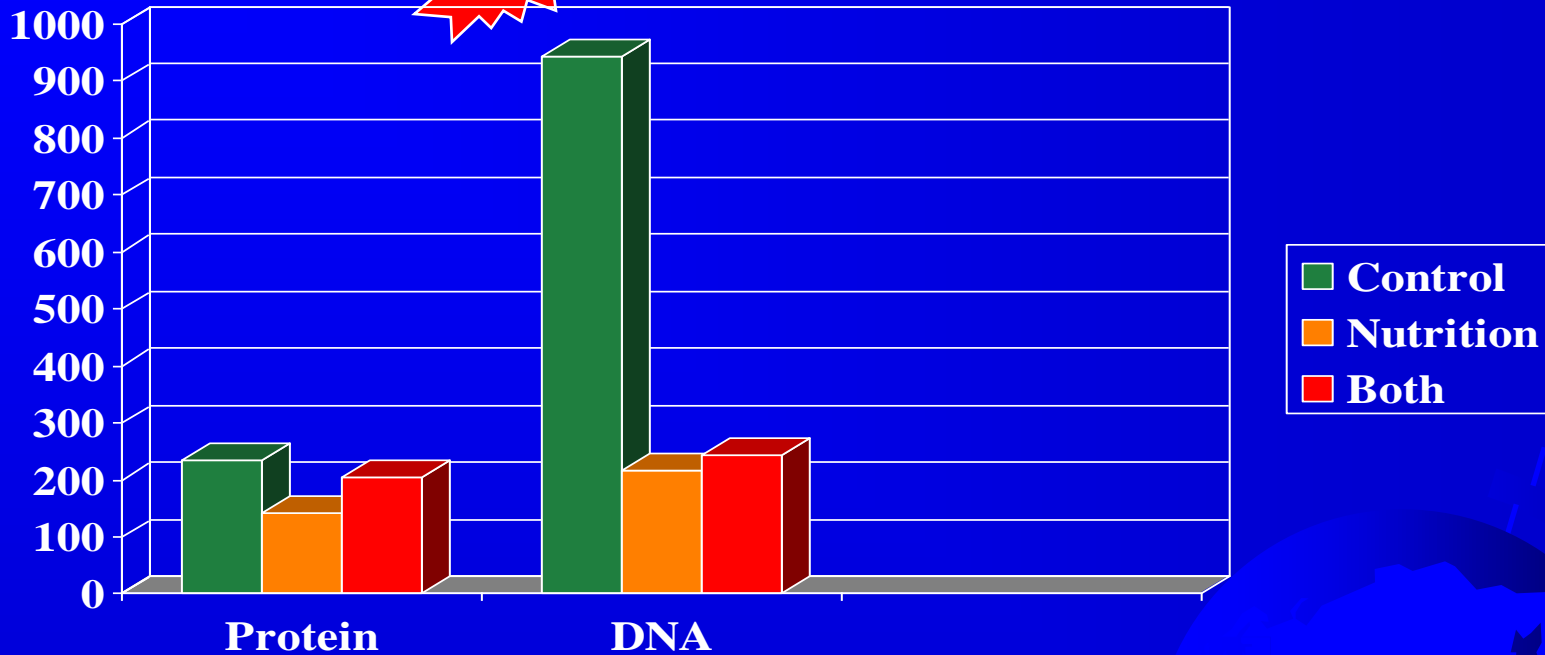


# Approach



- ☞ Explant culture to measure hoof cell function (proliferation and keratinization) in biopsy and post mortem samples

# Observation 1



- ☞ Insult (biopsy) increases proliferation
- ☞ Other stressors (wet silage, concrete) can limit the response

# Observation 2: Design

- Within-cow comparison of 5 cows
- Challenge *post partum* (cubicles, silage)
- Hoof-block one hind hoof to create challenged and control hooves
- Biopsy both hooves at:

5d ONSET

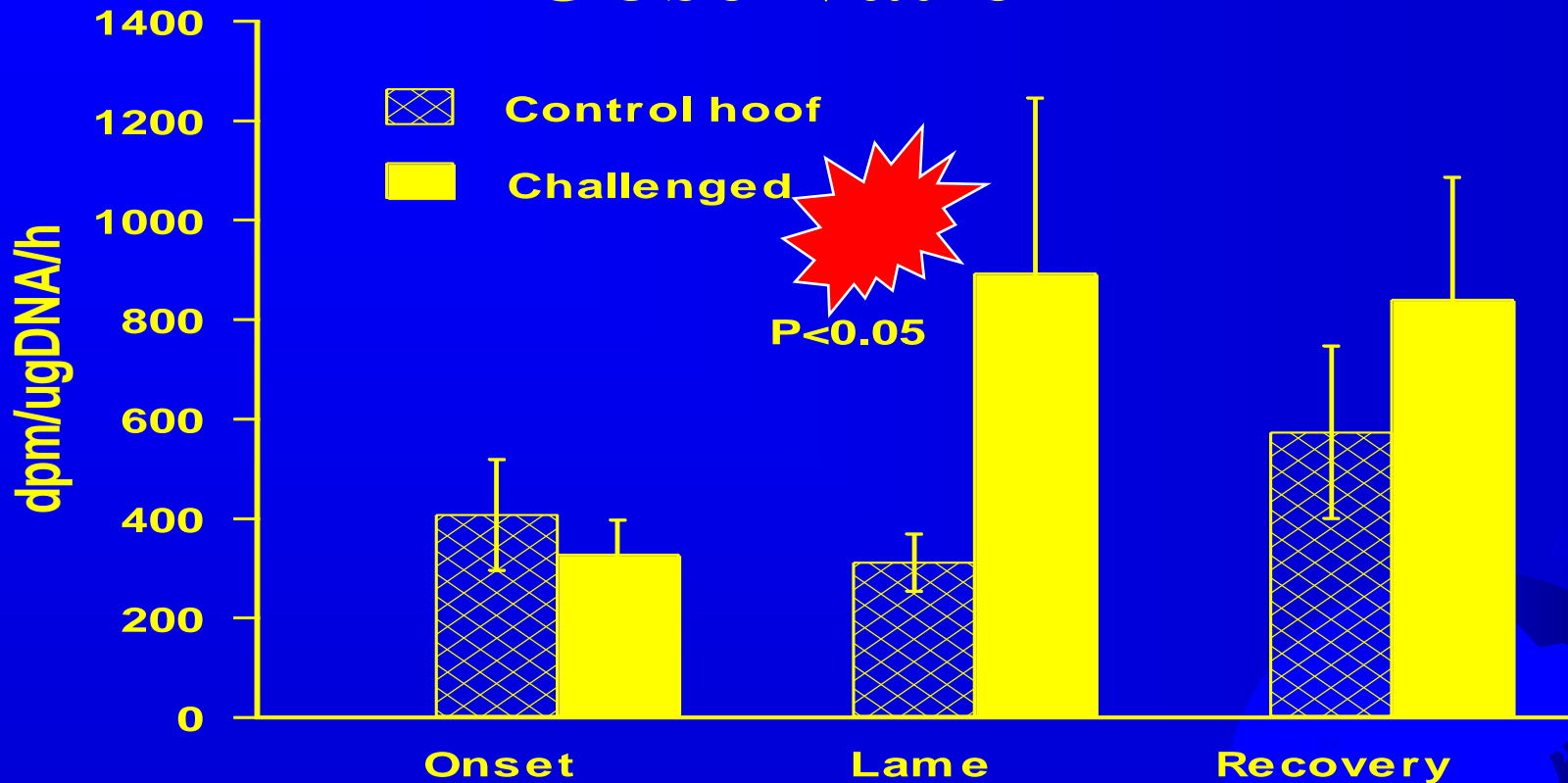
15d LAME

- Remove challenge, biopsy at:

4wk RECOVERY



# Observation 2



☞ Within-cow comparison shows increased proliferation is a localised response to the imposed challenge

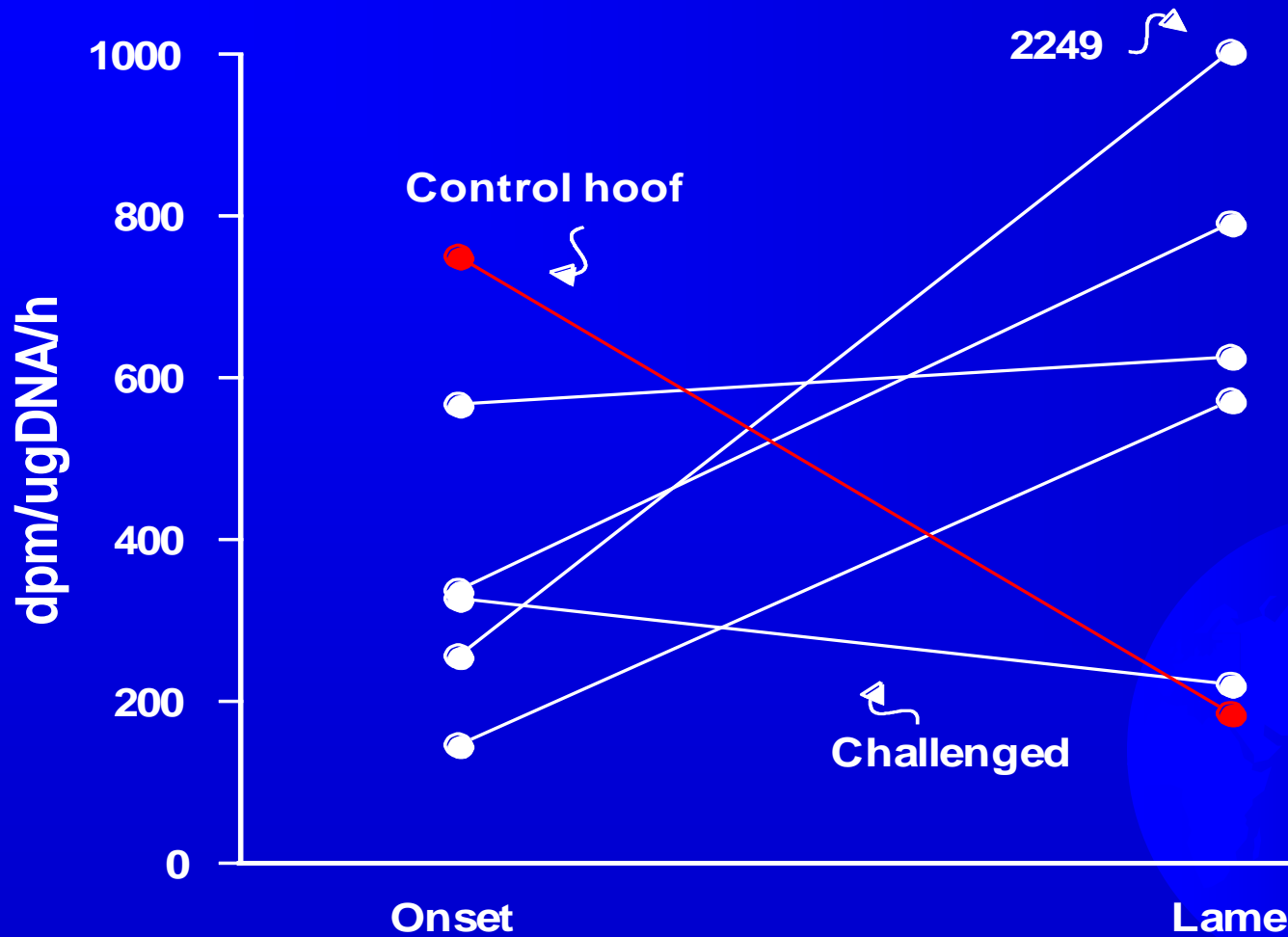




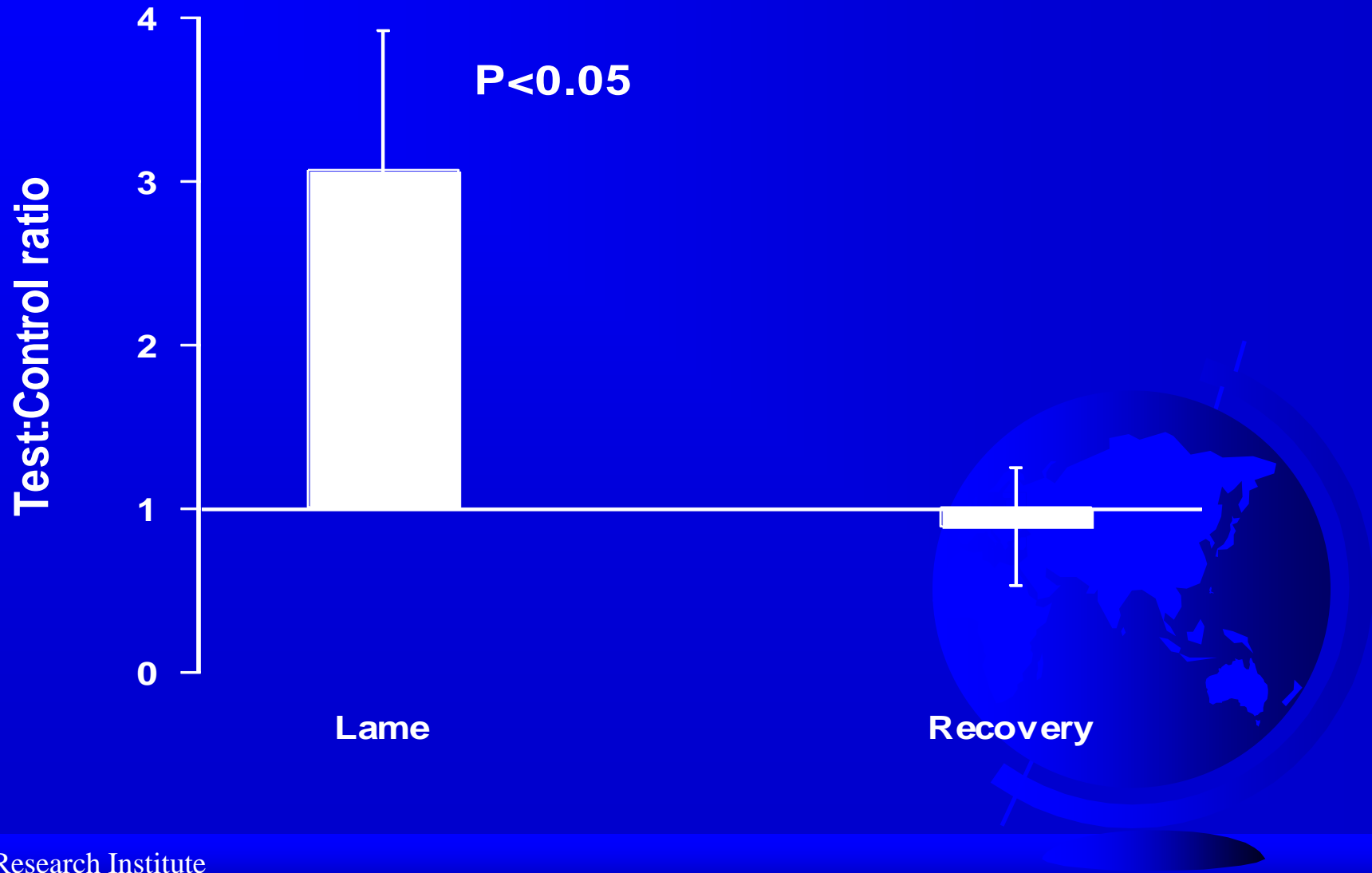
☞ A block is placed on the inside claw to reduce the weight that is placed on the outer claw.



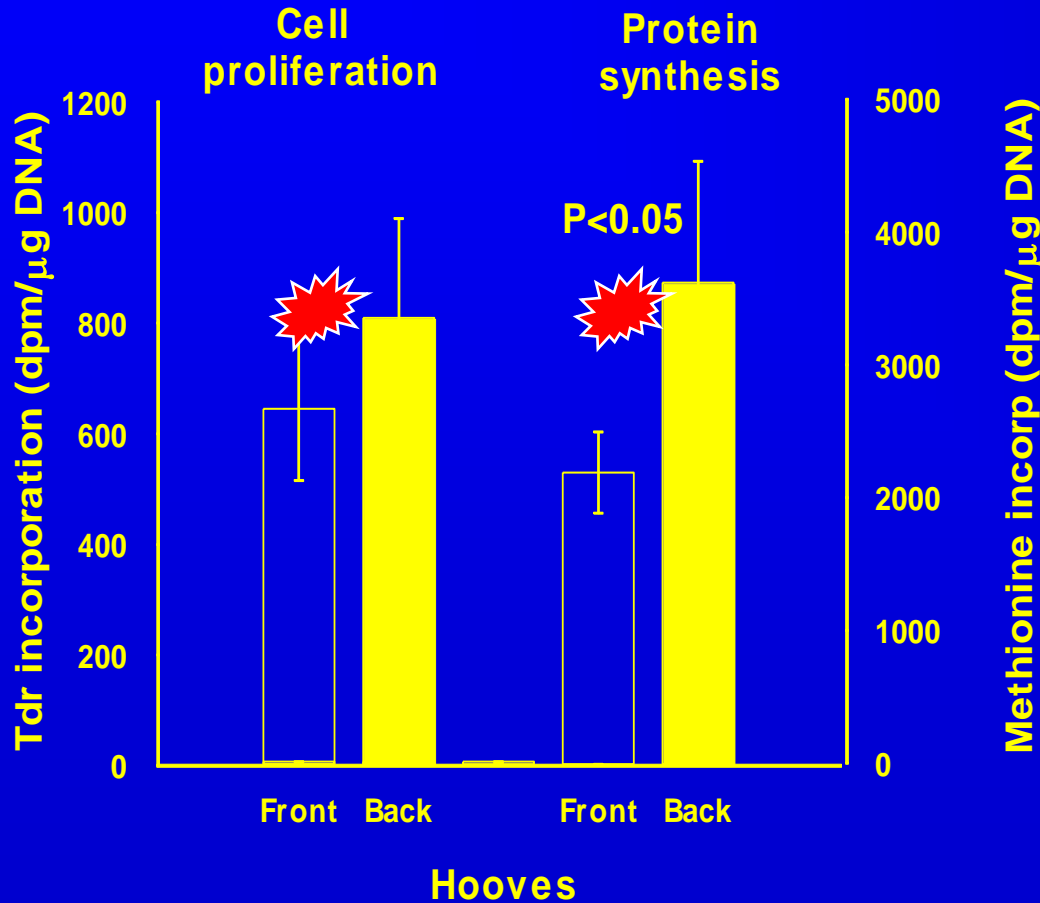
# Individual values



# Challenged /control ratio

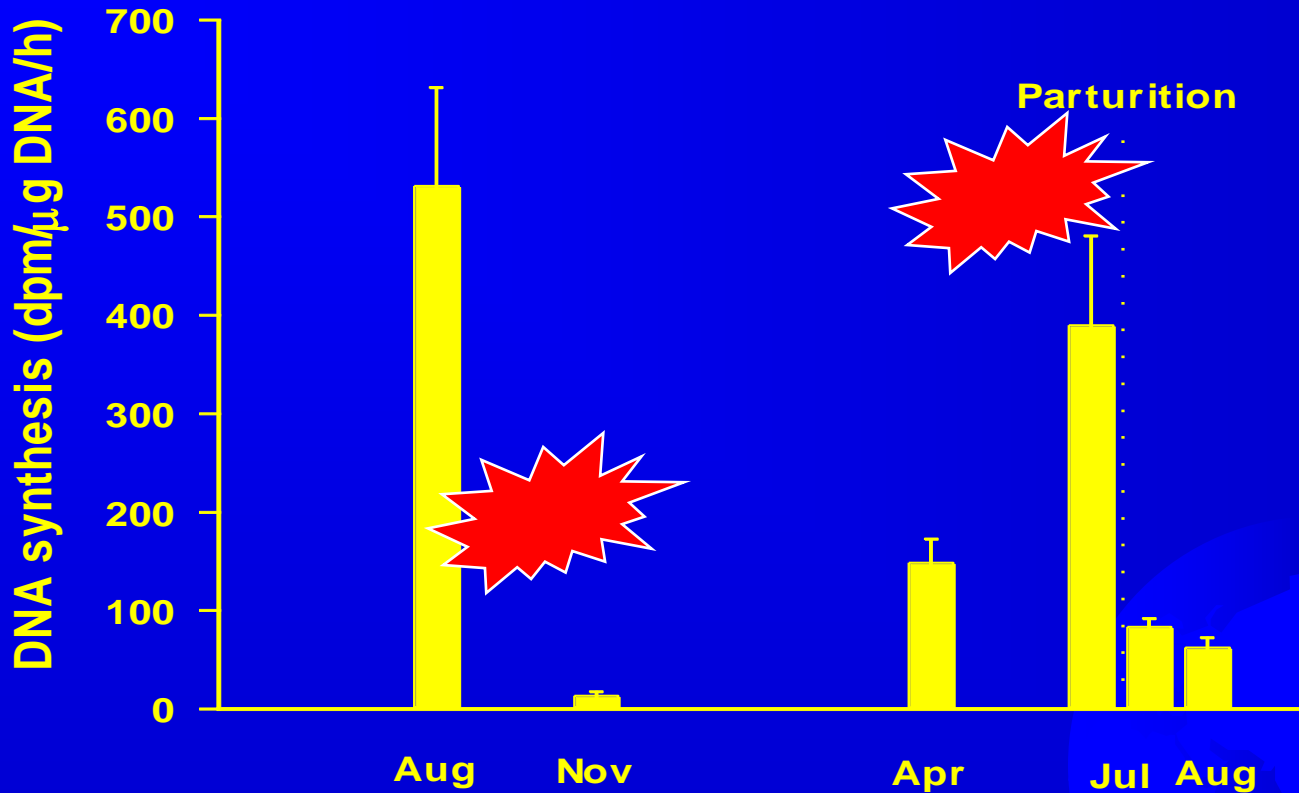


# Observation 3



Comparison of front and hind hooves shows that cell function correlates with load

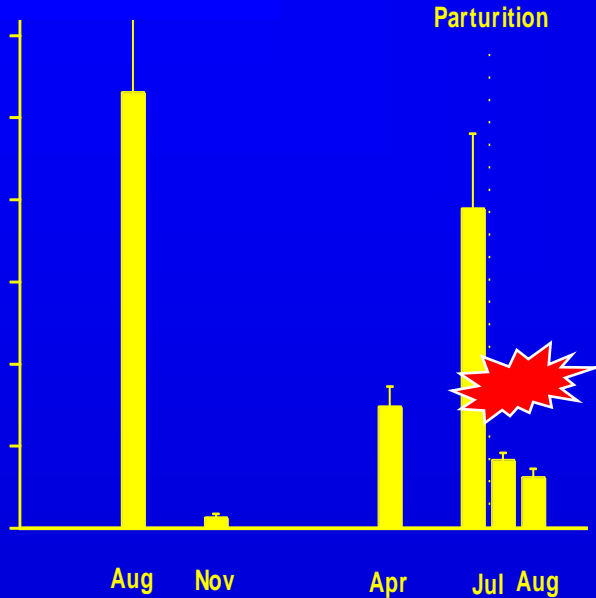
# Observation 4



☞ Longitudinal study shows that proliferation is greater in summer than winter

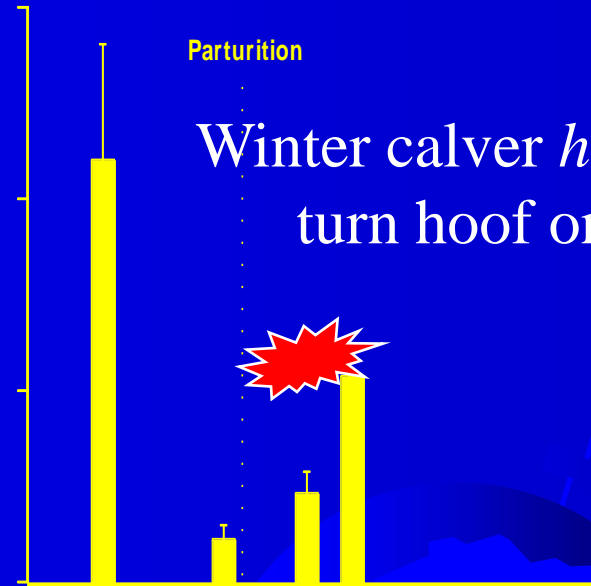
# Observation 5

Summer calver can  
turn hoof off



Parturition

Winter calver *has to*  
turn hoof on



- ☞ Post partum changes are influenced by degree of challenge and desire to partition energy away from unnecessary processes

# Conclusion

- ☞ The first event in production of new horn is proliferation of keratinocytes
- ☞ Proliferation is modulated by season and energetic considerations
- ☞ Increased lameness incidence in winter calvers, therefore, results from greater challenge *combined with...*
- ☞ ...increased biological susceptibility



# Question?

- ☞ Can a cellularly inert winter cow be turned into a cellularly active summer cow?
- ☞ Ongoing work is using melatonin and extended lighting to address this

