



# How Does the Immune System in the Dairy Cow respond to a challenge?

Barry Bradford, Department of  
Animal Sciences and Industry

**KANSAS STATE**  
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# HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE?

## Cows Under Fire

- Common challenges to the immune system in dairy cows
- Sensing the challenge
- Calling in the reserves
- Systemic responses
- Additive effects



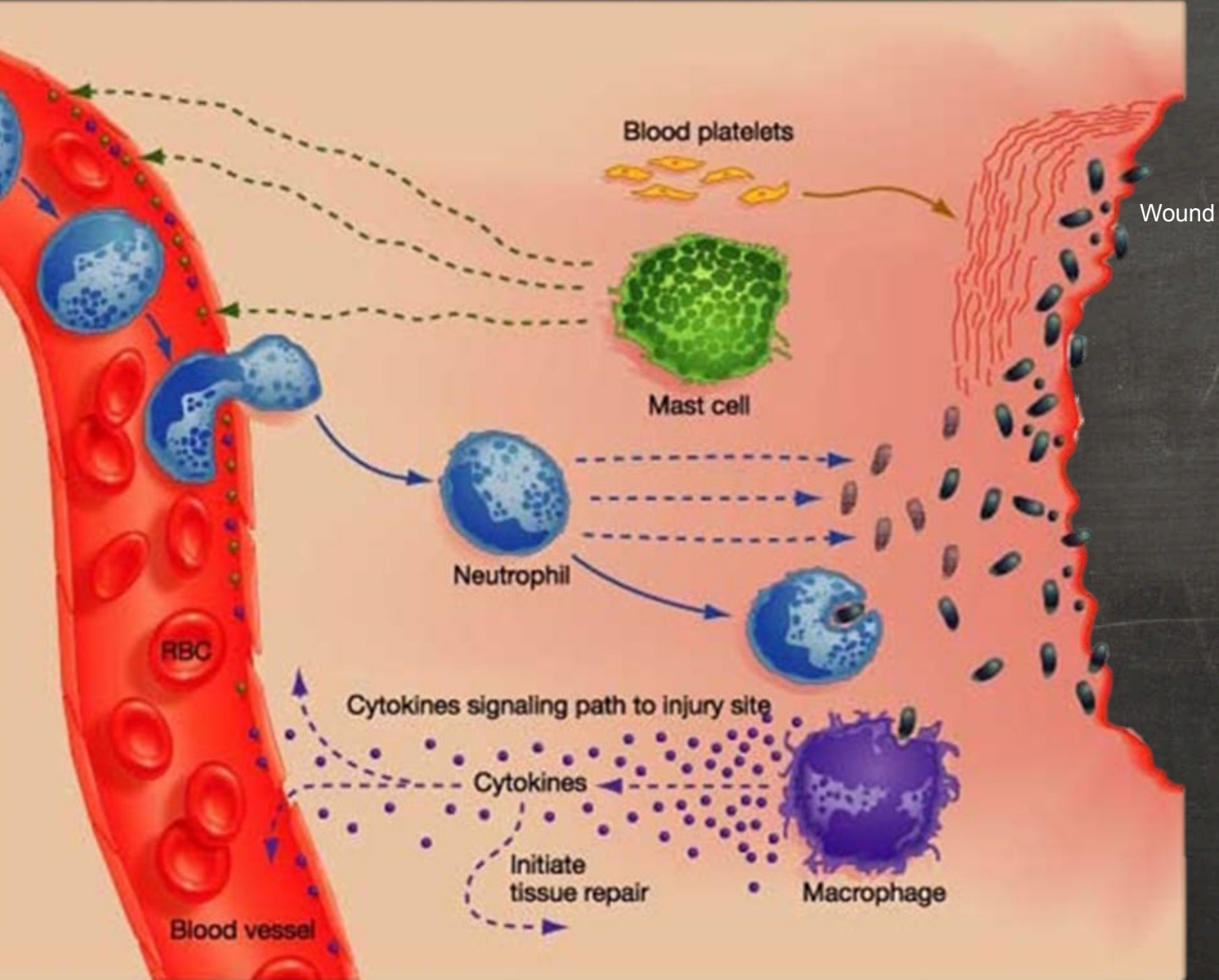


## HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE?

### Common Immune Challenges

- Mastitis
- Metritis
- Respiratory infections







HOW DOES THE IMMUNE SYSTEM IN THE  
DAIRY COW RESPOND TO A CHALLENGE?

## **Neutrophil Migration**





## HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE?

### **Immune Activation**

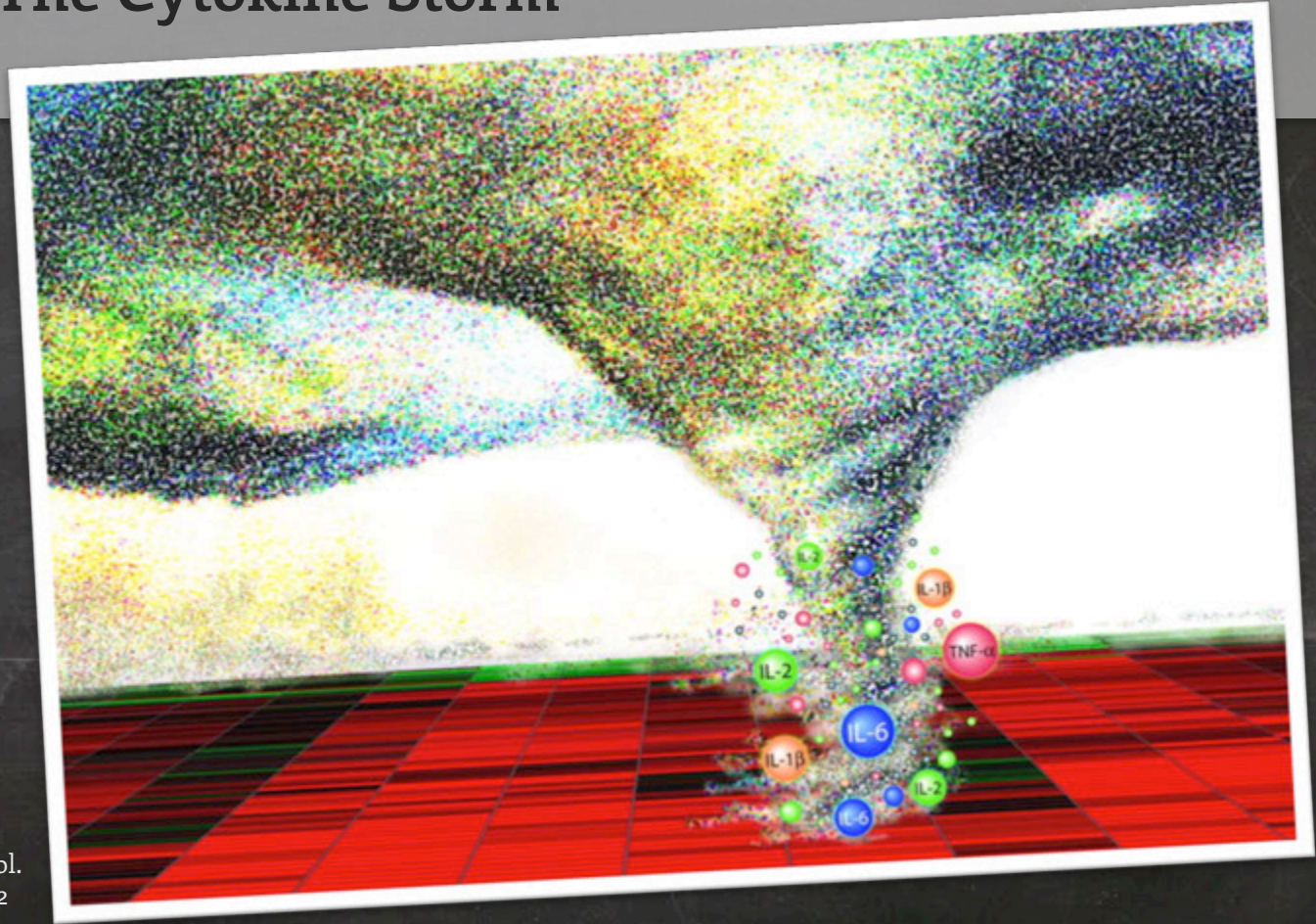
Cytokines have diverse effects:

- Promote further inflammatory signal release
- Stimulate adaptive immune function
- Speed up development of immune cells in bone marrow
- Promotes a delayed resolution phase, with release of anti-inflammatory mediators



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## The Cytokine Storm



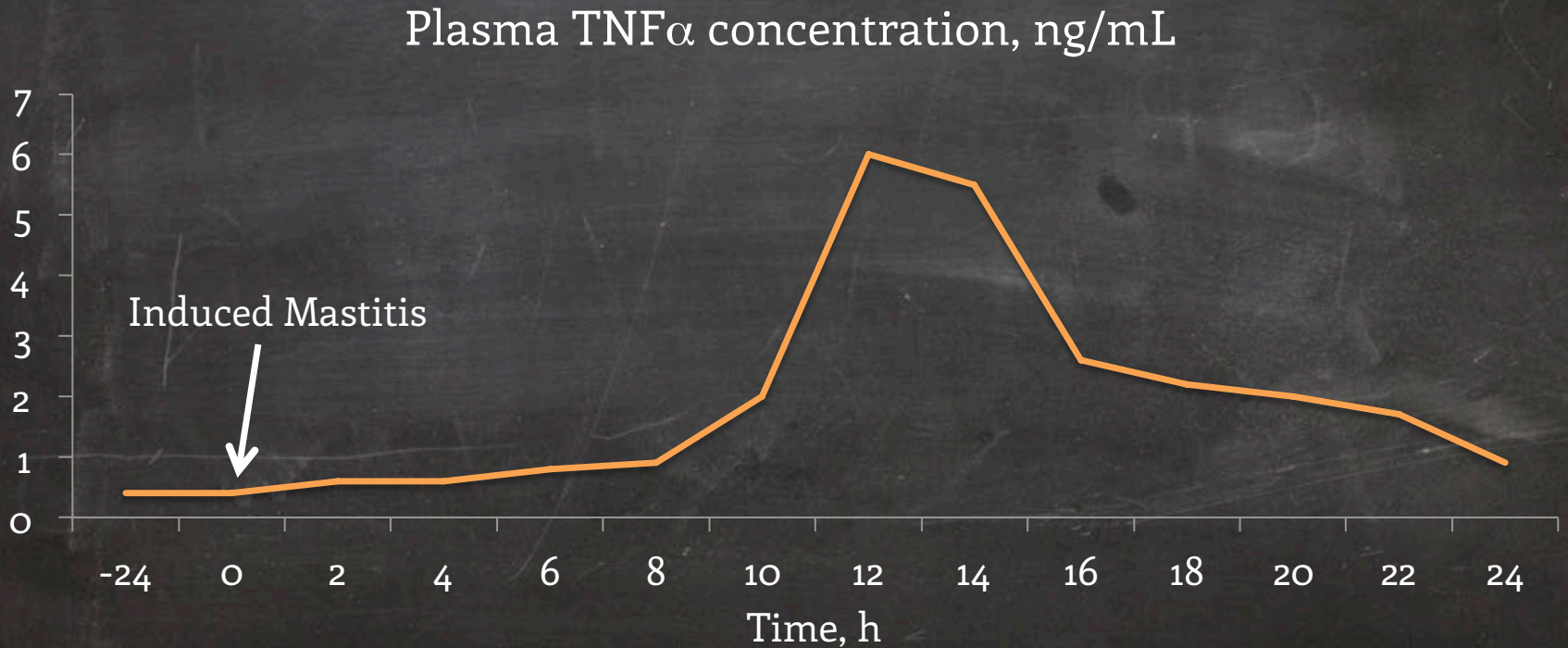
Tisoncik J R et al. Microbiol.  
Mol. Biol. Rev. 2012;76:16-32





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## Mastitis & Systemic Inflammation





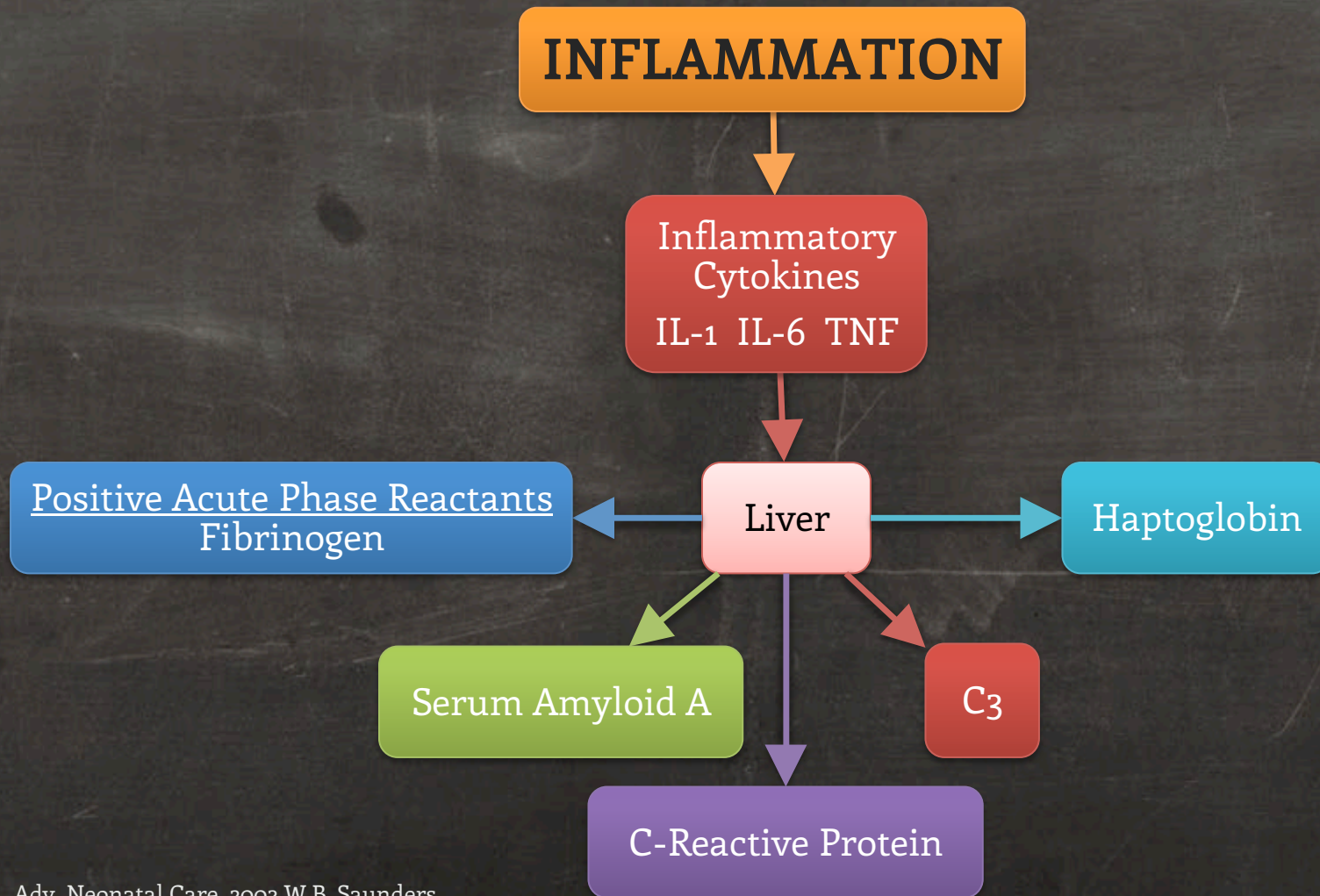


## HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE?

### Many Organs Respond to Cytokines

With severe systemic inflammation:

- Fever
- Poor appetite
- Decreased physical activity
- Muscle breakdown
- Altered liver function
- Increased heart rate
- Increased respiratory rate

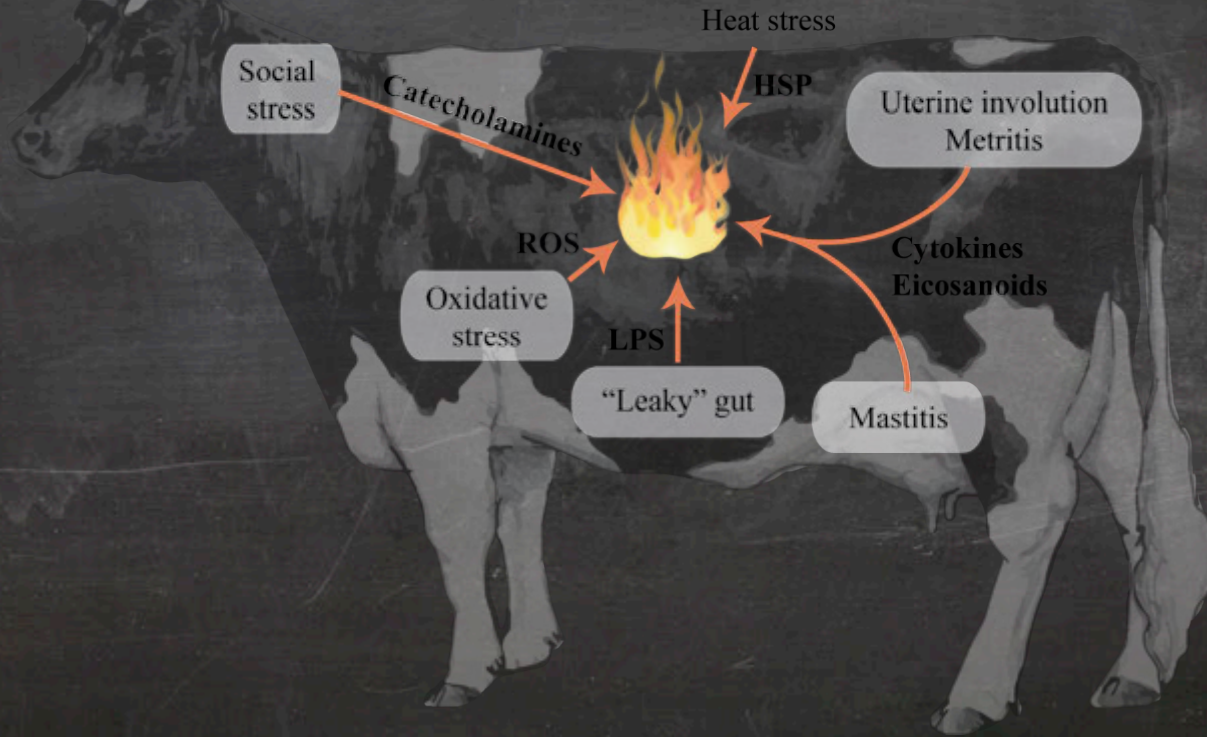






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## Many Factors Can Contribute to Inflammation

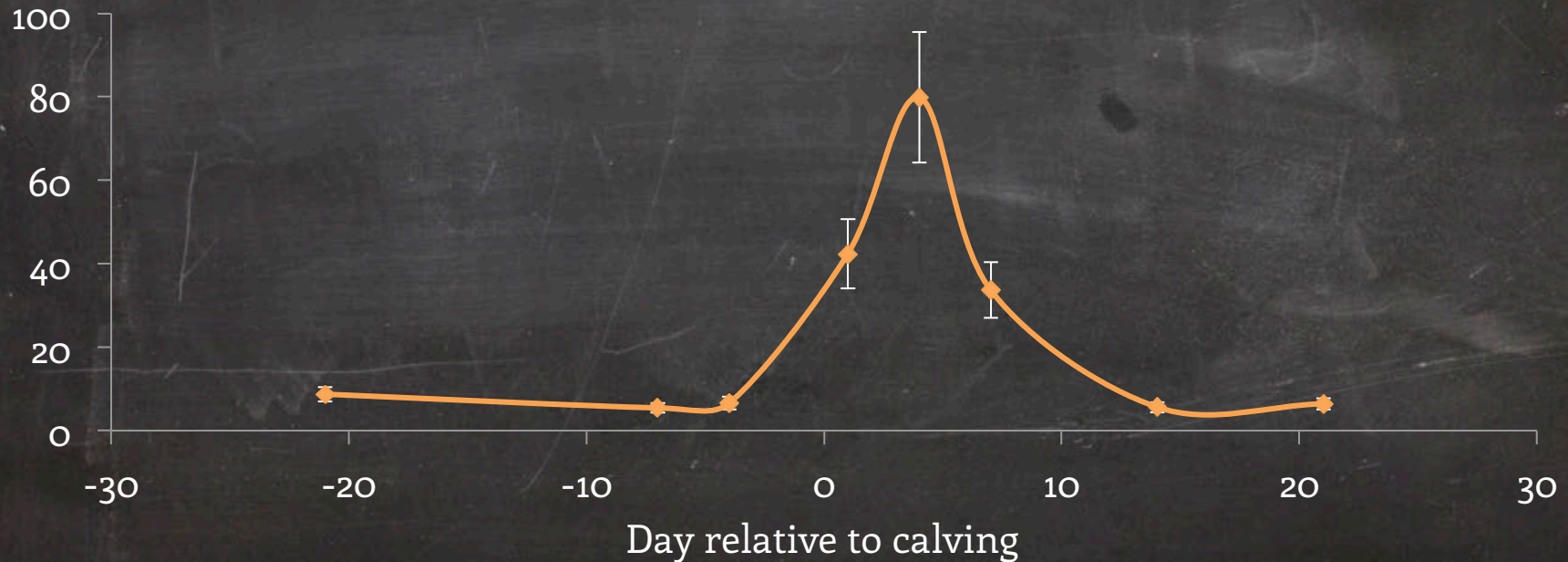




# HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE?

## Inflammation Occurs in Nearly All Transition Cows

Plasma haptoglobin concentration, mg/L







## HOW DOES THE IMMUNE SYSTEM IN THE DAIRY COW RESPOND TO A CHALLENGE? **A Balancing Act**

Responding to an immune challenge ideally means...

- Eliminating the pathogen
- Fixing the damage
- Getting back to normal
- Rapid resolution of an immune response is critical to minimize “collateral damage” associated with sustained and intense inflammation.