

Cold Stress in Baby Calves.

Cold Stress in Calves Occurs below the Following Temperatures:
(National Research Council 2001)

Calves Under 21 Days of Age - 60° F
Calves Over 21 Days of Age - 42° F

Increase in Daily Maintenance Requirements for Calves Under 21 Days of Age:

| Ambient Temperature Body Weight (Pounds) | | | Increase in Daily Maintenance Requirements from 60° F to 32° F | | Increase in Daily Maintenance Requirements from 60° F to 5° F | | |
|---|--------------------------|-------------------------|--|---------------|---|---|------------|
| | 60° F Mcal/ ME/day | 32° F Mcal ME/day | Increase in Mcal/ME Required Per Day | % Increase | 5° F Mcal/ ME/dy | Increase in Mcal/ME Required Per Day | % Increase |
| 110 | 1 .92 | 2 .53 | 0.61 | 32 % | .13 | 1.21 | 63% |

STATE

5 YEAR AVERAGE^a

Texas

| | |
|---|-----|
| No. of days with average temperatures below 60° F | 110 |
| Average High | 63 |
| Average Low | 38 |
| Mean temperature | 50 |
| Days with average temperatures below 42° F | 15 |
| Average High | 47 |
| Average Low | 27 |
| Mean temperature | 37 |

Source: AccuWeather.com

Normal Behavior of Sick Animals
Source: VanAmburgh ADSA Scholar Award Lecture '04

Energy Balance and Signaling of Immune Response:

Animals with infections have reduced feed intake - primarily due to pro-inflammatory cytokines IL-6, IL-1 β , and TNF- α (Johnson, 1998)

Energy Balance, Signaling and Immune Response Increase in Temperature (Fever):

In humans, for every 1.8°F increase (fever) in temperature, basal energy expenditure increases 10 to 15% (Beisel, 1977).

Accordingly, a 2.7°F to 3.6°F increase in temperature (fever) would increase maintenance requirements by ~ 25 to 30% (100 pound calf ~ 0.52 ME Mcal per day)
Bottom-line when calves get sick and have a fever, energy requirements go up.

Energy Balance and Immune Response Complete Scenario:

Calves fed at or below maintenance intake for 2 to 3 weeks during periods of cold stress:

- 1) Body fat depots are depleted, little accretion
- 2) Immune challenge - Fever response – further maintenance energy increase (~ 0.52 Mcals ME/d for 100 pound calf)
- 3) Calf goes off feed (cytokine/leptin response)
- 4) Energy supply reduced to “labile” protein
- acute phase protein production limited
- 5) System fails – calf is slow to recover or dies (“calf starvation death syndrome”)

When calves are fed at or below maintenance and are challenged by their environment or disease:

- 1) Body reserves are used up.
- 2) Calf *gets sick; gets a fever; requires more energy.*
- 3) Calf goes off feed because it doesn't feel good.
- 4) *Snow-ball effect:*
 - There is *more energy being used* than is *being taken in.*
 - Bodily functions *start shutting down.*
- 5) Dead Calf

Cold Stress and Nutrition:

- Energy requirements for growth are not met before starter intake occurs, *especially* under cold stress conditions.
- Immune responses to disease challenges require energy.
 - If cold stress is already in play, the ability of the calf to mount an effective response is limited.
- Restricted rates of milk feeding in calves leads to low feed conversion efficiencies.

Why not just feed added fat?

Increasing fat % in milk without increasing protein causes reduced starter intake.
Animals need to consumer starter for weaning and rumen development.

Protein amount needs to be increased to assure the correct composition of gain.

Best solution: correcting environmental temperature and maintaining constant and increased solids in milk.

