

# Heat Stress in Camelids

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# Heat Stress

- ◆ The inability to cope with environmental conditions resulting in a detrimental rise in core body temperature.

# Causes of heat stress

- ◆ Environmental factors
- ◆ Animal Factors
- ◆ Nutritional Factors

# Environmental factors

- ◆ Ambient temperature
- ◆ Humidity
- ◆ Sunlight
- ◆ Topography of farm

# Animal Factors

- ◆ Gender
- ◆ Species (alpaca vs llama)
  - Breed (huacaya vs suri)
- ◆ Age
- ◆ Pregnancy Status
- ◆ Body Condition Score
- ◆ Fiber Coat
  - Thermal window
- ◆ Parasitism
- ◆ Illness

# Native Environment

## ◆ Llamas and alpacas

- Andes mountain ranges
  - ◆ 8,000 to 14,000 feet elevation
- Climate is somewhat arid
  - ◆ BUT extremes of temperature are not as common as you might think
- Limited ability to withstand extremes
  - ◆ heat or cold

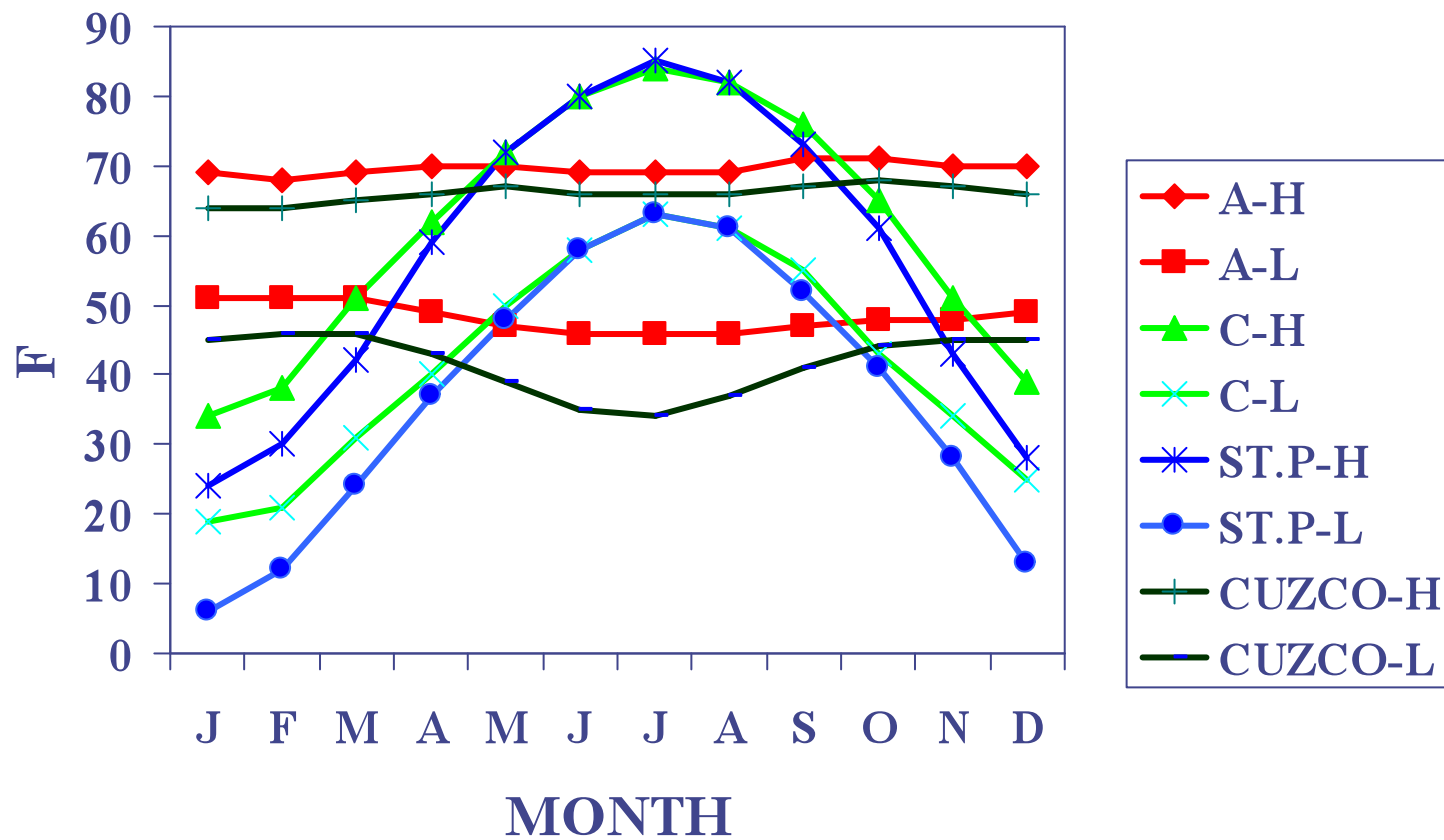
# Native Habitat



- ◆ Well adapted to mountainous regions of South America
- ◆ Extremes of temperatures are less pronounced than occur in many areas of North America

# NA VS SA

20 + YEARS DATA





# Nutritional Factors

- ◆ Grazing
- ◆ Stored forrages
- ◆ Concentrates
- ◆ Water

# Recognition of Heat Stress

- ◆ Lethargy
- ◆ Increased respiratory effort
- ◆ Flaring nostrils
- ◆ Scrotum
  - pendulous
  - Enlargement / swelling
- ◆ Recumbency – increased periods

# Recognition of Heat Stress

- ◆ Congregate in areas of shade or shelter
- ◆ Decrease feed intake
- ◆ Depression
- ◆ Distress
- ◆ Death

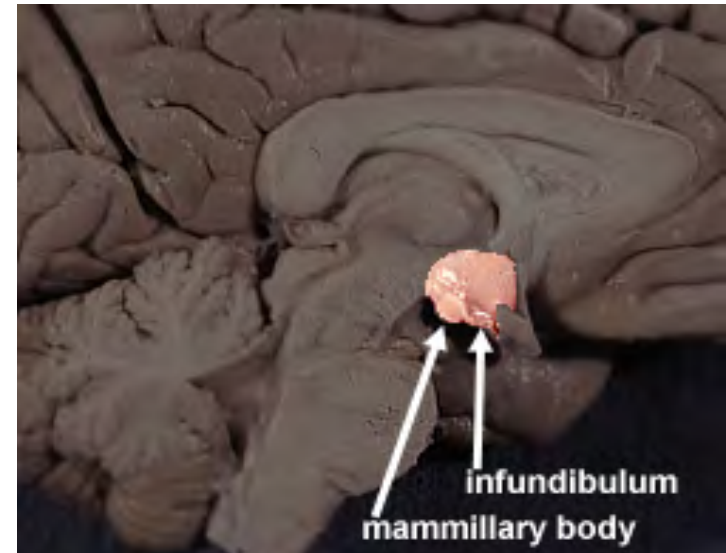
# Effects of Heat Stress

- ◆ Core body temperature increases cause:
  - Destabilization of cell membranes
  - Denaturation of proteins / enzymes
  - Changes in cardiac output
    - ◆ Loss of vascular tone → systemic vasodilation
  - Decreased vital organ perfusion
  - Increased capillary permeability

# Effects of Heat Stress

## ◆ Increased capillary permeability

- Edema
- Extravasation of protein
  - ◆ Hypoproteinemia
- Electrolyte losses
- These cause:
  - ◆ Pulmonary edema
    - Severe respiratory distress
  - ◆ Brain edema
    - Seizures, coma, death
  - ◆ Testicular and scrotal edema
    - infertility



# Intervention

- ◆ Early, immediate action needed
- ◆ Emergency situation
- ◆ If you see signs of heat stress, measure rectal temperature of multiple animals to determine risk

# Intervention

- ◆ Quick easy rule-of-thumb to determine risk
- ◆ Heat Stress Index
  - $HIS = TEMP (F) + HUMIDITY$ 
    - ◆ < 120 good
    - ◆ 120 to 160 caution
    - ◆ > 160 dangerous

# Intervention

## ◆ Rectal temperature

### ■ Individual

- ◆ Normal < 102.5 F
- ◆ Concern 103 to 104 F
- ◆ Critical > 105 F



# Intervention

## ◆ Rectal temperature

### ■ Group

- ◆ If  $> 30\%$  of group have rectal temps  $> 102$ , need to address environmental management

# Treatment

## ◆ Early

- SHADE
- SHEAR
- VENTILATION
- COOL, FRESH WATER

# Treatment

- ◆ First – get them into a shaded, well ventilated area
- ◆ Second – get them shorn
- ◆ Third – cool them off



Water on floor  
and underbelly

# Treatment

## ◆ Supplemental Therapy

- Physical therapy
  - ◆ Don't let them just lay there!
- Medical therapy
  - ◆ Anti-oxidants
    - Vitamin E supplement in feed
    - Trace minerals / salt
- Restrict activity during daytime
  - ◆ Graze at night

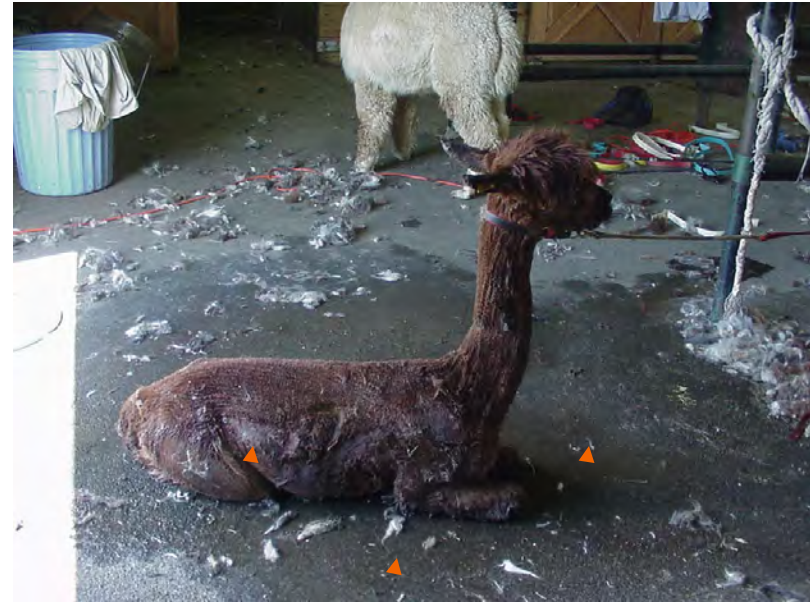
# Treatment

## → Clinical Cases

- Oral electrolytes vs IV electrolytes
- NSAID Drugs
- Vitamin E / Selenium
- Trace minerals and salt
- Physical therapy
- Hydrotherapy ?

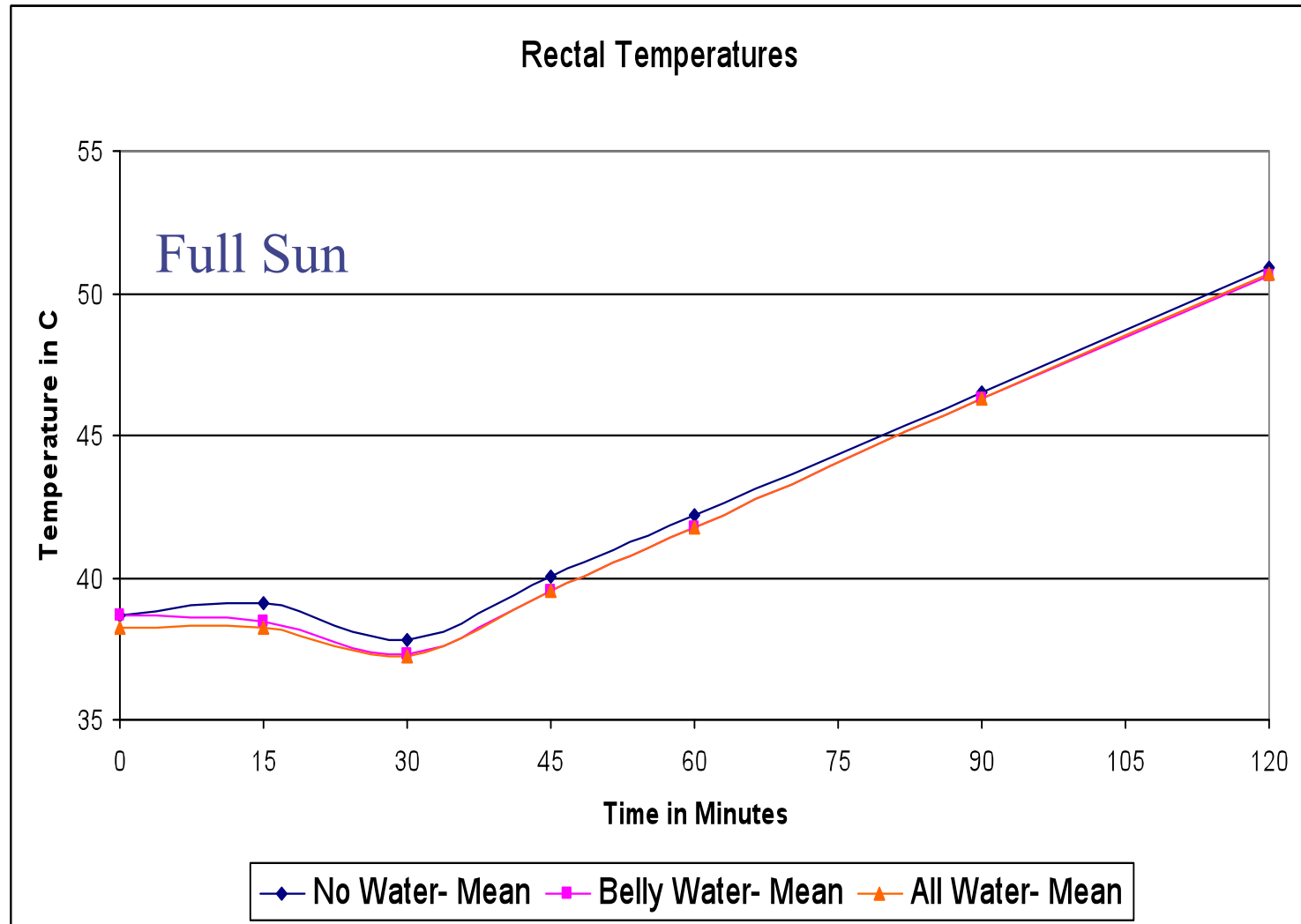
# Heat Stress Research: Hydrotherapy

- Effect of Hydrotherapy
- Effect of shearing

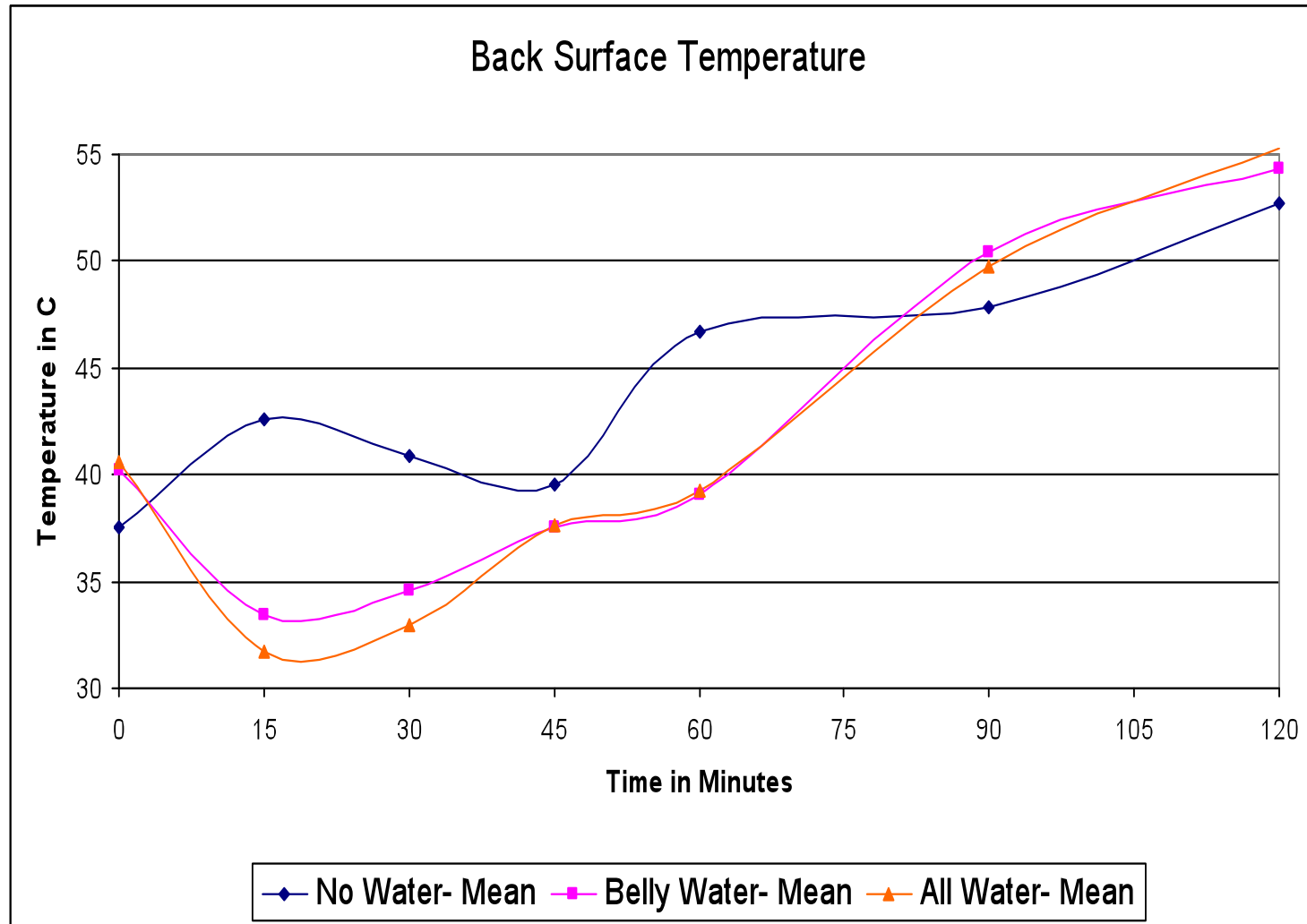


Water on floor  
and underbelly

# Effect of Hydrotherapy on Rectal and Skin Temperature



# Laser Skin Surface Temp – Sun



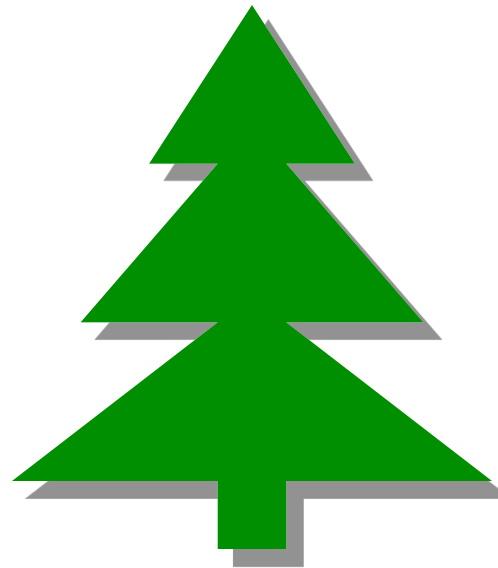


# Shade

What is shade?

Must be EFFECTIVE shade – not just  
“shelter” or “shadow”

Effective shade = cool, refreshing area out of  
sunlight



# Effective Shade

## Trees!

- High, large, long limbs with leaves

- Allows free movement of breezes

- Does not trap heat at all

- Casts large area of shade regardless of position of sun

The best type of shade!







# Choose Trees that Have Effective Shade



# Effective Shade

## Shelters

Dimension of shelter is critical to usefulness of shade

Desirable items:

Deep

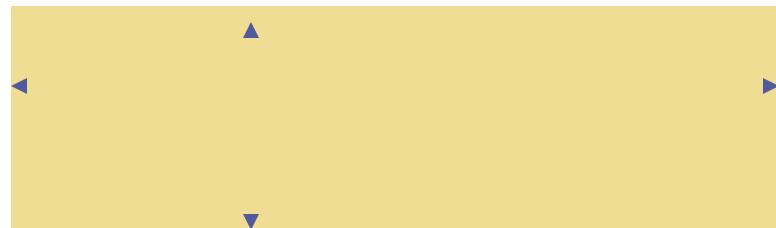
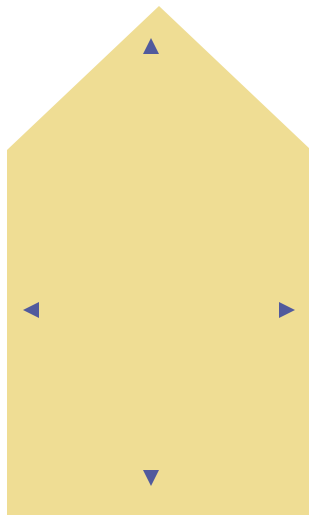
Wide

Long

Tall

Vented roof

Free movement of air



# Types of Shelter

Three-sided shelters

Large open-sided shelters

Tunnel Barns

Quansit huts

Pole Barns









# Heat Stress Research: Shelters

## Compared

### Three-sided shelters

10 x 14

14 x 16

Face southeast

### Carport Shades

12 x 16

### Large open sided barn

Pole barn

Open to the east

### Tunnel Ventilation barn

"Tunnel" courses north-south









# Heat Stress Research: Shelters

Temperature: 85 F   Humidity: 60%

Shelter	Peak Temperature
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3-sided	
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Inside	115 F
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Outside	90 F
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Carport	85 F
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Open-sided Barn	85 F
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Tunnel ventilation barn	80 F
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# Shear

## Why?

Fiber coat creates a  
thermal insulation  
effect

Fiber does protect skin  
from direct sunlight

Benefit of protection  
overwhelmed

## THERMAL WINDOW

“Armpits” front and rear  
limbs

Tail head underneath  
tail



# Shear

How much?

Barrel cut versus full  
body cut

Barrel cut is adequate  
given effective shade

Full body cut more  
effective







# Shear



Should be done BEFORE on-set of heat stress conditions

If clinical signs of heat stress are noted, shear should be done immediately

In healthy alpacas and llamas, heat stress is seen almost exclusively in animals that have not been sufficiently shorn

# Un-shorn vs Shorn Alpacas

## ◆ RECTAL

- Pre-exercise
  - ◆ 100.6F vs **99.5F**
- Post-exercise
  - ◆ 101.2F vs **100.6F**

## ◆ LASER

- Pre-exercise
  - ◆ 86 F vs 92 F
- Post-exercise
  - ◆ 88 F vs 92 F



# Ventilation

Heat is exhausted most effectively in alpacas and llamas by radiant and evaporative heat loss from skin surface

Do not sweat well

Do not lose heat through breathing efficiently

# Ventilation

Movement of air cools surface of skin by increasing evaporative heat loss

Critical when humidity is high

Evaporative heat loss is diminished

Respiratory heat loss diminished

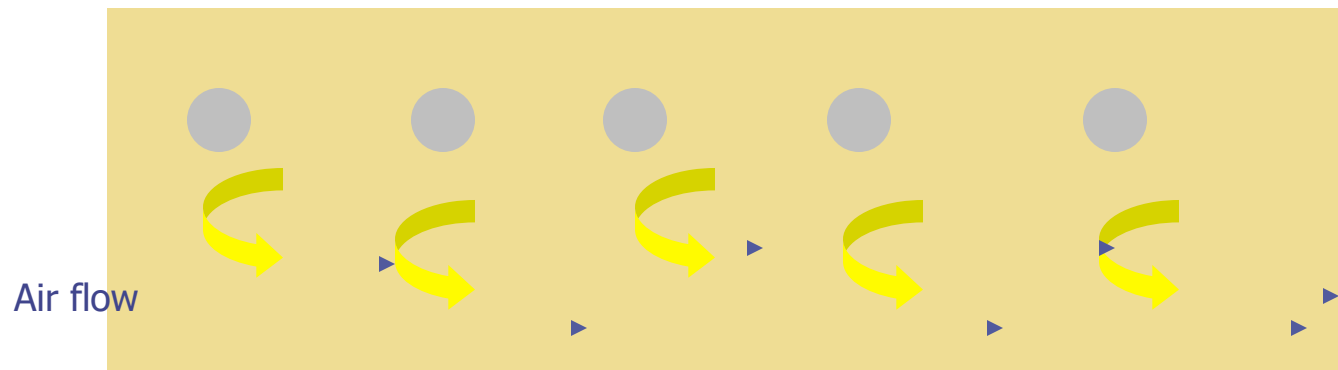
# Ventilation

## Facility

Large volume fans

Placed strategically to create “tunnel” ventilation

Fans should compliment each other



# Ventilation

## Animal

- Floor level fans

- High flow rate but gentle

- Encourage to stand

- Increases thermal window

# Water

Must encourage water intake

Cool

Fresh

Plentiful



Water should be covered / shaded

Sunlight will increase water temp during day in excess of 100 F

# Water

## Unsheltered water



- Heats up during day
  - Decreased water intake
  - Decreased blood volume (dehydration)
  - Decreased cardiac output
  - Decreased ability to "loose" heat



# Prevent Heat Stress!

- Shear
- Effective
  - Shade / shelter
  - Ventilation
- Water management

# Nutrition Prevention

- Can we feed to prevent heat stress?
  - Grass vs hay vs grain
  - Rumination process produces heat over prolonged period
    - Hay > >> grain
    - Grass is excellent because of water intake and readily digestible

# HEAT STRESS

DON'T LET IT HAPPEN