



Horses and Shade

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Overview

- Heat dissipation
- Equine responses to hot weather
- Shade research
- Heat stress in cattle



Heat Dissipation

Conduction

Between surfaces

Convection

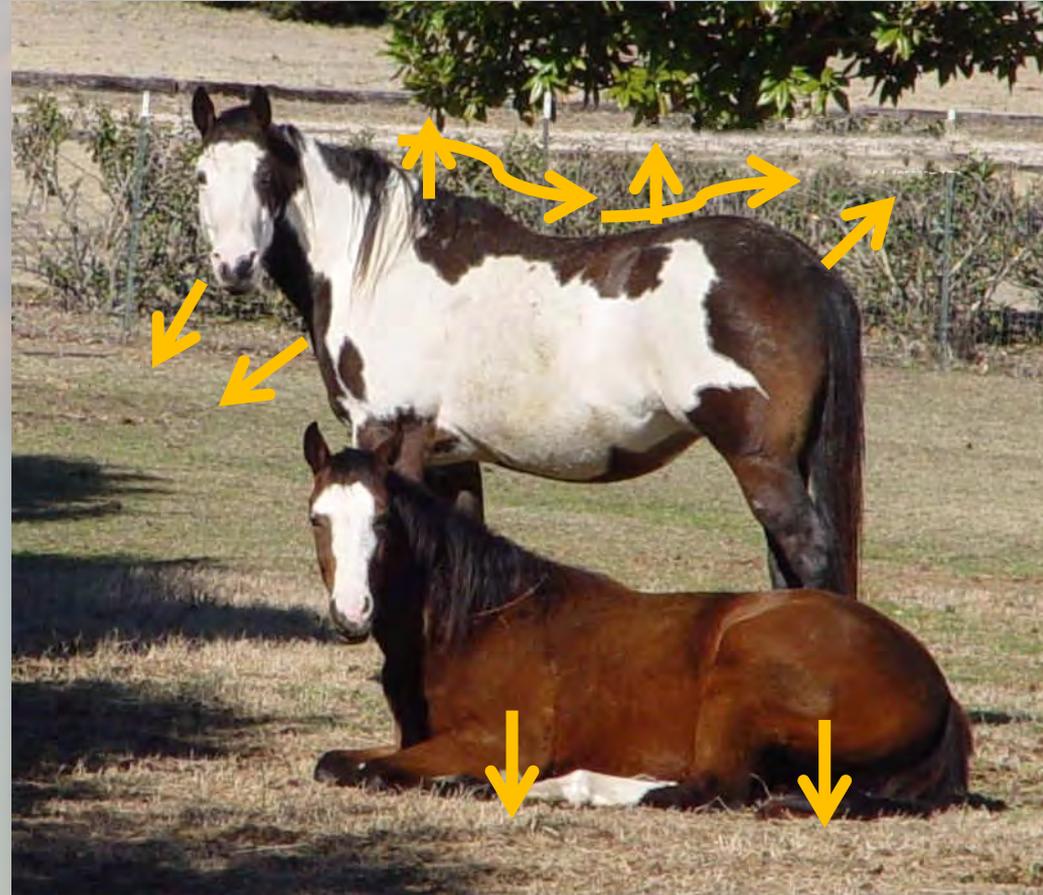
Air, wind

Radiation

Electromagnetic waves

Evaporation

Respiration & sweat



Heat always moves from higher to lower temperature

Responses to Hot Weather

- Increase respiration rate
- Increase blood flow to skin
- Turn rump to sun, move to shade or into breeze, stand rather than lie down, stand near or in water
- Drink more water, eat less feed
- Sweat



Sweat

- Cooling through evaporation
- Sweat glands over entire surface of horse's skin
- Hindered by humidity
- If horse doesn't drink water, fluid loss leads to dehydration

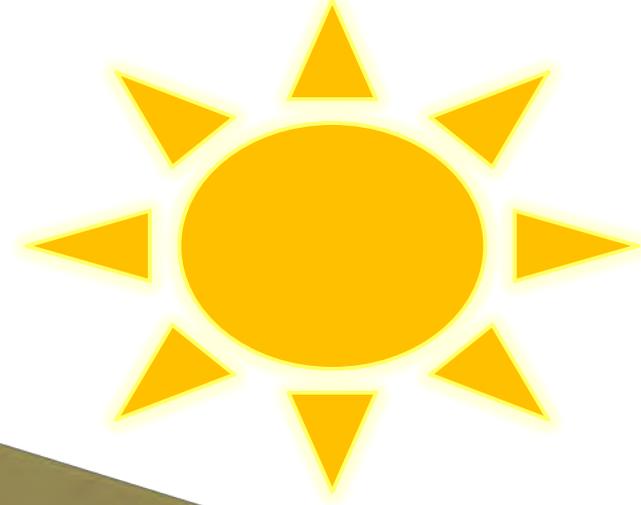


Research

- Extensive heat stress research for horses undergoing strenuous exercise
- Hot, humid weather
- Not for horses at rest



Perceived temperature



Ambient temperature

Relative humidity

Wind speed

Precipitation

+ Solar radiation

= Lower perceived temperature

Shade Research

Do horses benefit from shade?

Measured physiology & behavior of domestic horses in

100% Shade



OR

100% Sun



Average Weather Conditions, Davis, CA

July 2011

12:00-6:00 pm



Avg. Ambient Temperature, °F
Maximum, °F
Solar Radiation, Watts/m²
Soil Temperature, °F

	Shade	Sun
Avg. Ambient Temperature, °F	88	88
Maximum, °F	102	103
Solar Radiation, Watts/m ²	18	733
Soil Temperature, °F	88	132

Shade Research Results



	Shade	Sun
Rectal temperature, °F	99.5	100
Respiration, breaths/min	21	26
Skin temperature, °F	94	96
Standing near water, % observations	19%	34%
Sweat, % observations	1%	52%

All are significantly different



Shade Research

If available, will horses use it?

Preference test in pens half-covered by shade structure
1 horse/pen



Results:

- Average shade use was 57.1 %
- = 7.1% > chance



Shade Research

If available, will horses use it?

Group of 3 horses/pen

Shade structure in large pen



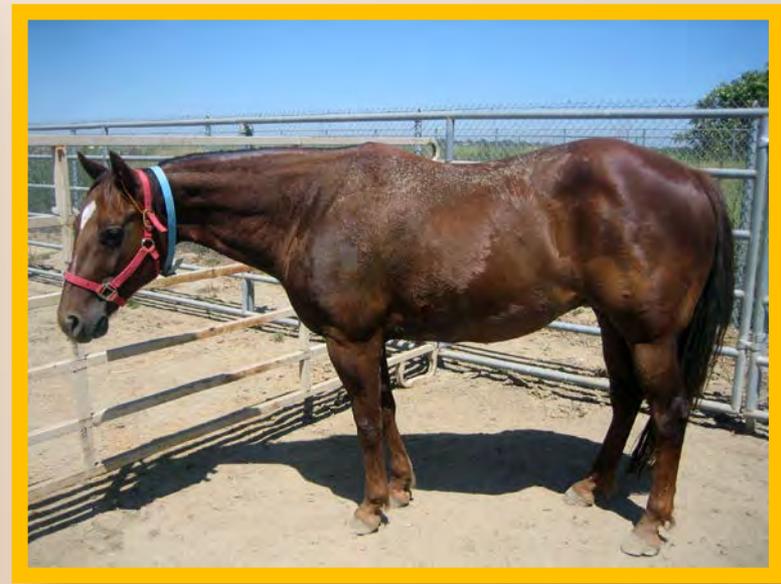
Results

Average shade use 7.1%

Social factor

Shade Research Conclusions

1. Do horses benefit from shade? **Yes**
2. If shade is available, will horses use it? **Yes**
May depend on social situation



Considerations

Horses with compromised health are likely to receive greater benefit from shade than mature, healthy horses



Heat Stress in Cattle

- 2006 California heat wave
- 25,000 cattle died



Heat Stress in Cattle

Cattle affected by heat at lower temperatures than horses

- Size
- Digestive system: rumen
- High calorie diets
- High production
- Lying behavior (14 hr vs 1.5 hr)
- Panting



Effects of heat stress

- Eat less, gain less weight, produce less milk/growth, pregnancy rate drops
- Death (depends on night time cooling)

Heat Abatement for Cattle

- Shade structures
- Water misting and sprinkler systems
- Fans





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