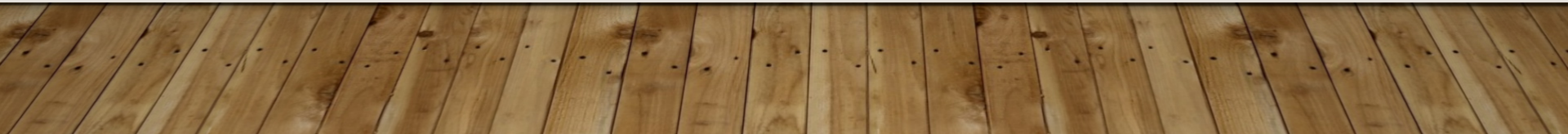


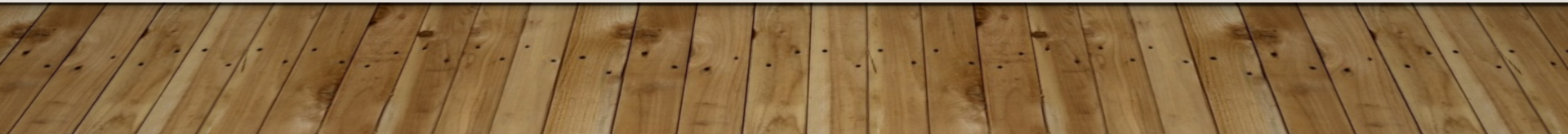
# Horse Hoof Health



# THREE VECTORS FOR HORSE HOOF HEALTH

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JANE BURROWS, DPT, HPCS



# THREE VECTORS FOR HORSE HOOF HEALTH

---

Jane Burrows, DPT, HPCS

- Doctorate in Physical Therapy
- Horses in my practice for 15 years
- Pediatrics and adults
- Special Strides, Monroe, NJ

# THREE VECTORS FOR HORSE HOOF HEALTH

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Duke and Dollie



Bobby and Beaux

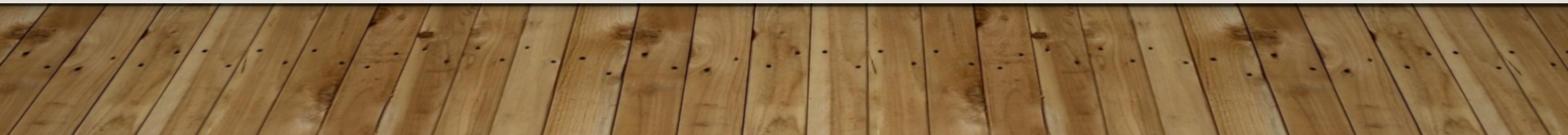
# THREE VECTORS FOR HORSE HOOF HEALTH

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# THREE VECTORS FOR HORSE HOOF HEALTH

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# THREE VECTORS FOR HORSE HOOF HEALTH

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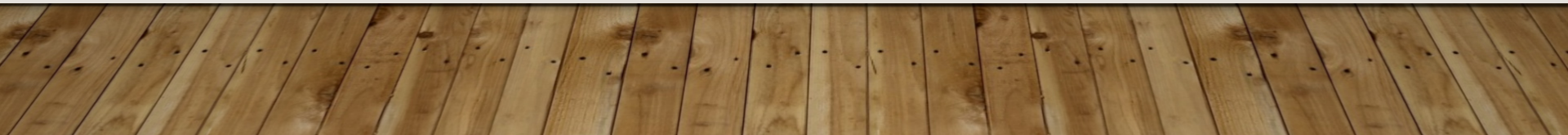
Learning objectives:

- Identify three supporting factors for horse hoof health
- Identify a horse's nutritional state thru Body Condition Score
- Identify the relationship between stress and exercise
- Identify important landmarks and relationships within the hoof anatomy
- Identify three possible triggers for laminitis

# THREE VECTORS FOR HORSE HOOF HEALTH

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- One of the most debilitating hoof ailments is laminitis
- Laminitis is inflammation of the sensitive structures in the hoof called the lamellae. The lamellae are the means by which the coffin bone is held tight within the hoof capsule.
- Untreated laminitis often leads to Founder when the coffin bone becomes detached from the hoof capsule and in severe cases will penetrate through the sole.





# THREE VECTORS

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The horse's hoof is affected by:

- Nutrition
- Exercise
- Hoof Care

# HOW DOES NUTRITION AFFECT THE HOOF?

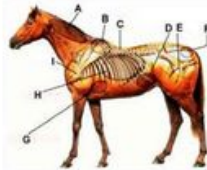
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- Body condition score
- NRC recommendations
- Hidden traps in your feeding program
- Greener grass isn't always better
- Better to know than to guess

# BODY CONDITION SCORE SHEET



## BODY CONDITION SCORING CHART



### Areas of Emphasis for Body Condition Scoring

- A: Thickening of the neck
- B: Fat covering the withers
- C: Fat deposits along backbone
- D: Fat deposit on flanks
- E: Fat deposits on inner thigh
- F: Fat deposits around tailhead
- G: Fat deposit behind shoulder
- H: Fat covering ribs
- I: Shoulder blends into neck

### 1 Poor

Animal extremely emaciated; spinous processes, ribs, tailhead, tuber coxae, and tuber ischii projecting prominently; bone structure of withers, shoulders, and neck easily noticeable; no fatty tissue can be felt.

### 2 Very Thin

Animal emaciated; slight fat covering over base of spinous processes; transverse processes of lumbar vertebrae feel rounded; spinous processes, ribs, tailhead, tuber coxae, and tuber ischii prominent; withers, shoulders, and neck structure faintly discernable.



### 3 Thin

Fat buildup about halfway on spinous processes; transverse processes cannot be felt; slight fat cover over ribs; spinous processes and ribs easily discernable; tailhead prominent, but individual vertebrae cannot be identified visually; tuber coxae appear rounded but easily discernable; tuber ischii not distinguishable; withers, shoulders, and neck accentuated.



### 4 Moderately Thin

Slight ridge along back; faint outline of ribs discernable; tailhead prominence depends on conformation, fat can be felt around it; tuber coxae not discernable; withers, shoulders, and neck not obviously thin.



### 5 Moderate

Back is flat (no crease or ridge); ribs not visually distinguishable but easily felt; fat around tailhead beginning to feel spongy; withers appear rounded over spinous processes; shoulders and neck blend smoothly into body.



### 6 Moderately Fleshy

May have slight crease down back; fat over ribs fleshy/spongy; fat around tailhead soft; fat beginning to be deposited along sides of withers, behind shoulders, and along sides of neck.



### 7 Fleshy

May have crease down back; individual ribs can be felt, but noticeable filling between ribs with fat; fat around tailhead soft; fat deposited along withers, behind shoulders, and along neck.



### 8 Fat

Crease down back; difficult to feel ribs; fat around tailhead very soft; area along withers filled with fat; area behind shoulder filled with fat; noticeable thickening of neck; fat deposited along inner thighs.



### 9 Extremely Fat

Obvious crease down back; patchy fat appearing.



ASSURANCE  
Excellence in Equine Nutrition

# NATIONAL RESEARCH COUNCIL (NRC)

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- Recommendations for horses appropriate to your situation
- Non-Structured Carbohydrates (NSC), Protein, Important trace minerals

# NATIONAL RESEARCH COUNCIL (NRC)

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- Domesticated horses do not feed seasonally and this may promote chronic health problems such as: Laminitis, IR
- Insulin Resistance (IR) responds positively to low input diet


# NATIONAL RESEARCH COUNCIL (NRC)

← → ↻ nrc88.nas.edu/nrh/

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*Advisers to the Nation on Science, Engineering, and Medicine*

**2007 Nutrient Requirements of Horses**

<a href="#">Title Page</a>	<a href="#">Animal Specification</a>	<a href="#">Dietary Supply</a>	<a href="#">Other Nutrients</a>	<a href="#">Program Info</a>	<a href="#">Program Operation</a>
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**Nutrient Requirements of Horses**

**Sixth Revised Edition  
2007**

Available for purchase from the  
National Academies Press  
(<http://www.nap.edu/>)

National Research Council  
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	Amt kg	DE Mcal	CP g	Lys g	Ca g	P g	Na g	Cl g	K g
<b>Animal Requirements</b>		16.65	630	27	20	14	10.0	40.0	25.0
<b>Dietary Supply</b>	0.00	0.00	0	0	0	0	0.0	0.0	0.0
<b>Balance</b>	-10.00	-16.65	-630	-27	-20	-14	-10	-40	-25.0
<b>Densities (per kg DM)</b> (10.00 kg intake)		1.67	6.3	0.27	0.20	0.14	0.10	0.40	0.25

www.agmodels.com/Demos/NRC\_Equine89/Equine\_Model\_2006.asp#

Nutrient Require...html ^

Search the web and Windows

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Animal Specification

Mature Weight, kg    Estimated Actual Weight, kg  
 Intake Level, % BW

Adult at Maintenance    Stallion  
 Growing  
 Pregnant  
 Lactating  
 Working/Training

Average ▾

	Amt kg	DE Mcal	CP g	Lys g	Ca g	P g	Na g	Cl g	K g
<b>Animal Requirements</b>		16.65	630	27	20	14	10.0	40.0	25.0
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<b>Densities (per kg DM)</b> (10.00 kg Intake)		1.67	6.3	0.27	0.20	0.14	0.10	0.40	0.25

Nutrient Require...html

Search the web and Windows

# NATIONAL RESEARCH COUNCIL (NRC)

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	Amt	DE	CP	Lys	Ca	P	Na	Cl	K
	kg	Mcal	g	g	g	g	g	g	g
<b>Animal Requirements</b>		16.65	630	27	20	14	10.0	40.0	25.0
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<b>Densities (per kg DM)</b>									
(10.00 kg intake)		1.67	6.3	0.27	0.20	0.14	0.10	0.40	0.25



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[Title Page](#)   [Animal Specification](#)   [Dietary Supply](#)   [Other Nutrients](#)   [Program Info](#)   [Program Operation](#)

Feed Name	Dietary Supply									
	Amt kg	DM %	DE Mcal/kg	CP %	Lys %	Ca %	P %	Na %	Cl %	K %
<b>NEW</b> Orchardgrass	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Orchardgrass	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Alfalfa Hay	0.00	90.9	2.17	17	0.87	1.19	0.24	0.1	0.65	2
<b>NEW</b> Feed3	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Feed4	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Feed5	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Feed6	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1
<b>NEW</b> Feed7	0.00	89.1	2.17	12.8	0.25	0.38	0.25	0.02	0.66	1.1

	Amt kg	DE Mcal	CP g	Lys g	Ca g	P g	Na g	Cl g	K g
<b>Animal Requirements</b>		16.65	630	27	20	14	10.0	40.0	25.0
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www.agmodels.com/Demos/NRC\_Equine89/Equine\_Model\_2006.asp#

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<a href="#">Title Page</a>	<a href="#">Animal Specification</a>	<a href="#">Dietary Supply</a>	<a href="#">Other Nutrients</a>	<a href="#">Program Info</a>	<a href="#">Program Operation</a>
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**Daily Requirements for Other Nutrients**

Magnesium (Mg)	7.50 g
Sulfur (S)	15.0 g
Cobalt (Co)	0.5 mg
Copper (Cu)	100.0 mg
Iodine (I)	3.5 mg
Iron (Fe)	400.0 mg
Manganese (Mn)	400.0 mg
Zinc (Zn)	400.0 mg
Selenium (Se)	1.00 mg
Vitamin A	15000 IU
Vitamin D	3300 IU
Vitamin E	500 IU
Thiamin	30.0 mg
Riboflavin	20.0 mg

	Amt kg	DE Mcal	CP g	Lys g	Ca g	P g	Na g	Cl g	K g
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- <http://nrc88.nas.edu/nrh/>
- <https://www.nap.edu/read/11653/chapter/1>

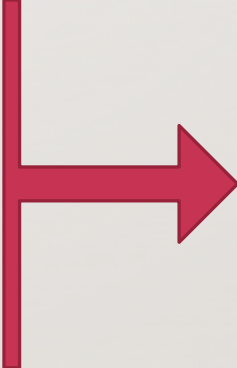
# MYTHS OF HORSE NUTRITION

---

- Alfalfa is the best hay to feed
- My horses need a full measure of feed to get all the trace elements
- The best time to graze a pasture is in the early afternoon when the dew has dried off

# THE GRASS IS ALWAYS GREENER...

---

- Close cropped grass vs longer grass
  - Green grass vs brown grass
  - Grass vs weeds
  - Native pastures vs improved
- 
- Hidden traps
- Variety is the spice of life

# TEST – DON'T GUESS

---

- Testing is expected in the dairy industry
- Testing is not expensive
- Test at least seasonally
- Test: <http://www.equi-analytical.com/>
  - [http://www.foragetesting.org/index.php?page=certified\\_labs](http://www.foragetesting.org/index.php?page=certified_labs)

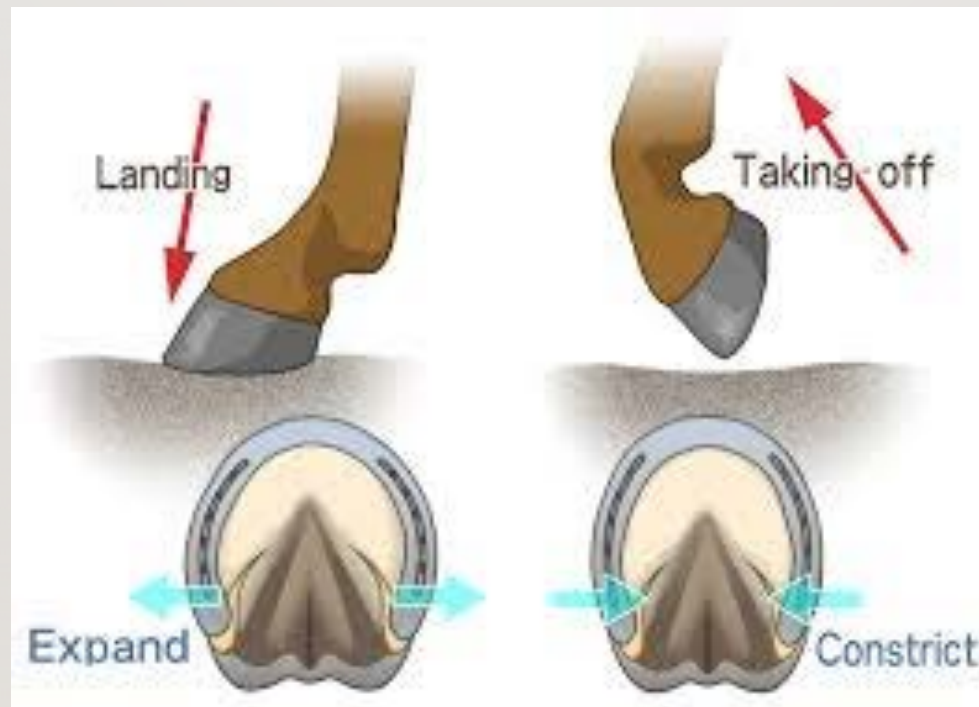
# HOW DOES EXERCISE AFFECT THE HORSE'S HOOF?

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- Hoof pump mechanism
- How much exercise is enough?
- Exercise and attitude (cortisol)

# HOOF PUMP MECHANISM

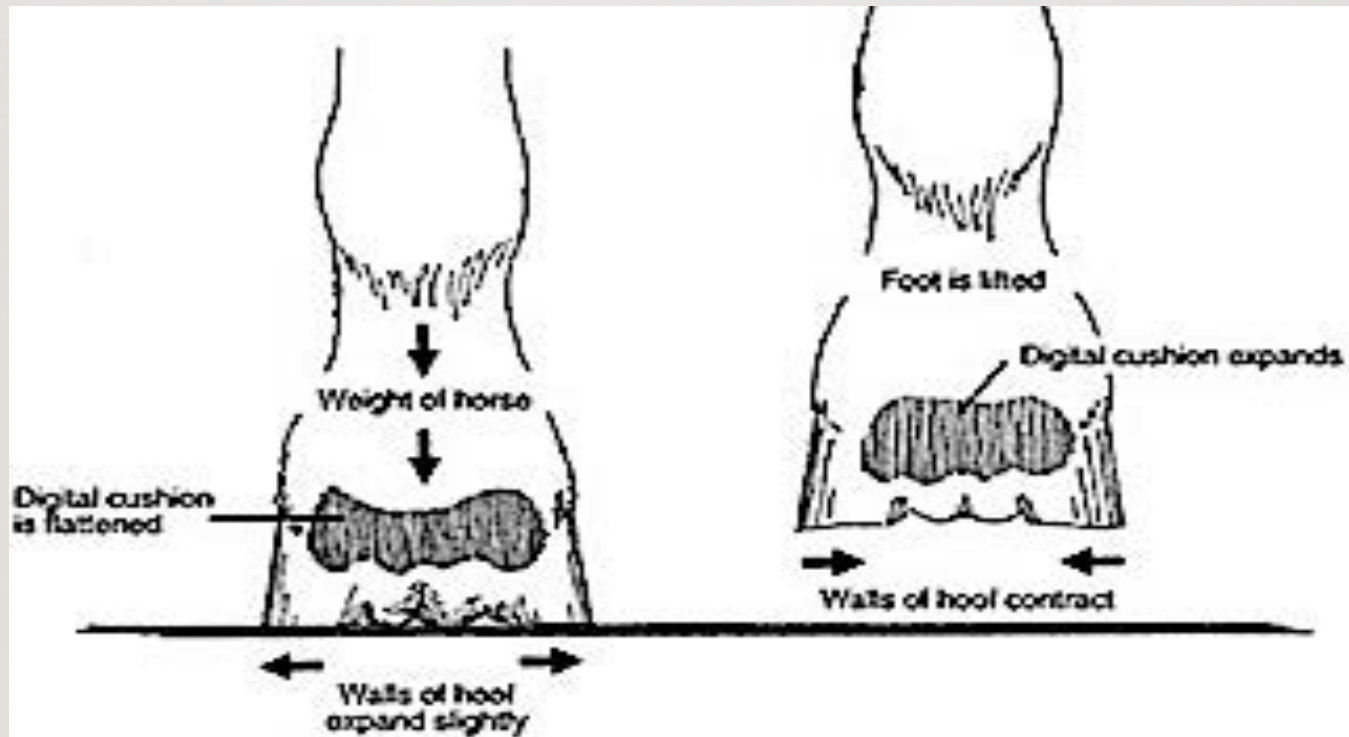
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# HOOF PUMP MECHANISM

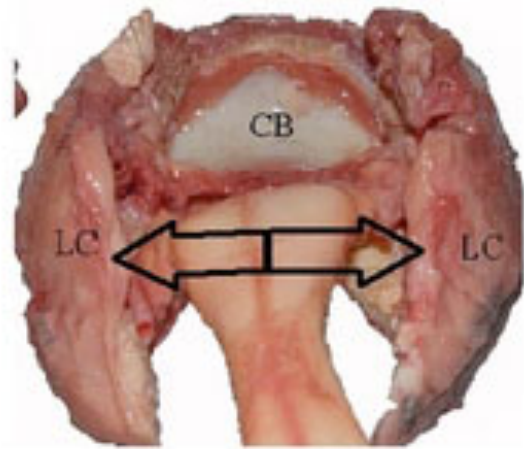
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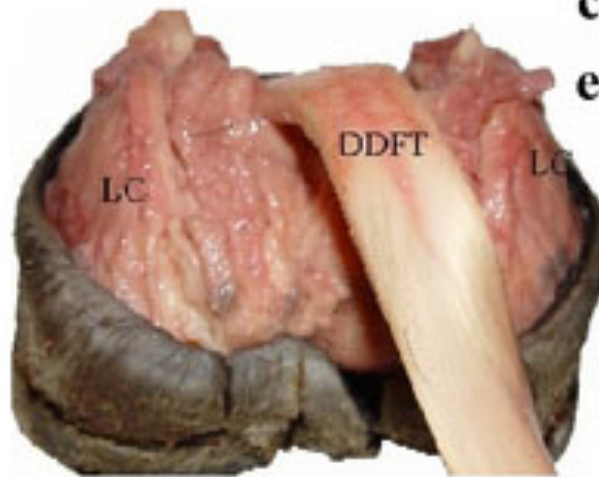
# HOOF PUMP MECHANISM

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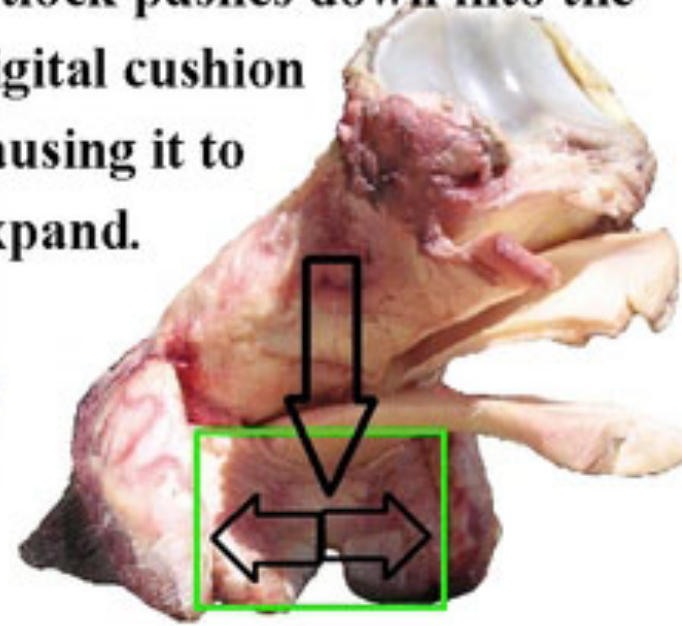
a. The digital cushion pushes against the lateral cartilage.



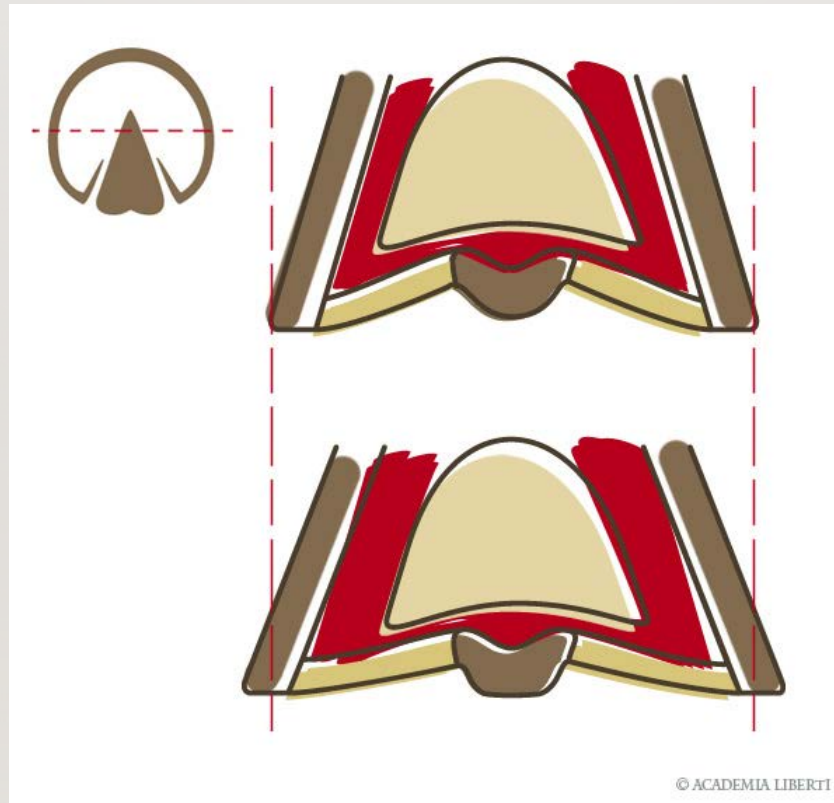
b. The digital cushion located between the lateral cartilage.



c. The descending of the fetlock pushes down into the digital cushion causing it to expand.



# HOOF PUMP MECHANISM



# HOW MUCH IS ENOUGH

---

- 5-20 miles per day for feral horses
- 5-10 miles per day for feral dogs
- 5-15 miles per day for wild cattle
- 0-2 miles per day for stabled horses

# EXERCISE AND ATTITUDE

---

- The researchers conclude that exercise reduces stress levels in horses even “in cases where riders are clumsy or lack appropriate horse-riding experience” and...
- “resting without any particular exercise can also increase the stress levels in horses.”

**Reference:** “Changes in salivary cortisol concentration in horses during different types of exercise,” Asian-Australasian Journal of Animal Sciences, May 2016 *This article first appeared in EQUUS issue #466, July 2016.*

# EXERCISE AND ATTITUDE

---

- Typical system events

• Eat → Insulin release → Glucose into cells



Leptin release → Satisfaction at Hypothalamus



# EXERCISE AND ATTITUDE

Stress → cortisol → insulin → leptin

- Stress produces inflammation thru release of Cortisol
- Cortisol causes insulin resistance and fat retention
- Increased body fat releases cytokines
- The brain can become resistant to leptin thru damage to the hypothalamus

# EXERCISE AND ATTITUDE

---

• Stress → cortisol → insulin → leptin

- Exercise increases insulin sensitivity and lessens inflammatory cytokines.  
[xiv] It has also been shown to directly reduce hypothalamic inflammation.  
[xv]

[xiv] Liburt, N.R., Fugaro, M.N., Wunderlich, E.K., et. al., 2011. The effect of exercise training on insulin sensitivity and fat and muscle tissue cytokine profiles of old and young Standardbred mares. *Journal of Equine Veterinary Science*, 31 (5-6), 237-238.

[xv] Yi, C.X., Al-Massadi, O., Donelan, E., et. al., 2012. Exercise protects against high-fat diet-induced hypothalamic inflammation. *Physiology & Behavior*, 106(4), 485-490.



# EXERCISE AND ATTITUDE

---

Stress can come from many sources –

- stall confinement,
- isolation from buddies,
- change in environment,
- travel to strange locations,
- excessive training and performing,
- pain and illness,

# EXERCISE AND ATTITUDE

---

- and the most stressful of all – not being allowed to graze on forage at all times. Forage restriction is incredibly stressful.[ii] Putting the horse on a “diet” by limiting the amount of hay he can have will create a chain of chemical reactions that prevent the very outcome the “diet” was meant to ensure.

[ii] Getty, J.M. 2014. Restricting forage is incredibly stressful. Choose a different method to help your horse lose weight.

<http://gettyequinenutrition.biz/library/restrictingforageisincrediblystressful.htm>

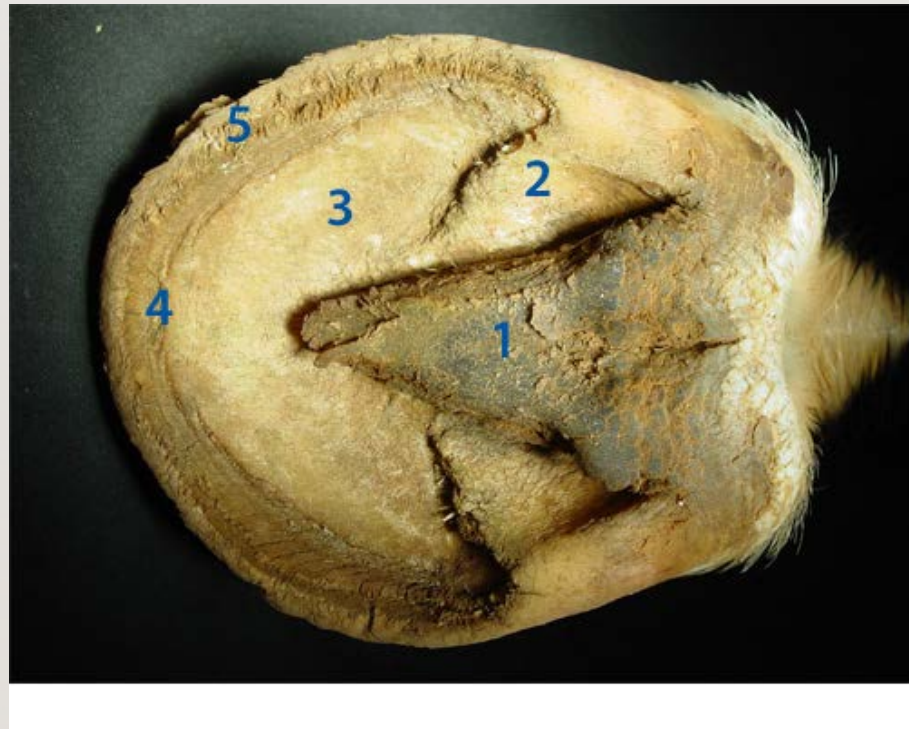
# HOW DOES THE TRIM AFFECT THE HORSES HOOF?

---

- Internal hoof anatomy
- Relationships
  - Frog to sole
  - Coffin bone to level
  - Collateral groove depth
  - Wear patterns

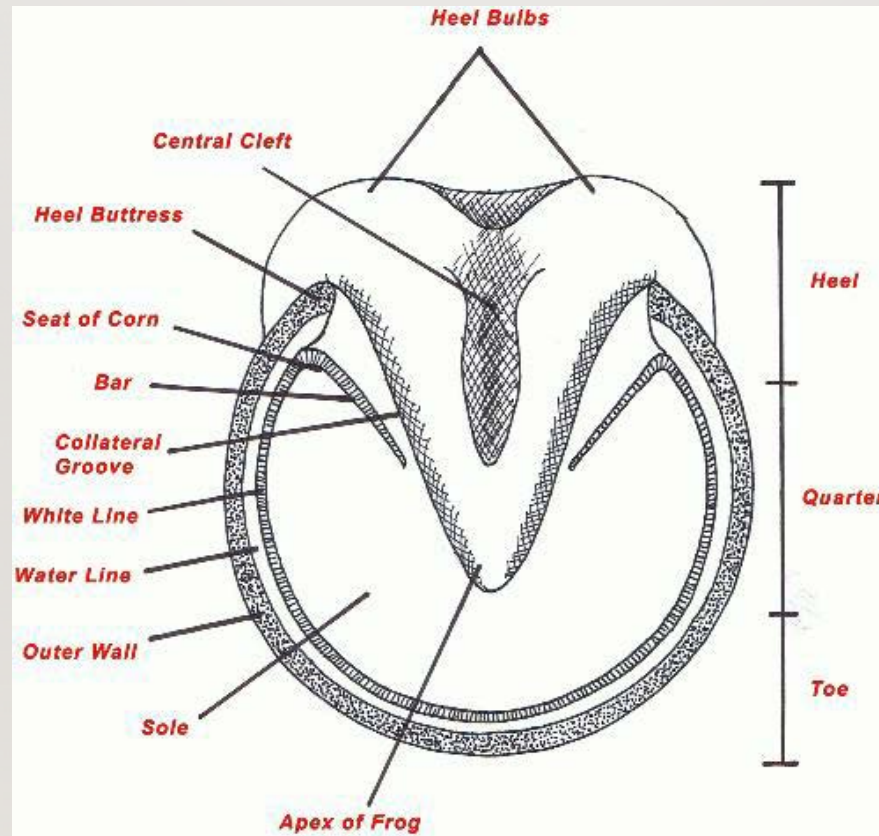
# HOW DOES THE TRIM AFFECT THE HORSE'S HOOF?

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# HOW DOES THE TRIM AFFECT THE HORSES HOOF?

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# HOW DOES THE TRIM AFFECT THE HORSES HOOF?

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# HOW DOES THE TRIM AFFECT THE HORSES HOOF?

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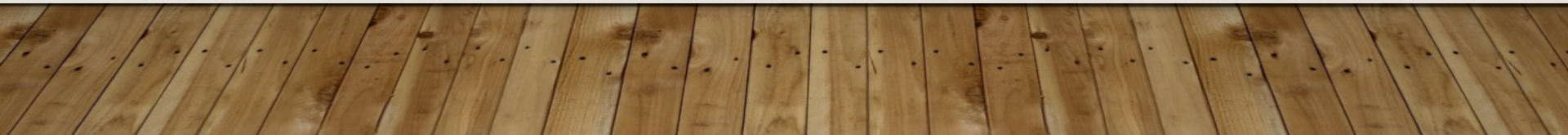
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# HOW DOES THE TRIM AFFECT THE HORSES HOOF?

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# HORSE HOOF HEALTH

---

- **Causes of Laminitis**
- High intake of soluble carbohydrates (sugars and starch) ...
- Stress. ...
- Severe infection. ...
- Obesity. ...
- Concussion. ...
- Cushing's disease. ...

# HORSE HOOF HEALTH

---

- What to do?
  - Nutrition – maintain appropriate weight, monitor NSC intake in pasture grazing, a test is best
  - Exercise – not just for conditioning but for stress reduction
  - Hoof trim – Shod or unshod it starts with an appropriate trim; familiarize yourself with what a healthy hoof looks like

# Horse Hoof Health

