Equine

Metabolic Syndrome

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a.k.a

Couch Potato Syndrome

Extra calories are converted to storage as fat...

As savings for Winter, for drought, for famine...

ALFALFA AND C.O.B IS...

DORITOS AND COKE
Human History

• Evolution Favors Efficient Consumers!
  • Energy Storage
  • Preserving Fat Stores For Winter

• Domestication = Consistent Calories
  – 5000-6000 years human history
  – Prey Species, then Livestock, then Athletes
“EASY” keepers

• Appropriate Physiologic Response
  – Preserve Fat Stores for Winter

• Some breeds have Increased risk
  – Ponies
    • Welsh, Dartmoor, Shetland
  – Morgan
  – Paso Fino
  – Arabian
  – Saddlebred
  – Spanish Mustang

• Any other breed...!
Fat is not just a storage site!

• Human Metabolic Syndrome:
  – “Pre-diabetic” state
  – Obesity + Insulin Resistance
  – Systemic Inflammation
  – Hypertension

• Signalled by hormones produced in fat
  – Adipokines
    • Leptin, resistin, adiponectin etc
  – Cytokines
    • TNF$\alpha$, IL-1, IL-6
    – Chronic, low-grade Inflammation

• Prothrombotic State

• Vasculitis $\Rightarrow$ Laminitis
Insulin Resistance: What does Insulin Do?

• Short-acting Hormone: Responds to high blood sugar
• Enhances sugar storage
  • Initial storage: Glycogen (Liver)
  • Long-term storage: fat
• High blood sugar: OVERSUPPLY of Calories
  Consumption exceeds demand
• High blood sugar is toxic!
Insulin Resistance

Constant exposure to high-concentrations of insulin and glucose decreases sensitivity

High blood sugar ⇒⇒
   Increases Insulin release ⇒⇒
   Cells decrease response ⇒⇒
   Increases blood sugar ⇒⇒
   Increasing Insulin release

Result = Toxicities!
   Lethargy
   Obesity
   Laminitis
Cortisol’s Negative Effects: The Bottom Line

Cortisol

- Stress Hormone
  - Normally Increased during stress

- Huge increase when pituitary is diseased – ACTH Release

- Produced in adrenal gland

- Enhances energy availability:
  - Produces HIGH blood sugar
  - When you need energy now
    (Fright or Flight)
  - i.e. Anti-Insulin
RISK FACTORS

• Too many calories “In”, not enough “Out”
• Genetic Predisposition
• Lack of Aerobic Fitness
• Humans
  – Obesity ⇒ Insulin Resistance
    • Cardiovascular Disease
    • Type 2 diabetes
• Horses
  – Genetic Predisposition
  – Insulin Resistance
    • Laminitis
Laminitis

- E.M.S: “Pre-laminitic Metabolic Syndrome”
- Obesity/Abnormal Fat Deposits
- Lethargy/irritability
- Decreased performance
- Vasculitis + Incr. Cortisol
  - LAMINITIS
Cushing’s Disease
Is not
Metabolic Syndrome

• **Differences**
  Cushing’s Disease: Pituitary Tumor
  • Excessive Cortisol
    (Steroid Stress Hormone)
  • Cortisol is ANTI-Insulin

  Metabolic Syndrome:
  • Hormones of fat preservation
    – Released from body fat
  • Occurs during dietary excess
  • Increases Cortisol

• **Similarities**
  Excess Cortisol
  Diseases of Insulin Resistance
  Comparable Body-shapes
Nutritional Concerns

- *Non-Structural Carbohydrates*
  - “Water Soluble Carbs” = WSC
  - Rapidly Digestible
  - “Simple Sugars”
    - Candy & Fruit
    - Corn & Oats
  - Fructans - high in cool season grasses
  - Target: <10% of total for at risk horses

- Structural Carbohydrates
  - Cellulose
  - Slowly Digestible
Testing

• If you think a horse has E.M.S, it probably does!
Testing

- **Dynamic Testing**
  - Only if non-painful
  - Only after a fast (6-12 hours)
  - Oral or IV Glucose Challenge
  - Sampling of glucose + insulin
    - Multiple time points

- **Hyperglycemia**
  - Not often present

- **Hyperinsulinemia**
  - Affected by stress, pain, recent feed
Treatment - Diet

- Decrease Condition!
- Minimize Non-fiber Carbs
  - No candy = No whole grain
  - Bermuda or Timothy
  - Consider supplementation
    - Vit E, Vit A,
    - Copper, Zinc, Selenium
    - Protein
- Feed 1.5% of B.W.
  - Weigh the Food!
- <10% W.S.C.
Treatment - Grazing

- Decrease Condition!
- Diet + Exercise!

- Grazing is complicated
  - Fructans
    - Higher Concentration in our cool season grasses
    - Increased laminitis risk
  - Hand-grazing
  - Grazing Muzzle
  - Night-time grazing
Treatment: Medications

- **Goal:** Improve Insulin Sensitivity

- **Metformin**
  - Biguanide medication
  - Several Studies in horses
  - Effective, at least initially
  - Safe

- **Psyllium**
  - Enhanced insulin sensitivity
  - Dr. Shannon Moreaux
**Treatment:**

**Equine Metabolic Syndrome**

- Improve Insulin Sensitivity  
  *(DECREASE OVERALL BODY CONDITION)*
- Supplements, Botanicals, Nutraceuticals  
  - Chromium  
  - Chasteberry  
  - Cinnamon  
  - Currently - No Solid Research in horses
What about the thyroid?

• Thyroid increases energy utilization
• Thyro L acts like accelerator pedal on overall metabolism
• No thyroid deficiency
  – Not deficient in Metabolic Syndrome
  – Not deficient in Cushing’s Disease
  – Removal of thyroid does not produce Disease
• May initially assist with weight-loss
• Side effects
  – Increased cardiac stress
    • ?Hypertension?
  – Resistance develops over time
Questions?

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