

# EQUINE INSULIN RESISTANCE

## ETIOLOGY

- IR can be described as a reduced sensitivity or failure of cells to respond properly to physiologically “normal” levels of insulin. This may result in decreased insulin action, compensatory increases in insulin production by the pancreas, decreased glucose uptake by cells, decreased glucose production by the liver, and increased fat mobilization.
- Several interrelated mechanisms that impact endocrine signalling pathways are thought to contribute to development of insulin resistance:
  - Elevated release of adipocyte-derived pro-inflammatory signalling molecules which impair insulin signalling
  - Hypercortisolism (high circulating levels of cortisol, which stimulates macrophages to release adipokines into circulation as well as expand regional adipose repositories)
  - Release of free fatty acids from regional adipose repositories into circulation, contributing to adipokine production and hepatic IR
- In addition to nutritional interventions, an appropriate exercise regimen can play a key role in improving insulin sensitivity.
- Horses routinely consuming calories in excess of their maintenance and exercise requirements will result in increase in body condition and weight gain.
- For horses that are obese but not IR, the level of calorie intake is more important than the source of those calories.
- For horses that are obese and IR, the source of calories has a huge impact on the horse’s health and is equally important as the daily caloric intake (e.g. calories from fat and fibre vs. nonstructural carbohydrates).

## RISKS AND/OR COMPLICATIONS

- Obese horses are at increased risk of stress on the heart and lungs, greater risk of laminitis or founder and increased risk of developmental orthopedic (bone and joint) problems in young, growing horses.
- Overweight horses are subject to more strain on feet, joints and limbs, predisposing obese horses to or worsening symptoms of arthritis.
- Overweight horses also experience less efficient dissipation of body heat
- Fat buildup around key organs may interfere with endocrine regulation of normal body functions, contributing to lower reproductive efficiency, lethargy, and aberrant glucose and insulin metabolism.
- Some overweight horses may have metabolic disorders such as Cushing’s Disease (PPID), hypothyroidism, or muscle disorder(s).
  - This should be carefully investigated by a veterinarian as nutritional and medical interventions may be necessary to manage these disorders.

## MANAGEMENT RECOMMENDATIONS

- The best way to keep horses from becoming overweight is to control intake with an appropriate exercise program. Horses on lush pasture should be fitted with a grazing muzzle or placed in a dry lot and fed grass hay.

## DIETARY RECOMMENDATIONS

- Many obese horses cannot tolerate high levels of starch and sugar in the diet and should be maintained on rations that are low in calories and contain higher levels of digestible fibre.
- Horses in training that are “easy keepers” should be fed lower calorie feeds, but in sufficient amounts to meet dry matter and all other nutrient requirements.
- Grass hay is recommended over legume hay due to lower calorie content.
- It is important to know exactly how much feed is being fed. Therefore, a scale should be used to determine the weight of a given meal or daily ration of hay and concentrate to avoid over or underfeeding.
- Monitor weight gains or losses using a weight scale, weight tape or Body Condition Scoring System—and adjust feeding rate as necessary.
- Providing a reduced calorie, good quality balanced diet with appropriate amino acids, vitamins and minerals is essential to supporting appropriate weight loss, while maintaining lean tissue mass. Feeding rates should be determined according to the target or ideal body weight and body condition score, as opposed to the current (obese) body condition. All changes should be made gradually.
- Overweight horses that are insulin resistant may benefit from the supplementation of magnesium and chromium in the diet, which could improve sensitivity to insulin. Note: Chromium is not yet approved as an ingredient in horse feeds, but is available in some supplements.
- Always provide good quality grass hay, and free choice access to salt and water.

## SUGGESTED PURINA PRODUCTS:

### FEED NOTES:

- Maximize fats and digestible fibre for safe energy/calories; control starch/sugar intake while enhancing pre-cecal digestion to help avoid the effects of high blood sugar and starch overload.
- Vitamin E, zinc, magnesium and chromium can be helpful in managing carbohydrate-related disorders.

Recommended:

### **SUPERFIBRA INTEGRI-T**

Alternatives:

### **SUPERFIBRA PLUS SUPERFIBRA ULTRA**

Supplement:

### **HORSE-SHIELD**

can be used to improve nutrient absorption and promote an ideal pre-cecal environment (optimize the pH) in the horse.

### **HORSE PLUS**

can be used to supplement B vitamins. Some studies have shown the benefits of vitamin B supplementation for patients with insulin resistance. Since some B vitamins are involved in the metabolism of energy, supplementation is beneficial for optimizing sugar absorption and the utilization of sugar for energy production.



If the horse needs to lose weight and/or is insulin resistant: **EQUILIBRIUM EQUILIZER** is recommended. However, if the hay or pasture is below 12% protein, **EQUILIBRIUM OPTIMAL** is a better option.

In both these cases, the addition of an omega-3 source is recommended. The horse's diet should include a complete supplement providing all necessary vitamins, minerals and protein. If the horse needs extra calories (e.g. a horse at work), a source of digestible fibre may be added.

#### FEED RATE PROTOCOL NOTICE

This feeding protocol described here pertains only to Cargill Limited Horse Feeds. There is not established feeding protocol that all feed companies must follow. Purina provides two feeding rates on their tag a “Minimum” and a “Purina Superior”. The “Minimum” meets the levels established by the NRC Nutrient Requirements of Horses (2007), which will prevent all classic nutritional deficiencies. The “Purina Superior” is a greater level of fortification that promotes an optimal level of performance and immunity. By no means does that imply “Minimum” is subpar, and for the non-competitive horse, that stays home year round and has no health issues there is probably no need to exceed this level. However, if you are feeding a true equine athlete, with all the immune stresses associated with that level of competition, then the “Purina Superior” level is paramount to ensure an optimal level of performance and immunity.