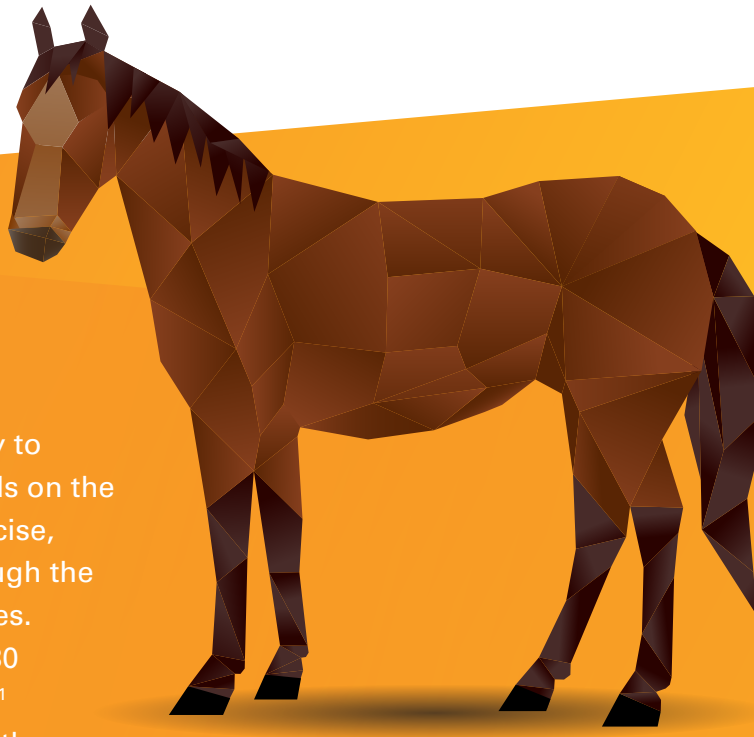
KemTRACE® CHROMIUM

KEMIN | EQUINE



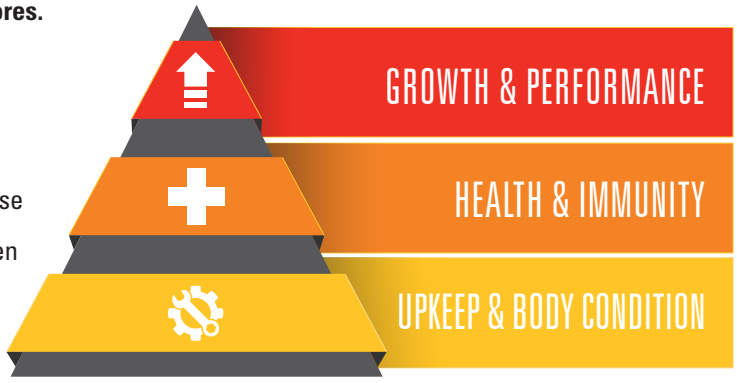
GLYCOGEN AND THE ATHLETIC HORSE

Carbohydrates and fats supply the bulk of the energy to horses during exercise and use of each often depends on the intensity of the exercise. During lower intensity exercise, approximately 42 percent of energy is supplied through the oxidation of fat, versus 58 percent from carbohydrates. During high intensity exercise, the ratio can shift to 30 percent from fat and 70 percent from carbohydrates.[1] Regardless of intensity, top performance requires both an adequate supply of and efficient use of carbohydrates.

Cells take up carbohydrates from blood plasma in the form of glucose, which is stored as glycogen in the liver and skeletal muscle. For optimal performance, horses must effectively utilize plasma glucose and maintain cellular glycogen stores. Carbohydrate availability and its impact on physical performance in horses are connected in two ways:[1]

1. Increased time to fatigue when supplemental glucose is administered intravenously (IV) during moderate exercise
2. Negatively impacted performance when muscle glycogen stores are depleted prior to exercise

This research demonstrates the importance of glucose/glycogen metabolism to physical performance.



KemTRACE® Chromium

ACTIVATES INSULIN RECEPTORS › **MORE GLUCOSE** ENTERS CELLS › **MORE ENERGY** AVAILABLE › **IMPROVED HEALTH** & PERFORMANCE

GLUCOSE UTILIZATION

Providing glucose through IV is not a practical solution. Ensuring the diet provides adequate levels of glucose or glucose precursors, as well as the efficient use of the available glucose, is ideal.

Unlike humans, plasma glucose levels in horses can increase during exercise because of the mismatch between glucose's rate of appearance (Ra) due to the breakdown of glycogen in the liver and the rate of disappearance (Rd) or uptake by skeletal muscle cells. At moderate levels of exercise, horses can experience a four-fold increase in both Ra and Rd.[3] However, at higher intensities, while the four-fold increase in Rd is maintained, Ra can increase to seven times higher than normal – resulting in a significant increase in plasma glucose levels.[4]
If skeletal muscle cells could further increase their uptake of glucose, it might be possible to improve performance or delay fatigue.

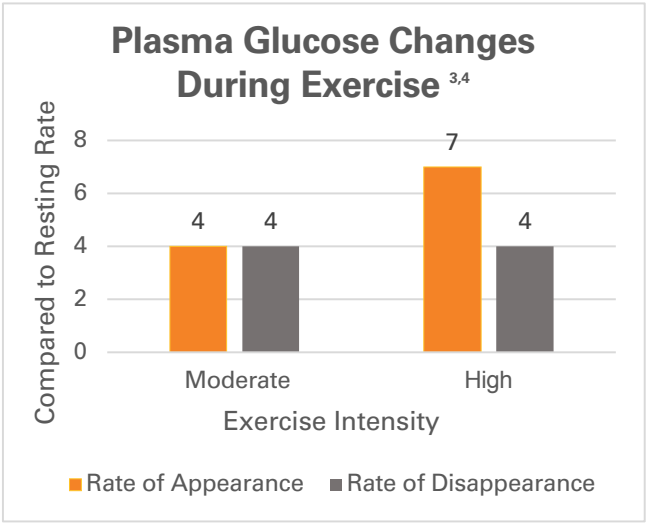
GLYCOGEN LEVELS

Low levels of skeletal muscle glycogen (approximately 50 percent of normal) have been shown to negatively impact performance.[2] One 800-meter sprint can deplete glycogen stores by up to 65 percent.[1] Multiple events during the day or consecutive days of competition or training could quickly deplete glycogen levels to the point at which performance is impacted or horses become easily fatigued. The rate of glycogen synthesis is considerably lower in horses than in humans. Once significantly depleted, it can take 48-72 hours to replenish glycogen stores.

There are two thoughts as to why horses have such a slow rate of glycogen replacement:[1]

1. The gastrointestinal function in horses is not well suited to digest starch and other soluble carbohydrates, resulting in limited glucose availability
2. The mechanisms involved in glycogen synthesis are not as productive as in other species

WHAT COULD YOUR HORSE DO WITH ADDITIONAL GLUCOSE?



IMPACT ON GLUT4 RECEPTORS

GLUT4 is the primary glucose transporter, responsible for facilitating movement of glucose into cells.[5] When GLUT4 activity is disrupted, glucose transport and insulin sensitivity are significantly reduced.[6] While research in glycogen synthesis is limited in horses, supplemental chromium in rats and beef cattle has been shown to increase movement of GLUT4 receptors to the surface of skeletal muscle, resulting in improved glucose uptake metabolism.[7,8,9]

Learn more at kemin.com/chromiumeq

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