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RECOVERY

ARTICLE: **DR JENNIFER STEWART - EQUINE VETERINARIAN AND CONSULTANT NUTRITIONIST**

DURING EXERCISE FUEL RESERVES ARE MOBILISED AND THE WORKING MUSCLES RELEASE ENZYMES TO OBTAIN THE RAW MATERIALS THEY NEED.

Once these enzymes are triggered, tissue breakdown is irreversible - protein synthesis rates drop 30%, protein breakdown exceeds protein synthesis and tissue damage may persist for 3-5 days - longer in young horses just beginning training. These are catabolic processes ie they involve the 'breakdown' and using of body stores. But by supplying the correct balance of carbohydrate, anti-oxidants and specific essential amino acids at strategic times it is possible to switch the catabolic state into an anabolic (ie rebuilding of tissue) state, enabling muscles to recover and respond more quickly to work, training and competition.

Work, training and competition all place significant demands on the horse and cause some degree of muscle trauma - hundreds of tiny, microscopic rips and tears in the muscle fibres and a high rate of mobilization of muscle fuels.

To minimise damage, optimise recovery and allow the muscle to increase in size and strength, 5 criteria must be met:

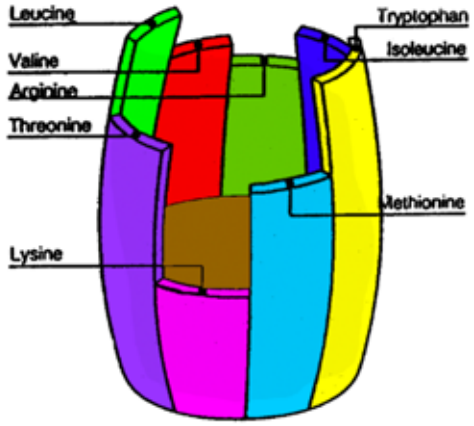
- specific amino acids (protein) and anti-oxidants are provided before and after work
- refuelling: carbs (energy) are fed immediately after work
- electrolyte (salt) and hydration are appropriate
- work load is adequate, but not excessive
- there is plenty of rest between sessions plus ice and poultices.

WINDOWS OF OPPORTUNITY:

Just as there is more to be gained by sowing crops or fertilizing paddocks just before and just after rain, there is an advantage in providing certain nutrients just before and just after exercise. This window of opportunity is created by the increase in muscle blood flow, enzymes and hormones that shunt nutrients into muscle cells during exercise. Feeding protein and anti-oxidants ½ to 3 hours before and immediately after work ensures the blood is fully loaded with nutrients when the working muscle is demanding them. Muscle recovery and body building cannot begin without the necessary nutrients - so the faster nutrients are supplied during this period, the easier repair and tissue building become.

THE IMPORTANCE OF PROTEIN, AMINO ACIDS AND ANTI-OXIDANTS:

Proteins are chains of amino acids and each tissue in the body has its own recipe or combination of amino acids. Essential amino acids cannot be made by the body and which must be provided by the feed. If any single one is below recommended, a limit is placed on muscle mass, reducing the amount of lean muscle mass and the power–to– weight ratio.



Picture a wooden water barrel. The shortest slat sets the amount of water the barrel can hold. Similarly, if the barrel represents the body, and each slat represents an essential amino acid, a deficiency limits the amount of muscle the body can build. Amino acids that can't be used because the supply of others in the 'recipe' ran out are converted to fat.

The timing and amino acid profile of the dietary protein is the most important factor influencing muscle growth. During work, the breakdown of muscle protein exceeds its synthesis, but by feeding specific amino acids and anti-oxidants in the hours before and immediately after work, protein synthesis (ie muscle repair and building) can be increased. The amino acid supply is of specific significance for reducing fatigue, improving stamina, maintaining muscle integrity and speeding post-exercise recovery. Low protein and unusable protein reduce the amount of lean muscle mass and the power–to–weight ratio, and contribute to higher heart and respiratory rates, sweating and dehydration.

Energy is produced from oxygen. During exercise the muscles use fuel at a very high rate. The 'burning' of oxygen results (as with most power plants) in the generation of waste products. In the muscle, these are semi-used atoms of oxygen – called free radicals or oxidants. Free radicals and oxidants cause tissue damage during and after work, which manifests clinically as dullness, loss of appetite, weight loss, muscle soreness and pain. It is also associated with loss of muscle mass and reduced work tolerance and exercise capacity. The body's anti-oxidant defence system must upregulate to meet the increased oxidant production. The anti-oxidant defence system scavengers the free radicals. It requires vitamins E, C and minerals such as selenium and zinc. If these are provided in the pre- and post-work feeds, cell membrane injury from free radicals is reduced – increasing muscle cell protection and decreasing

muscle damage, membrane leakage, soreness, fatigue and injury.

A degree of muscle soreness and fatigue are part and parcel of any training program, but with strategic feeding strategies we can support repair and refuelling and hasten muscle recovery. Whilst lactic acid has been touted as the major cause of fatigue and muscle soreness, recent studies have shown this to be incorrect. Muscle glycogen is always the limiting factor for fatigue, whilst soreness is due mainly to muscle damage.

Prolonged strenuous exercise can result in muscle soreness caused by microtrauma to muscles and surrounding connective tissue leading to a local inflammatory response. There are reports that MSM (methylsulphonylmethane) is effective against muscle soreness because of its anti-inflammatory effects as well as its possible sulphur contribution to connective tissue. Measurements of exercise-induced muscle damage and muscle enzyme leakage were reduced with MSM supplementation.

Formulated with an understanding of the biochemical and hormonal effects of exercise on the muscle and the roles of each nutrient Jenquine has recently released all-4-feet ® to provide high levels of essential amino acids, anti-oxidants, omega 3 oil and the vitamins and minerals required to support recovery. Feeding 150 to 500 grams of Jenquine all-4-feet ® before and after work supplies the precise combination of nutrients the muscle requires to transition to protein synthesis and the bone marrow uses to increase red cell production. This enables the muscles to recover quicker, increases the response to training, reduces the incidence of delayed muscle soreness and allows the horse to tolerate increased work. Reducing the need for multiple supplements, and when fed before and/or after work with a small amount of lucerne, the risk of stomach ulcers is reduced.

MUSCLE REFUELLING:

After encouraging muscle repair and lean muscle building, a second, separate issue is muscle refuelling. Exercise can decrease muscle fuel (called 'glycogen') by 20-40% and the replenishment of glycogen is important in determining the time needed to recover from exercise. The period of most rapid uptake and glycogen repletion is the preferably in the first hour after work – and certainly within 3 hours. The enzymes that facilitate muscle glucose uptake and glycogen synthesis remain elevated for up to 3 hours after work

Energy to make muscle glycogen comes from carbs in grains (preferably oats) and fermentation of beet pulp, oil, hay and pasture. Combining energy with anti-oxidants, carbohydrate and certain essential amino acids enhances glycogen repletion. The speed with which muscle is refuelled is dependent upon the timing of post-work carbohydrate intake – ie whether it is consumed immediately following work or several hours later. It is preferable that carbohydrates be given ½ to 1 hour after work. Standard feeding routines fall a long way short of meeting the muscles requirements and without strategic provision of carbs in the hours immediately after exercise, muscle refuelling can take over 72 hours. Clear cut and obvious differences occur between horses fed a small amount of a carb/protein/anti-oxidant supplement hourly after work and those that are left to their own devices.

ELECTROLYTES AND REHYDRATION:

Muscle enzyme systems operate smoothly within a very narrow range of temperature and pH. The ability to effectively eliminate heat while exercising is very important to performance. Post-exercise dehydration is a key contributor to slow muscle glycogen replenishment in horses. Correct rehydration with fluid and electrolyte supplementation after exercise enhances muscle glycogen resynthesis during the recovery period. During 3 hours of steady trotting in 21°C and 45% humidity, a horse can lose 25kg in sweat and 250g (= 8 tablespoons) of electrolytes. At 35°C, blood sodium levels are decreased for up to 26 hours after exercise and even with a daily salt intake of 38g (1 heaped tablespoon), it can take several days to compensate for the sodium loss.

For horses doing moderate daily exercise in cool to moderate temperatures, 25g twice a day increasing to 50g twice a day in hot weather is a good rule-of-thumb. A mix of 3 parts table salt (NaCl) and 1part potassium chloride can be made into a paste (with apple sauce or other palatable carrier) and horses given 75 grams after work. They must have free access to clean water. Inadequate electrolyte intake can limit sweat production in extreme cases, but more often it impacts performance and recovery through dehydration. Clipped horses have a more efficient power output and recover quicker in hot and colder weather. And horses that travel need to be allowed time to recover – especially if feed and water consumption is reduced during travel. Preparing them for travel with electrolyte paste and access to clean water several hours before and again after transport can help maintain hydration and support recovery.

CARING FOR LEGS:

Generally, cold poultices are best for acute injuries, bites, stings and after exercise. Used to reduce pain, minimise swelling and decrease inflammation, they are a form of 'cold therapy'. Although cold-hosing and ice are more effective for cooling, they are not always available and a clay-based, cooling poultice is an alternative option for drawing heat from legs after work. As the clay begins to dry, it draws fluid from the tissues underneath and as the poultice water evaporates, it takes the heat with it. This is similar to icing an injured area, but a poultice can provide hours of therapy. The heat from your horse's leg will gradually warm up the poultice, and a bandage is placed over the poultice it can cause the area to heat up even more. To reduce this, a damp cloth or moistened brown paper can be placed between the two to keep the poultice and the area moist and cool for longer.

Because cold therapy poultices help to reduce pain and minimise swelling, a good practice is to use them as a preventative therapy for muscles, tendons, ligaments and joints both before and after exercise. Usually based on clay or salt they are cooled in the fridge and then spread thickly on the cannon bones, tendons and ligaments of the legs – and more is better! After hard work the poultice is applied to all four legs and covered with a damp cloth or paper. The temporary cooling and natural astringent properties help minimise swelling, soreness, stiffness, inflammation and support faster recovery.

PERIODS OF RECOVERY HELP PREVENT OVERTRAINING:

Finally, adequate recovery between training sessions is crucial because the tissue damage may persist for 3-5 days and much longer in young horses just beginning training. The basic determinants of muscle strength and size, are the work intensity and the interaction between food intake and work intensity. There is a certain threshold of exercise intensity, below which

no significant increases in muscle size occurs, due to lack of stimulation of muscle protein synthesis. On the other hand, both insufficient rest and exercise that is too intense inhibit protein synthesis and reduce the potential for muscle recovery and growth.

Overtraining syndrome is more often a consequence of increased training intensity rather than increased training volume. Horses suffering from overtraining syndrome can enter a catabolic state where body tissues are broken down, resulting in weight loss. Overtraining occurs when work exceeds fitness level or there is insufficient recovery time between work sessions. Signs that a horse may be developing overtraining syndrome include weight loss despite adequate food intake, loss of appetite, dry coat, dull eye, loss of enthusiasm for work, slower times, longer recovery, colic and nervous disorders. Athletic performance decreases and horses must reduce work or be spelled for various periods of time for recovery. Muscle fitness doesn't decline significantly for almost 6 weeks after training stops – unlike us where 2 weeks without exercise reduces muscle mass and strength! This means we can provide horses with short breaks of a week or more of reduced work between periods of more intense work. Periods of recovery during training actually improve the effectiveness of conditioning programs. Maintaining nutrient intake is important during spells.

No matter how balanced the diet, exercise causes a disruption to normal cellular processes - creating a need for specific nutritional support. Fatigue is frequently attributed to 'running out of energy' – however as well as sustained energy, performance depends on a strong and athletic body – and this requires protein with the correct amino acid balance. The fastest most powerful car is not the one with the biggest fuel tank – it is the engine size that matters. Muscle is the 'engine in horses' – and muscle building requires protein.

Nutrition is a powerful tool when used properly and recovery from hard exercise and preparation for the next work session can be hastened by strategic feeding management. Nutritional strategies must include protein to facilitate quick recovery because it is during recovery that protein will be working hardest - repairing rips and tears that occur during training, increasing muscle fibre size and creating new red cells and blood capillaries.

The interaction of amino acids with vitamins and minerals is necessary for improved muscle growth and repair, stronger supportive tissues, improved carbohydrate metabolism, stronger bones and joints, thicker hoof walls and greater overall soundness.