

Exercise Physiology

Competitive Trail Riding

Submitted by Donna Stokell

Training Journal Part 1

The sport of my choice will be **Competitive Trail**

The philosophies of competitive trail riding are: to develop the horse in stamina and hardiness; demonstrate soundness; proper methods of training and conditioning in horses; encourage good horsemanship and demonstrate the best methods of caring for horses during and after long rides without artificial aides or stimulants. (OCTRA)

Competitive Trail rides are divided into Divisions.

Open Division - for horses 5 years of age and over with the ride being a minimum of 40 km in length per day and no maximum distance

Heavyweight (rider and tack over 190 lb)

Lightweight (rider and tack (100 lb to 189 lb)

Junior (riders age 10-17 with no weight restrictions)

Novice Division - primarily for horses over 4 and newcomers to the sport
Minimum ride distance of 32 km and a maximum distance of 56 km.
novice division has the same 3 categories as the Open Division

Competitive Pleasure Division - for horses 4 years and older with no rider age/weight restrictions.

The distance of the ride is accurately measured and the riders are notified of the number of kilometres the ride will consist of. The objective is to cover the course within the allotted time, with penalties being awarded for either excessive speed or tardiness. (Clayton) The time is set the day of the ride based on climate; trail conditions, terrain, obstacles and other environmental factors. Competitive trail is about horsemanship, where both horse and rider must be in condition being able to average five to seven miles per hour (15 minutes is added on for each veterinarian check points) consistently for the duration of the ride in a safe and healthy manner.

Prior to the beginning of the competition, at check points along the trail and within thirty minutes of completing the competition horses will be examined by the veterinarian or experienced people to establish the horse's overall condition. The horse will be examined for soundness, fatigue, lameness or soreness, tack or trail lesions, dehydration and cardiac recovery. Points will be deducted for deficiencies in any of these areas.

Competition judging is based upon each horse starting the ride with a perfect score of 100 points, and evaluated as follows: Condition -40%, Soundness -45%, Trail

Ability/Manners – 15%. Most of the judging is on the horse, however, the riders also compete for Horsemanship awards based on care and handling of their mounts with a strong emphasis on safety. The highest number of points will win.

2. (A) Goals

The main goal I wish to achieve is to learn how to safely condition my horse for Competitive Trail Competitions using the following parameters:

(A)- Train within the horse's Health Check guidelines

(B) – Maintain current Body Conditioning Score of 5

(C)- Start a training program that will condition slowly as to prevent injuries as a result of the activities.

The goal for myself is to learn how to be successful in conditioning my horse. This is all new information to me that I want to apply with a careful systematic approach keeping both my horse and myself safe and healthy.

Short Term Goal – to familiarize myself to the sport of Competitive Trail Riding and develop a good comprehension on the development of a proper conditioning/training program.

Medium Term Goal - to maintain training during the winter to begin next spring with a horse in reasonable condition ready to continue to the next level of training

Long Term Goal – have my horse ready to enter a competitive trail pleasure event in 2007 and then working up to Novice.

2. (B)

For my horse to be successful he must become physically fit to encounter the different terrains, obstacles and distance while remaining calm and collected. The proper conditioning in Competitive Trail is mandatory to pass the vet checks within normal health check parameters (heart rate, respiratory rate, hydration level etc). As a rider I must be able to complete the ride no more than a few minutes over or under the assigned time, have the horse properly groomed, comfortable while maintaining constant control over his health and behaviour.

2. (C)

My horse will require training in all areas to achieve my goals. The horse I have chosen for this sport has been used mainly for hacking around the farm at a relaxed pace. I would expect by late fall to have this horse going about a five-mile distance in just over one hour while maintaining normal health check rates.

3. Horse Health Check

Eyes:	Bright and clear
Capillary Refill:	instant
Mucous membranes:	moist and pink
Jugular Refill:	instant
Skin Pinch:	less than 1 second
Gait:	no abnormal gait
Attitude:	bright, eating, drinking, playful
Wounds/Saddle/Girth:	Green (no wounds or marks)
Gut Sounds:	Normal
Heart Rate:	Resting 37

Rectal Temperature 38.5
 Anal Tone: tight – green light
 Respiratory Rate: At rest 12
 Joints/Legs: Green light, no heat, or swelling.

4. Apply the Physiology

The gelding’s muscle fibre types are predominately (48%) FOG, which will give him the strength and power to achieve the challenging trail. . The FOG fibres are conducive to this sport as they offer fast muscle contractions working either aerobically or anaerobically depending on the type of conditioning. While riding on small grades, stony ground, marsh, water crossings and muddy terrains the horse will require the FOG fibres that have the high glycolytic and oxidative capacity to generate both the power and endurance. The FG (45%) fibres will come into play by providing the rapid strength and power required for the steep hills and areas of increased exertion. When trotting in the more open areas the FOG fibres will maintain the pace over the distance. Although this gelding only has 7% SO fibres which are designed for long steady work without fatigue, I believe that by conditioning his aerobic capacity and developing the FOG11A fibres that will increase lactic acid buffering, oxygen uptake and utilization, fatigue can be decreased making the horse a good candidate for competitive trail riding.

Part II

1. The Horse I Am Using – “CHESTER”

HORSES CHARACTERISTICS	DESIRABLE	UNDESIRABLE
Quarter Horse	Intelligent breed with placid willing disposition	
15.2 HH	Average height for the breed	
1120 lbs	BCS 5-6	
6 years old	Train well and in good physical shape, should be able to condition well	Would have been better to start training this horse for competitive trail at a younger age
Personality	Docile, forgiving and a great willingness to please	Herd bound
Injuries	No previous injuries to contend with	
Training	Shows signs of being athletic	Chester is only used as a pleasure horse for hacking around the farm

Do you have a suitable horse?

I believe that this gelding is a suitable competitive trail horse. He has excellent conformation, is well-balanced, sound feet, shoulders and back. Chester is now at a mature age with an excellent disposition and is very willing to please.

I realize that a Quarter Horse has thicker muscle than some breeds that will make cooling and monitoring the heart load imperative. Based on the type 11A muscle fibres this horse will have the stamina required for the aerobic parts of the trail and the type 11B fibres will carry him in the areas that require more power. As “Chester’s” breed is lower that some in SO fibres ongoing aerobic conditioning will be a must to succeed. .

Neither my horse nor myself have ever competed as we spend our time hacking around the farm enjoying each other. Horses that are used in competitive trail should be energetic and this may be a challenge for Chester as he does have an extremely relaxed attitude. I love this horse and I believe the relationship we have with each other gives us an excellent starting point to pursue this endeavour.

(c) Identify what “support” you have to carry out your goals.

I have a 100-acre facility with a round pen, a creek that I use for water crossings, small bridge and several riding paddocks. Within one mile of my facility there are riding trails with many different terrains.

This is my fifth Equine Science Certificate course so I believe that I am knowledgeable in the health, nutritional practice and overall management of my horse. During the past few years I have compiled a large resource library that will assist in certain areas of research.

I have discussed my interest in competitive trail both y veterinarian and farrier only to find that neither of them are aware of a coach or competitor in this area. Once a week there is a trainer that comes to my facility for a client that is teaching her horse how to jump. This person has agreed to assist me with my training wherever possible.

I am confident that with my knowledge and determination that Chester and I will succeed.

1. What is the current practice in other programs? (Focus on conditioning)

I do not know anyone that has ever specifically conditioned for competitive trail so I am evaluating a sample twelve week program that I found on a web page “Conditioning for the Competitive Trail Horse” – By Becky Siler (<http://www.gaitedhorses.net/messageboard/825.shtml>).

This program is written to assist beginners to get started with conditioning for competition.

A: What others are doing to train their horses to be able to compete in a Competitive Trail ride.

- set reasonable goals for both horse and rider to keep the program on track
- assess that you have a horse with lean muscles and good conformation
- have the horse examined by a veterinarian to ensure that he is healthy and sound
- maintain proper regular farrier care and determine what type of shoes the horse requires
- design an appropriate feed program
- ensure tack is a proper fit and in good condition
- prepare a training journal to record heart rates etc
- feed 1 – 2 ounces per day of electrolytes while training (made of 2 part table salt, two parts light salt and one part powdered dolomite)

Week 1 and 2 – start the horse by walking four to five miles in about one hour, four or five days per week

Week 3 – add in trotting for five-minute intervals throughout a five or six mile walk

Week 4 – trot about half the ride increasing to longer intervals throughout the ride

Week 5 – add in longer rides 2 times per week (10 miles in 1 hr 45 min)

Weeks 6 and 7 – continue previous conditioning adding a 15 mile ride in three hours – monitor pulse and overall condition and attitude during these weeks

Week 8- continue overall training adding another 15 mile ride in 3 hours trotting about half of the distance at various intervals

Week 9- trot the whole six-mile loop with heart rate returning to less than 60 beats per minute within ten minutes

Week 10 – rest the horse, no long rides

Two weeks prior of the event, ride 20 miles in 3 ¼ to 3 ½ hours (this will require quite a bit of trotting) Then back the horse off to riding three or four days a week with enough trotting to maintain condition. Ride 10 miles the weekend before the ride, and with light rides during the week of the competition.

During the competition give the horse one ounce of electrolytes for every 10 miles traveled, providing he is drinking.

B. Assess the conditioning program that others have been using based on the knowledge you have gained from this course. Identify and discuss what appears to be working and why, and what is not working and why.

The start of the training plan is essential as the horse is the main focus and his overall health; diet and conditioning are well assessed by both veterinarian and farrier prior the start of conditioning. The program begins with a proper aerobic routine for developing cardiovascular and respiratory systems, which will provide energy to the cells and increase muscle contractions. . The LSD (long slow distance) work should improve

strength by working the slow twitch type 1 oxidative fibres. Adding the trot, more distance and increasing speed will help to maximize the aerobic potential of the fast oxidative-glycolytic fibres while increasing the aerobic intensity.

This Program does not provide everything that the horse and rider will require in order to be successful. Anaerobic exercise must be added into the later stages of this program after establishing an aerobic base and strengthening the musculoskeletal tissues. The generation of ATP by anaerobic processes occurs in the absence of oxygen. The anaerobic conditioning will increase the phosphocreatine (P Cr) and creatine kinase in the muscle at rest, then there will be a more efficient transfer of ADP to ATP. To train the horse anaerobically the speed will increase, or the number of works will increase, or the rest breaks could decrease. Some of this training must be done on hills, over water crossings, downhill gradients, mud, stones or other various terrains that will be encountered during competition. Lack of this training on the various terrains could cause injury to the horse's tendons, ligaments or muscles.

Climate is never taken into consideration for this training program. The horse should be ridden in weather conditions that will be similar to what may be encountered during competitions. Working the horse in heat and humidity on a gradual basis will help the horse to acclimatise and the rider to know how to manage the individual horse's health and condition.

The program starts out by working the horse four to five days per week, which will not allow enough time for the tissues to regenerate and strengthen causing gradual fatigue to the peripheral systems of the horse. Clayton suggests three times per week on alternate days, which will give the horse time to rest and reduce the chance of injury due to overtraining.

The workload increase is designed over the number of weeks in training, not on the improved fitness of the complete horse. The cardiac and respiratory recovery rates, capillary refill time, temperature, skin pinch test and gut sounds will give some good indications as to the condition of the horse. All of these health check readings must be recorded in the training log. If this specific conditioning plan were followed the horse's condition would not be monitored until week six and the musculoskeletal system is never assessed. Condition should be monitored and recorded during each exercise session.

The directions on making and giving electrolytes are unacceptable as Na and K look to be equal but are not as light salt is not 100% potassium, therefore you do not actually have a one to one mix. The Na + K should be equal to the chloride. This solution has no obvious or measurable chloride. Dolomite is a sedimentary rock composed largely of calcium magnesium carbonate ($\text{CaMg}(\text{CO}_3)_2$) which resembles limestone and often used in fertilizer. The horse will now also receive an unknown amount of magnesium. This formula has no dextrose to assist with fast absorption, fumaric acid or citric acid and would not be palatable to the horse

The horse should be on a "proper optimal diet" (Ecker 2002) and the nutritional status is never re-addressed since the beginning of the program. As the horse intensifies the level of work the diet will need to be reassessed and adjusted accordingly. A consultation with

an equine nutritionist would be advisable.

C. Identify the strengths and weaknesses of other conditioning programs currently in use. What improvements could be made to achieve the goal in a safer, more effective program?

When I compare this training program to two others that I located on the web sites many of the same strengths and weaknesses were repetitive and the programs also very incomplete posing a high potential for injury and dehydration.

Strengths:

- Proper evaluation of diet, health (vet check), and farrier care are all advised
- Aerobic conditioning always appears adequate
- Programs use “progressive loading” to increase intensity

Weaknesses:

- Inappropriate electrolytes – both formulation and administration
- Inadequate rest days for the horse between training sessions – requires time for both the physical (fibres) and chemical systems to strengthen
- Potential for fatigue and serious dehydration

Improvements:

- “Progressive loading” must be based on the horse’s condition not on the number of weeks in training as different systems adapt quicker to conditioning than others - increases in VO₂max, plasma volume and sweating response occur within 1-2 weeks while the muscle capillaries, muscle mitochondria, muscle aerobic enzymes, bone density and strengthening of tendons and ligaments can take up to six months (Dr L Warren)

D. Identify the most common problems faced by competitors in that sport?

The most common problems faced by competitors are:

Lameness- can be caused by: bone, tendons and ligaments being overworked if “progressive loading” is too aggressive for the current musculoskeletal condition of the horse or starting the horse too young; injuries that can occur on the trails (bruised soles etc) twisted leg caused by a stone

Fatigue- when the quality and consistency of movement is compromised the horse is fatigued - if the recovery heart rate is greater than 72 bpm after ten to fifteen minutes of rest, the horse has been overexerted and is experiencing fatigue. (Hagstrom, D) – if the horse is exercising and sweating for a long period of time the stores of fuel in the cells as well as the electrolytes and water will be depleted

Dehydration – occurs when the horse has lost at least four gallons or about 32 lbs of body weight through the loss of water (sweat) – can be identified by a blood capillary refill test or the skin pinch test – will impair the horse’s ability to thermo- regulate

Thermoregulation of the horse must be constantly monitored as more than 75% of the energy created from the conversion of glucose, glycogen and fat (chemical energy) into muscle contraction (mechanical energy) is lost as heat. As the body temperature rises the hypothalamus sends a signal indicating that the body must transfer heat from the body to the environment. The body responds by sweating, panting and dilation of the cutaneous blood vessels, which will increase heat loss by radiation, conduction, convection and evaporation. When the climate is hot and humid overheating problems can quickly arise, as the sweat will not evaporate losing the cooling effect. Core body temperature must be 41 degrees C or less or serious damage to the organs and muscles may occur.

Electrolyte depletion – caused by excess sweating and loss of fluids

Weather - horses that have not been acclimatised to the temperature and humidity levels over several days could have serious thermoregulation problems during the event

Colic – can occur with the reduced blood flow to the gut and a side effect of dehydration

Azoturia and Exertional rhabdomyolysis – caused by the excessive breakdown and myoglobin being released from damaged muscle fibres, which sends large amounts of nitrogen waste to the kidneys

1 Warm up –Muscles, tendons, ligaments and bones are often compromised without a proper warm up, as the horse's system has not had a chance to obtain an increased blood flow to warm the skeletal muscles by slowly increasing the speed of the muscular contractions – warm up will assist the horse with thermoregulation as the exercise intensifies and delay the onset of fatigue.

Cool down –After conditioning a horse must always be properly cooled down to bring the systems back to normal range. As the exercise comes to an end the work should become progressively easier by lightly jogging or walking (warm down period). While the horse continues to move, blood flow continues to flush metabolic waste and heat from the muscles. If the horse just stops, the blood will pool in the muscles and compromise the circulating blood volume to the gut. This is a cooling off process only for a horse that does not have a compromised system and recovery is happening within all horse health check parameters.

E. Design a good electrolyte supplementation program for our horse for the sport of your choice. From your tack shop visit, choose the electrolyte you believe is best from the list available. Give reasons for your electrolyte supplementation program and what the expected results should be if the program is effective.

The electrolyte product that I found in our local feed store was ElextroDex. This product does not contain dextrose, which would maximize absorption to the small intestine, and aid in the ion transfer through the gut wall. In this product Na + K is almost equal to Cl, however, most of this product is simply expensive salt.

Endura-Max is recommended on the endurance riding web site, however, after investigation this would not be my product of choice. Endura-Max was developed by KER and has been a leader over time in the endurance competition industry. When I analyze this product I find some differences to the Perform 'N Win. Endura- Max contains the essential electrolytes but the calcium carbonate, and dihydroxy aluminum

sodium carbonate are in a carbonate form, which we have learned are not as quickly absorbed. When I refer to the information provided by our guest speaker I learned that products with carbonates are for sick horses whose systems are acidic and that endurance horses should not have an electrolyte containing bicarbonate (Ecker 2002) due to the sweat loss that is already alkalotic and the bicarbonate would increase this problem.

The product that I would chose for competitive trail riding is Perform "N Win. This product contains all the essential electrolytes in proper proportions that the horse will require. Dextrose (D-glucose) is required by the cells of the intestinal system to transport the Na⁺ and water from the gut into the cells and then to the blood. D-glucose will aide in the quickest absorption possible

Electrolytes are required to hold water in the ICF and ECF. The cellular fluids require equal parts of Na⁺, K⁺ combined to be equal to CL⁻ to be effective. The ECF relies on the Na⁺ while the ICF requires the K⁺ for the body to have a balanced charge.

2 Electrolyte Program for Competitive Trail Riding –Perform 'N Win! (PN)

For my program I am using the assumption that the horse has been trailered in the heat and humidity and is at risk of being marginally dehydrated even though he was given electrolytes one hour prior to travel. . Also note that all electrolytes being given are accompanied with clear fresh water and the water is always available wherever possible.

As a precaution the horse will be given three ounces of PN in one gallon of water immediately after off loading from the trailer. This will ensure that the horse comes into a euhydrated condition as soon as possible. . If the horse is not dehydrated and is given too much water and electrolytes there will not be a problem, as the kidneys will excrete any excess.

Eight hours before the competition the horse will be preloaded with electrolytes by receiving three ounces of PN in one gallon of water. This will ensure that the horse is fully hydrated to start the event and that any deficits in electrolytes have been replaced with water being retained in the ECF and the ICF.

Two hours before the start of the event the horse will receive three ounces of PN mixed with one gallon of water so that any electrolyte losses within the first couple of hours will be immediately replaced, as the gastrointestinal tract will have a reserve.

During the competition the horse will receive three ounces of PN in one gallon of water for each hour of work completed. (based on special event directions provided by PN). The rate of supplementation will double in hot environments when sweat loss is extensive (Pagan J)

At the completion of the competition electrolytes will continue to be administered as the horse may still sweat for sometime after the event to reduce his body temperature (Ecker 2002) (mix three (ounces) scoops of PN in one gallon of water). If the horse was only to

consume water it could dilute the blood and further lower the plasma concentration. The horse should only be fed after he is fully satisfied with water and electrolytes, as digestive enzymes will pull water and potassium into the gut, worsening any possible effects of dehydration.

With a properly designed electrolytes and water program the horse should not become dehydrated which will enable him to have the best chance that all body systems will remain in the normal ranges and decrease the possibility of fatigue during competition.

1. Planning Your Own Conditioning Program

(a) Based on your knowledge and experience, the knowledge from the course, and the experience of others, develop a plan for a conditioning program for your horse to achieve your goals in a safe and effective manner.

A. This is My Training Journal (MTJ) to condition my six-year old Quarter Horse “Chester” for a Pleasure Class Competitive Trail Ride in the fall of 2007 In this conditioning plan I will be looking to maximize performance, delay fatigue, influence thermal regulation and maintain soundness of my horse.

I plan to ride Chester four days per week, which will allow his body time to rest and tissues to repair before his next riding session. On some of the rest days we will do groundwork and Parelli training. This will enhance his manners, handling and the horsemanship criteria for the competition, while providing some mental change and relaxation to the training routine. The terrain that will be used for training has some grass areas, sand, water crossings and hills. I believe that five months will be required to train and condition my horse based on his present condition. Chester has been worked very little in the past and has a loss of strength in his supporting structures. The strengthening of the tendons, ligaments and the remodelling of his bones could take up to six months.

Before starting spring training my horse will be thoroughly examined by his veterinarian, have his feet trimmed and feed program reviewed to ensure that we are off to the best possible start.

Training will start by walking Chester for three miles and gradually increasing to five miles with a slight escalation in speed to bring him to a good level to start long slow distance (LSD) training. During the second week I will add in two three-minute trotting intervals allowing full recovery between intervals. The walking will increase his musculoskeletal structure after a winter of little exercise and begin the basis of aerobic work. When we start walking I will begin the health checks to determine Chester’s resting baseline temperature, respiration rate, heart rate, gut sounds, capillary refill time and record them in MTJ so his progress can be properly monitored.

During the following weeks of conditioning Chester’s routine will consist of low

intensity/long duration training with interval training (IT), (high intensity/short duration). The levels of fitness improve in MTJ due to gradual increases in the volume of exercise with the incorporation of intensity (varied speed, hills), duration (length of time the exercise is performed), and frequency (the number of workouts performed over a set period of time) while continually increasing the volume (amount of exercise). This routine will improve Chester's overall level of fitness.

At the current intensity of training Chester will be working in the 40% HR max and never over 60% of HRmax. Training will now start to progress into trotting half of a four mile distance in intervals, gradually increasing his distance back to five miles. Some the work will be in opposite directions to equally strengthen his body

Training should now be entering into week seven where the distance will increase to seven miles provided Chester is maintaining good health checks, dissipating his heat well and showing proper heart rate recovery. During week eight, Chester will begin IT by walking up steep uphill gradients to develop power and work at increasing his anaerobic condition. During the IT I will be trying to work Chester at 70% of HRmax. The anaerobic conditioning will have weekly increases in intensity (speed, repetitions) using "progressive loading" as long as Chester can recover to 60% of HRmax within two minutes. Chester will slowly walk up the hill at first and walk down learning to move in a collected frame with his hind legs reaching under, this will give him some recovery time. As this conditioning becomes easier he will gradually increase to a trotting speed up the hill.

The start of week nine Chester's routine will remain unchanged with no increases in duration or intensity. This is where he will go into a "holding pattern" allowing slower tissues time to respond and prevent over-training. At this time based on my slow and stable conditioning plan Chester will have increased his VO₂max increasing the oxidative capacity of the muscles, the plasma volume, sweating response and increased red blood cells which will increase the oxygen carrying capacity of the blood. This will have been accomplished without jeopardizing his supporting structures, which would be at the least dense point as bone remodelling (the increase of bone density) continues.

The aerobic program will now become more rigorous with the primary goal being to build the exercise duration and speed. During this segment of training cantering intervals will be introduced in three-minute sessions looking to increase the HRmax to 75%- 80%. As Chester's HR recovery time decreases the distance will increase to ten miles with longer intervals of trotting, trying to safely achieve a time of one hour and forty five minutes The next goal will be during week fifteen to do one fifteen miler in three hours incorporating both trotting and cantering. The other training sessions will remain at 10 miles with the ongoing IT using gradients.

At this point of training I will reduce the number of rides per week and begin pre-competition simulation trying to increase to an eighteen-mile session once per week with all other riding sessions remaining at fifteen miles. This intensity and distance will require very close monitoring to ensure that Chester has good HR recovery and enough time between workouts for the tissues to properly repair, his muscles to rest and to ensure

that no injuries occur.

Chester is now two weeks away from his first competition and will require time to revitalise. I will continue to condition Chester during this time by doing short low intensity rides three times per week. This will give him physiological benefits of a rest without losing conditioning.

Daily Exercise Routine

Before beginning each conditioning session the horse should be assessed to ensure that he is fit to work. A resting heart of 30-40 beats per minute, respiration rate ranging from 8 to 16 breathes per minute, good gut sounds, rectal temperature of 38.6 and an evaluation of any soreness on limbs or loin will help keep injuries to a minimum.

The warm up is an essential component of MTJ as this allows the cardiovascular, musculoskeletal and respiratory system to gradually prepare for the higher intensity of the exercise. The goal of this warm up is to raise Chester's body temperature by 1C while increasing the blood flow to the working muscles and slowly increasing the speed of muscular contractions. A proper warm up will improve the volume of oxygen available, assist with thermoregulation and delay the onset of fatigue.

Chester will start with a slow walk for several minutes until he gets relaxed, then I will increase to a quicker walk for 10 minutes and then an active trot for five minutes in each direction to increase the blood flow and the aerobic energy system. This will follow with a two-minute canter session. (During the first six weeks of training I will not be using this warm-up, as the intensity is higher than the initial work Chester will be doing.) The first six weeks when he is only walking and increasing distance his warm up will be mainly a start and stop routine at a walk and slow trot every few minutes to keep him focused on his tasks. After week seven I will increase the canter gradually up to five-minute intervals in both directions.

Upon completion of each exercise session Chester will begin his warm-down. During this time he will trot gradually reducing the speed until his vitals return to the resting state. A proper warm-down will minimize stiffness and soreness from excess metabolic wastes that have built up in the muscles during high intensity work. At the end of the warm down Chester will do some suppling exercises while the muscles are warm and a full range of motion can be achieved in the joints without risking injury.

The cool-down is the final step after the warm-down and this is where Chester will walk at a slower pace while his body continues to cool. If it is extremely hot and Chester has sweat a lot he will be hosed off and scraped until the water runs cool off his body.

The electrolyte program that will be using for Chester is outlined in Training Journal III.

B.

Specify how you will monitor the performance gains and how you will minimize risks to your horse as you work through your plan.

- What do you monitor? Why? How often?

At approximately the same time each day I will monitor the resting heart rate looking for any significant variances in rate from Chester's usual 34 bpm. If his heart rate has changed it could be an indication of illness, excitement, discomfort or soreness to the muscles or skeletal system, dehydration, electrolyte imbalance heat or fatigue.

The recovery heart rate checks that are recorded in MTJ will reflect any increased levels of fitness. As Chester becomes more fit the heart rate will drop and return to the normal resting rate quicker. Heart rate recovery time will decrease as training progresses – should return to <60-70 bpm within 10 minutes.

Performing the horse health checks before and after exercise will be a main indicator to identify if Chester's training routine is too aggressive or if he is ready for more intensity/duration. The following health checks must be monitored:
Respiratory Rate: a lower recovery rate as the cardio respiratory system becomes more efficient at extracting oxygen from the air and eliminating CO₂.
Capillary, Jugular Refill and Skin Pinch Tests; recovery times will be an indicator of hydration or dehydration
Gut Sounds; abnormal sounds or lack of gut sounds are serious indicators that the horse is experiencing health problems and may not be fit to continue. Could be a sign of fatigue, colic or lack of blood flow.
Rectal Temperature; the temperature will rise during exercise and should quickly decrease as the horse cools off- if the temperature does not decrease it is a sign of a thermoregulation problem and then the horse should be further evaluated.
Anal tone; should remain tight – once the anal sphincter is relaxed and slow to respond to touch the horse is likely suffering from fatigue

An evaluation of the muscle skeletal system will be done each day by palpating the legs and the horse's back for heat, tenderness and swelling. Any of these signs could be a potential injury or signify poor fitting tack.

The outdoor temperature and humidity level is crucial to the horse's ability to thermo regulate his body. When the humidity levels are too high the sweat cannot evaporate efficiently which ultimately makes the horse's core body temperature higher.

Based on MTJ Chester's workload will require additional calories so that he can maintain his current body conditioning score of five. During the aerobic work Chester's muscles will use oxygen in the burning of carbohydrates and fat as his main energy source. Fat contains over two times as much energy as a carbohydrate diet (corn, oats etc.), therefore, the same energy can be provided in lesser amounts of total feed. If there are no fats stored and the horse receives no dietary fats the aerobic exercise will make use of the blood glucose and muscle glycogen leaving less available resources for anaerobic work. Diet is paramount in regards to the intensity and length of performance for the horse. Poor diet will increase injuries related to fatigue; therefore, Chester's diet will be adjusted to remain consistent with his level of training.

As training progresses a monthly fitness test will be done to ensure that the expected increases in fitness are occurring. For fitness testing it is imperative that the exercise be consistent (distance, environmental temperature, terrain) to make the comparisons reflective of the actual progress. A heart rate monitor will be used during training and with proper documentation and the use of graphs Chester's fitness levels will be easily identifiable.

Expected changes and why?

I will expect to see a lower heart rate as fitness improves with quicker heart rate recovery. Stroke volume, controlled blood pressure, increased cardiac output, increased packed cell volume, increase in capillaries within the skeletal muscles, glycogen sparing during low- to moderate intensity exercise, metabolic removal (lactate, CO₂, heat) and thermoregulation will all be improved. Overall the horse should be showing signs of having more strength and stamina.

The LSD and rigorous aerobic conditioning will have increased the oxygen delivery and the CO₂ removal from the tissues while the anaerobic conditioning will have increased the strength of bones, tendons and ligaments. The success of the anaerobic condition has resulted from specific short/higher intensity exercises that have been increased over time by progressive loading while working at a heart rate of 180 – 200 bpm.

What are the most likely problems that will be encountered (based on others' experience)?

When temperatures are hot and humid the horse will sweat depleting his body of both fluids and electrolytes. The sweating will decrease the blood volume making the blood thicker and harder to pump reducing cardiac output, heat loss capabilities and oxygen carrying capacity. Electrolyte supplementation will be required to replace the ions that have been lost in the sweat so that the excitability of the cell membrane can be maintained. The electrolyte supplementation will attract and maintain water within the intracellular and extracellular compartments and throughout the body.

Signs of fatigue must be carefully assessed as horses are such willing athletic herd bound animals they will often keep going in excess of what their body is safely capable of accomplishing. When any of the health checks are in the yellow area the horse could be showing signs of fatigue, illness or injury. Other symptoms outside of the health check may also occur such as; lack of enthusiasm, slower gait, elevated pulse, and the horse may start to stumble or show little interest in food or water. Signs of fatigue are gradual and riders must remain cognizant of any changes in the horse.

The musculoskeletal conditions slower than the other systems of the body making tendon and ligament injuries a serious concern.

What are the early signs of these problems?

Dehydration and electrolytes: poor capillary and jugular refill time, slow skin pinch test
Tendon and ligament injury: heat in the affected areas, swelling, signs of soreness,

limping and stiffness

Central Fatigue: decreased vision and slower processing of information

Peripheral fatigue: Health check parameters show an increase in the yellow zones, could appear anxious, poor response, little interest in food and may appear uncoordinated.

How do you avoid/minimize them?

The horse should be acclimatized slowly to the increased humidity and temperature giving his thermoregulation system time to adapt. Correct formulation of the electrolyte supplement is essential and proper administration to ensure that the body actually absorbs it. The horse must have a chance to eat and drink regularly to maintain his hydration. Fatigue can be avoided with proper management of diet, rest and not overtraining the horse. Taking the time to properly train and allowing enough rest for the horse to adapt to the increased levels of exercise will avoid injuries to the muscles, tendons, ligaments and bones.

Justify your reasons from a physiological basis.

Chester is a Quarter Horse, so he has predominately a lower percent (7%) of slow-oxidative muscle fibres than the fast oxidative glycolytic type II A (48%) or fast glycolytic muscles type II B (45%), therefore, the primary focus of MTJ has been on the development of the slow oxidative and type II A fibres. Competitive Trail horses require the oxidative slow twitch muscle fibres to maintain the long distance without fatigue. The type II B fibres are anaerobic (without oxygen) and provide quick power, however, they quickly fatigue. Anaerobic training has also been part of MTJ but was not the main focus.

The LSD training combined with the longer timeframe of conditioning will have increased the number of mitochondria and the activity of the aerobic enzymes. The muscle capillaries continue to increase as training escalates prolonging the transit time for the blood through the muscle ultimately improving the exchange of substrates into the muscles and the metabolic waste from the muscles. Chester's aerobic conditioning has increased his ability to utilize fat as an energy source enabling his system to generate more ATP increasing the energy pathway's efficiency so that composition of the fast twitch fibres become more oxidative. The increase in oxidative capacity of the muscles fibres will delay the rapid decline in intracellular pH, the production of lactic acid and hydrogen ions created by the anaerobic metabolism that contributes to early fatigue.

The ATP is resynthesized anaerobically in the muscle from creatine phosphate or carbohydrates, such as blood glucose or muscle glycogen. This breakdown is known as glycolysis, resulting not only in the production of energy but also lactic acid. The uphill gradients will be the base of Chester's anaerobic exercise as his muscles are working too hard and fast to rely solely on oxygen in the process of making energy and his heart rate will exceed 150 bpm. The higher intensity of training is crucial for the adaptation of skeletal muscles and the bone remodelling process. Muscle fibres require time to repair and adapt to new levels of exercise intensity due to the continual small tears that occur from stretching. If proper rest is not given to the tissues to repair serious injuries could

occur.

The bones, ligaments and tendons adapt to exercise much slower than skeletal muscle and the cardiovascular system, therefore, the supporting structures must be carefully monitored to ensure that injuries do not occur from overtraining. A training program that gradually increases length, speed and repetition of exercise stress will enhance the bone strength, density and stimulate the remodelling process.

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