The Horse's Heart
Exercise, Training and Recovery
Part III

In Part II we discussed the changes that occur 'within' the horse in order for it to continue to exercise. Changes such as increased heart rate and breathing rate, shunting of more blood to the working muscles and increased sweating all occur very rapidly. Fortunately, horses are like human athletes, in that if you continually expose them to exercise and training, the horse's body adapts to this 'overload' process to make itself stronger. This adaptation or training effect enables the horse to work longer and harder before giving into the effects of fatigue.

The theory of training is very simple to understand. The horse's body likes to maintain all its systems (cardiovascular, respiratory systems etc) at a constant level. This constant physiological level is often called homeostasis (everything in balance). For example, the horse's body likes to maintain a constant temperature, a constant blood pressure, a constant level of acidity in the muscles and a constant level of enzymes and chemicals in the cells. If the horse's systems, or homeostasis, are disturbed or challenged by exercise, they modify or improve themselves so that they will not be disrupted as much the next time exercise is performed. In other words, the horse starts to become 'fitter'.
In the case of aerobic or endurance training, we are aiming to see improvements in the horse's heart, lung and muscular function. The following are some of the changes or adaptations that occur with a good aerobic training program:

- The heart can become larger and stronger, with increases in stroke volume and cardiac output
- There is an increase in the number of blood vessels in and around the muscles
- There is an improvement in the ability of the blood to carry more oxygen
- There is an improvement in the ability of the muscle cell to produce more energy by increasing the concentration of key energy producing enzymes
- The muscle and liver can store more fuel, particularly carbohydrate
- There is an improvement in the ability of the horse's body to recruit more muscle cells to produce more strength when necessary

These changes enable the heart and lungs to be more efficient in delivering oxygen and the working muscles become better at extracting oxygen from the blood, and within the muscle cells themselves. It is also important to understand that these changes occur slowly over time. So, for

continued improvement within a training program, you must continue to overload these systems through an increase in the amount, the frequency or intensity (or a combination of these) in your training. In other words, as your horse adapts to your training program, you need to gradually train it harder.

From a practical point of view, the above changes in fitness do alter the heart rate response to exercise – responses that are advantageous to the endurance horse. For example, equine research studies have shown that an increase in fitness is associated with a reduction in a horse's heart rate at a given speed or exercise intensity. Or in other words, the horse is able to achieve a higher running speed at a specific heart rate. Imagine you have a 40 km training track ride that you use regularly in preparing your horse. In the early stages of training the average heart rate of your horse during this ride might be 130 bpm. After 6 weeks of preparation, the average heart rate of your horse might fall to 120 bpm during the ride, even though you take the same time to complete the 40 km - the ride has now become less stressful for your horse! You now decide to try and complete the course at an average heart rate of around 130 bpm. You do this and find that you have cut 4 minutes off the time you normally take to complete the ride. Just as importantly, your horse has done it without becoming overly 'stressed'. All great news for the up and coming competition!

As well as having a lower heart rate at a given running speed, improved fitness will be reflected in a more rapid decline in recovery heart rate. This is a huge advantage when horses have to be judged to be 'fit to continue' at veterinary check points. Irrespective whether the 'Vet Gate into Timed Hold' or 'Stop and Check at 30 Minutes' system is used, the horse that has a rapid recovery heart rate will have a huge advantage in terms of continuing and winning the event.

In summary, good training is about preparing the horse to tolerate changes that occur during exercise so that they do not cause premature fatigue. Training also improves the horse's internal body systems so that more intense levels of exercise can be performed at reduced levels of stress.