The Physiology Of Training

Introduction
In this training guide I hope to give you a basic understanding of how bodies use energy.

Energy Systems
All the movements we make are the result of muscular contractions. For muscles to contract they need energy or "fuel". This fuel is provided in the form of Adenosine triphosphate (ATP). ATP is an energy rich molecule which is stored in muscles. It is the breakdown of the ATP to Adenosine diphosphate (ADP) that releases a phosphate and the energy for muscular contraction.

ATP---->ADP + P + ENERGY
The ATP has one of its phosphates "broken off". The energy that was stored in the bond between the phosphates is then used for muscular contraction. For further muscular contraction to occur however the ADP must be converted back to ATP ie. the phosphate that was broken off must be put back on. This too requires energy. The body has three ways of replacing the phosphate. These are called our energy systems or energy pathways.

The three systems are:

- ANAEROBIC (without oxygen) ALACTIC
- ANAEROBIC LACTIC
- AEROBIC

It is the INTENSITY and DURATION of the activity that determines which system the body will use to convert the ADP back to ATP.

Anaerobic Alactic
This system is used for very high intensity, 95 to 100% of maximum effort. It only lasts for about 10 seconds but recovers very quickly, 50% in 30 seconds and 100% in 2 minutes. It does not require oxygen.

Anaerobic Lactic
This too is used for high intensity but from 60 to 95% of maximum effort. If working at 95% it will last about 30 seconds and at 60% it will last about 30 mins. Unfortunately, there is a waste product called lactic acid. It is the build up of lactic acid which causes muscular fatigue and soreness. It takes 20 minutes to 2 hours for the body to remove the lactic acid. Like the alactic system it does not require oxygen.

Aerobic
This is used for low intensity work up to 60% of maximum effort. At low intensity there is no limit to how long you can go. The only recovery time needed is the time it takes to eat and replace fuel stores. This system however does require oxygen. The only waste products are carbon dioxide which we breathe out and water which we sweat or pass out.

TRAINING EFFECTS ON THE THREE SYSTEMS

Anaerobic Alactic:

- Can increase the amount of ATP stored in the muscles by up to 25%.
- Can increase the rate at which ADP is converted to ATP.

Anaerobic Lactic

- Can increase muscle stores of ATP by up to 100%.
- The body can cope with lactic acid build up better i.e. an improved tolerance to the pain caused by lactic acid and the body's ability to remove it.

Aerobic

- More rapid transport of oxygen to the muscles.
- Increase the muscles ability to use fat.
- Increase the efficiency of the body's use of oxygen.

HOW TO TRAIN THE THREE SYSTEMS
To train the systems, you must do activities or training which place a strain on the specific system being trained. When the body is placed under stress, it reacts and adapts to meet the needs required. It is this adaption which is the improvement in fitness. For the best benefit, the training must also be specific to the sport or activity.

Anaerobic Alactic
To train this system you must put in 100% maximum effort. The duration is for 10 seconds as this is how long this system lasts before you change to the LACTIC system and will recover fully in 2 mins. To place a stress on this system, look to either increase the duration or decrease the time allowed to recover or combinations of both.

For example to improve recovery time aim at gradually decreasing the rest between efforts or increasing the duration of the effort for 11 to 12 seconds.

Anaerobic Lactic
To train this system we can use the same principles as for the alactic; the only difference being that you are only working at 60 to 95% of max effort.

Aerobic
It is important to have a good aerobic fitness as it helps the other two systems and greater gains can be made when training. It is possible that an improving aerobic system will cause some improvement in breath hold as the body becomes more efficient in its use of oxygen. To train this system you must do an activity that is of sufficient intensity to get the heart rate up to about 60% of the maximum for your age for a duration of at least 20 mins not including warm up. (The maximum heart rate for your age can be roughly calculated by: 220 - Age.)

This can be done in a number of activities such as aerobics classes, walking, running, cycling, as well as swimming with or without fins.

WHEN TO TRAIN
When training for an event or season you should use a technique called PERIODISATION. This basically means that you should do different types of training depending on the time in the season. Training can be divided into three phases for the season:

PHASE 1: Light aerobic work perhaps jogging or swimming twice a week.

PHASE 2: More aerobic emphasis training up to four times a week. Incorporate some anaerobic workouts twice a week work building up to a higher volume but low intensity.

PHASE 3: Little aerobic work perhaps once a week to maintain aerobic fitness. Build up anaerobic endurance by having harder sessions - increase repetitions, decrease rest etc. Higher intensity and low volume.