ALTITUDE TRAINING

(Extracts *from 'Lore of Running'4th Edition- Prof Tim Noaks OMS, MBChB MD, DSc,FACSM, Hon FFSEM (UK)*

Training at Altitude

Training at altitude will not definitely insure that the number of red blood cells are increased. Recent studies show that living and training at altitudes of 1800m(5905 ft) for 18 days failed to increase red blood cell mass. Similarly, elite Australian athletes who slept for 8 to 11 hours per night in a high-altitude or nitrogen house for 23 nights at 3000m failed to show any increase in red blood cell production.

Failure of altitude exposure to increase the blood cell mass, would then explain why the VO2 max does not increase with continuing residence at altitude less that perhaps 2500m (8202 ft). Without an increase in oxygen supply, either at altitude or at sea level, the governor model predicts that an increase in the maximum volume output necessary to raise the VO2 max cannot occur.

Hence it is clear that exposure must be to altitudes equal or greater than 2500m if there is to be any chance that performance will improve consequent to an increased red blood cell mass.

Muscles and criteria

As far as muscles are concerned, training at altitude has no magical effect; muscles respond to the relative intensity of effort, and are unable to detect whether the same training is performed at sea-level or at altitude.

Authors of another study suggest that athletes will only benefit from living or training at altitude if they fulfill three criteria:

Firstly, they must live at an altitude sufficiently high to stimulate the production of eythropoeitin so that the red blood cell mass increases. (Erythropoetin (EPO) is a hormone produced naturally by the kidney which stimulates the production of red blood cells by the bone marrow. Erythropoeitin production is stimulated whenever the oxygen supply to the kidney is reduced. This occurs whenever the oxygen content of the blood is reduced, for example, during exposure to altitude.

This altitude should not be less than 2500m (8202 ft).

- Secondly, they must either have adequate whole body iron stores or must receive adequate amounts of iron so that they can increase their red blood cell mass appropriately in response to the erythropoeitin production by the kidneys.
- .Thirdly, they must be able to train at the same velocity that they normally achieve at sea level. This requires that they perform their high-intensity training at altitudes as close to sea level as possible.

Experimenting to simulate altitude

Since the early 1990's, a number of researchers have been experimenting with techniques to simulate altitude exposure in those living at sea level. Two techniques have become popular.

The first is a high-altitude (Alpine) or nitrogen house in which a low oxygen, high nitrogen gas mixture, is fed into the room in which athletes rest and sleep for between 12 and 16 hours a day. The second is a more simple tent that fits over the athlete's bed, for use when he or she sleeps. The value of both is that the athlete sleeps at altitude but is able to train at sea-level; thus the disadvantage of a reduced training altitude is avoided. In addition, the athletes remain in their usual living and training environment.