September 2012 Research Update – Altitude and Intermittent Hypoxic Training

In a recent and very novel study, Garvican et al (2) clearly showed that a period of altitude training can enhance performance (cycling power output) even when increases in red blood cell volume are blocked. This is in contrast to the most commonly accepted theories, and shows that non-haematological adaptations to altitude and hypoxic training, likely within the muscle, have a significant impact on performance. Moreover, these findings challenge the very principle of needing to go to physical altitude for multiple weeks in order to enhance performance – in fact, phases of intermittent hypoxic training may well deliver the same benefits to the active muscle (1), without the need to travel to altitude and without the associated negative impacts (5).

In agreement, Robach & Lundby (6) suggest that many athletes likely reach a red blood cell volume plateau, and those that have reached this plateau may not benefit from further altitude exposure. However, we know that many athletes who's red cell volume fails to increase after altitude training, still make clear performance gains, so clearly these non-haematological adaptations to altitude and hypoxia do occur (4). Amongst other adaptations, these include enhanced capillarization and an increase in the size and number of mitochondria within the muscle (3, 7), both of which will lead to an increased oxidative power of that muscle – effectively, an enhanced endurance capacity. As these are adaptations within the working muscle, intensive intermittent hypoxic training is being increasingly used worldwide as a specific targeted intervention (1). Watch this space for some cutting edge intermittent hypoxic training research findings, from deep within the muscle...

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7. **Vogt M, Puntschart A, Geiser J, Zuleger C, Billeter R, and Hoppeler H**. Molecular adaptations in human skeletal muscle to endurance training under simulated hypoxic conditions. *J Appl Physiol* 91: 173-182, 2001.