KYMIRA Sport Endurance Summary

The following is a short scientific summary of how specific benefits of KYMIRA products impact endurance sports such as long distance running and triathlon.

Enhanced Performance

Increased Circulation

Exposure to infrared (IR) has been shown to increase Nitric Oxide (NO) levels in exposed tissue (Leung et al, 2008), NO has been shown to cause vasodilation (Klabunde, 2010) which results in an increase in circulation for the wearer. The benefits of this to an endurance athlete are multi factored, many of which will be expanded upon in subsequent sections of this review. As more blood is able to reach tissues, more fuel such as oxygen and nutrients are able to be supplied cells and waste products such as lactic acid transported away. Increased circulation also increases the body's ability to thermoregulate (Johnson, 2010) ensuring that the wearer stays at an optimum temperature for athletic performance.

Increased Tissue Oxygen Levels

Studies into our KYnergy technology which incorporates the textile Celliant have shown that the efficiency of respiration is significantly increased when wearing our products (Worobets et al, 2014). The results of which mean that less oxygen is consumed to achieve the same work output as when wearing control garments (Worobets et al, 2014). In addition with the observed increase in circulation, the combined results mean that an athlete can maintain peak output for longer periods of time as oxygen is more abundant in muscle tissue (Gordon and Coyle, 2011). While it has not yet been tested, it has been hypothesised that this will also delay lactic acid build up (McClue, 2005). Research into active recovery has shown that lactic acid is metabolised quicker when continuing to move after an intense lactic build up due to the increase oxygen delivery to the muscle – therefore without active recovery increasing tissue oxygen levels will delay the build-up as it is metabolised quicker (Gladden, 2004).

Pain Relief

While pain relief will be covered in more detail in the recovery section of this review, it is important to note that the reduction of delayed onset muscle soreness (DOMS) can have a beneficial impact on performance by removing a potential inhibitory factor to exercising at peak ability. Relief of pain from chronic conditions such as an old injury can also enhance an athlete's performance (Davies et al., 2009), even if only due to reduced psychological inhibition. Caution is advised when using

KYMIRA products to alleviate injury related pain as it will not be an instant cure and athletes should not ignore professional advice to allow their bodies to heal.

Thermoregulation

To perform any activity at peak levels, the body must be in optimal condition and provide an ideal environment for metabolic processes necessary to complete that task (Laursen, 2011). A major factor in this is temperature and the body's ability to regulate temperature so that chemical reactions are not hindered. Mechanical testing has shown that KYnergy fabrics will heat to an optimum temperature quicker than standard fabrics and then retain heat 63% longer when exposed to a colder environments. This means that when worn in cold conditions, the KYnergy fabrics will help the wearer to maintain an optimal body temperature. As mentioned above, the increase in circulation aid the body's natural ability to thermoregulate so that it does not become too hot.

In addition to the thermoregulatory benefits of increased circulation, the Kynergy fabrics are also able to help cool the wearer in hotter climates as they are 35% quicker drying than other baselayers on the market. IR reacts with sweat to accelerate the rate of evaporation and dispel heat. These quick drying properties are also beneficial in cold, wet climates as drier fabrics are able to stay closer to an optimal temperature when exposed than wet ones.

Accelerated Recovery

Increased circulation

As mentioned previously, an increase in circulation leads to more nutrients and oxygen being delivered to tissue and waste products such as lactic acid being degraded and removed quicker (Bieuzen et al, 2012). This leads to a suitable cellular environment for cellular recovery and repair.

Increased Tissue Oxygen Levels

Increased levels of tissue oxygen has been well documented to aid with recovery from tissue damage (McClue, 2005). Hyperbaric oxygen chambers are used to achieve ~10% increase in tissue oxygen levels. KYMIRA products have been shown to lead to a 20% increase in TCPO2 readings for tissue oxygen levels when compared to control garments.

Pain Relief

While pain may not inhibit recovery, it is often most abundant when not exercising and therefore in a recovery period. The immediate benefit to an endurance athlete will be a significant reduction in DOMS (Kraemer et al, 2001). This will be greatest when KYMIRA apparel is worn during exercise and recovery but wearing for only one or the other will still be beneficial. The pain alleviating effect is achieved through the utilisation of the same metabolic pathway as those used when taking opiates

(Burke, 2009). When an opiate such as morphine is taken, the morphine molecules bind to the nerve cell receptors, which causes a release of nitric oxide (NO). NO then goes on to activate Cyclic Guanine Mono-Phosphate (cGMP), which mediates the diminution in pain (Duarte and Ferreira, 1992). Infrared exposure, in particular FIR exposure causes an increase in NO levels in exposed tissues (Leung et al, 2008), essentially by-passing the need for drugs.

Increased Cellular Metabolism and Rates of Cellular Growth, Repair and Replication

Research has shown that exposure to IR will dissociate NO from the enzyme Cytochrome-C Oxidase which is a transmembrane protein found in mitochondria. While the dissociated NO is of benefit for reasons previously discussed, its removal from the active site if Cytochrome-C Oxidase activates the enzyme accelerating the rate at which is it completes the electron transfer chain to establish transmembrane potential to produce ATP. Due to this increased cellular metabolism, cells have been shown to grow, repair and replicate quicker (with no carcinogenic effects observed). This results in tissue damage due to training repairing quicker, enabling the athlete to be ready for peak performance sooner. IR has also been shown to dramatically improve the rate at which soft tissue wounds heal and similar mechanisms as observed in Toyokawa et al. (2003) can be applied to recovery from sporting injury and tissue damage.

Closing statement

While many benefits of wearing KYMIRA apparel will enhance performance on a one off basis in endurance sports, the greatest benefits will be achieved through prolonged use of KYMIRA products during exercise and recovery. The combined performance and recovery enhancing benefits will allow the athlete to increase work output/capacity for work over '*x*' period of time as they will be able to push themselves harder, while maintaining greater endurance and then recover quicker. The psychological benefits of realising these gains in performance will also be a factor to many athletes.

References

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