

Effects of Cold Therapy

The cooling of an acute (recent) injury is important to achieve a number of beneficial effects. Fast application of ice can be an important factor in the long-term recovery of the athlete.

Pain Relief

The reason behind the application of ice resulting in pain relief is not clear. There are many theories and it is possible that a number of the proposed mechanisms in combination can cause pain relief. Some of the possible mechanisms include:

- A decreased nerve transmission in pain fibers
- Cold reduces the activity of free nerve endings
- Cold raises the pain threshold
- Cold causes a release of endorphins
- Cold sensations over-ride the pain sensation - known as the pain gate theory

Reduces Bleeding and Swelling

By cooling the surface of the skin and the underlying tissues, ice causes the narrowing of blood vessels, a process known as **vasoconstriction**. This vasoconstriction leads to a decrease in the amount of blood being delivered to the area and subsequently lessens the amount of swelling. After a number of minutes, the blood vessels re-open (dilate) allowing blood to return to the area. This phase is followed by another period of vasoconstriction- this process of vasoconstriction followed by dilation is known as the **Hunting Response**.

Although blood still flows into the area the amount of swelling is significantly less than if ice is not applied. This decreased swelling or **edema**, allows more movement in the muscle and so lessens the functional loss associated with the injury. The swelling associated with the inflammatory response also causes a pressure increase in the tissue and this leads to the area becoming more painful. This pain is intensified by certain chemicals that are released into the blood when the tissue is damaged- hence vasoconstriction from applying ice also decreases pain.

Reduces Muscle Spasm

Muscle spasm is often a response to pain. The muscles surrounding the injury contract to protect it (muscle guarding) and prevent further damage. Ice, being useful for pain relief is therefore beneficial in reducing muscle spasms. However it is also thought that muscle spasms which are not caused by acute injury but more muscle overuse or imbalances can also be reduced through the use of cold therapy. This is not fully understood but is thought to be due to ice slowing the conduction velocity of sensory and motor nerves, as well as the activity of muscle spindle cells (responsible for muscle tone), resulting in a decrease in motor activity.

Decreases Metabolic Rate

By reducing the cells metabolic rate, ice reduces the cells oxygen requirements. Thus when blood flow has been limited by vasoconstriction then the risk of cell death due to oxygen demands (secondary cell necrosis) will be lessened.