

Physiological effects of cooling

Local effects

i) On cutaneous blood flow

There is immediate vasoconstriction of cutaneous blood vessels.

This restricts the blood flow in the skin so that heat loss is minimized.

→ The increased blood viscosity due to cooling also reduces the blood flow.

→ After some minutes, the vasoconstriction is followed by vasodilation which lasts for few minutes before replaced by another episode of vasoconstriction.

This alteration of constriction and dilation is called Lewis Hunting Reaction.

In the sense that the vessel hunts or ~~the~~ oscillates about its mean position.

Causes of Vasodilation

The cause of this vasodilation is not completely clear.

Axonal reflex mechanism involving a histamine like substance cause local vasodilation.

As the increased blood flow wash out these substances, the vessels constricts again thus continuing the cycle.

ii) On muscle blood flow

The response of muscle blood flow to cooling is same. The cooling

provokes vasoconstriction in all vascular smooth muscle and the increased viscosity certainly reduces the blood flow but it takes more time for cooling smooth muscles at deeper level than cooling the skin.

iii) On metabolic rate

On cooling the living tissues metabolic rate decreases in accordance with Vant Hoff's Law. Lowered metabolic rate causes →

- a) Reduced oxygen uptake.
- b) Reduced production of metabolites.
- c) Reduced cellular activity.
- d) Slowed healing.

Thus, cooling does not benefit the healing process.

iv) On peripheral Nervous System

→ Cold applied to the skin provides strong sensory stimulus by stimulating the cold receptors. This may be used therapeutically in the suppression of pain and treatment of hypertonicity.

→ If the cold is intense, it reduces the conduction velocity of peripheral nerve.

→ All the nerve fibres are not equally affected by cooling. The small diameter, non-myelinated, slow conducting 'C' fibre, B fibres, also small but myelinated autonomic fibres are least affected by cold.

→ The A δ fibres which are fast conducting fibres and A β and A γ fibres are most affected by cold.

v) On the motor system

Brief application of cold increases the isometric strength of the muscle and prolonged intensive cooling affects muscle metabolism i.e. decreases and viscosity of blood increases leading to muscle weakness.