

COLD THERAPY BENEFITS

FACTS AND FACTORS TO KNOW

Body temperature:

- The body temperature during the day is lowest ~two hours before waking - rises throughout the day – and then decreases at night to allow one to fall asleep.

Dumping and conserving heat:

- Vasoconstriction of blood vessels preserves heat.
- Vasodilation of blood vessels dumps heat.
- The order of dumping heat: arteries > capillaries > veins > out of the body.
- In cold temperatures, blood vessels constrict as a protective measure to keep organs healthy. When the body attempts to reheat, shivering occurs, and the vessels dilate to increase blood flow.

Cooling areas of the body:

- The body has three main cooling areas that contain Glabrous skin: the face, palms, and the bottom of the feet.
- Glabrous skin is smooth and hairless and dumps heat better because the avas-arterial capillaries bypass other capillaries.

TYPES OF BODY FAT

Brown adipose tissue (BAT):

- It is mainly stored in the neck and upper back areas.
- BAT contains more mitochondria. Mitochondria contain iron, which gives BAT its brown color.
- Older people have less BAT.

- Females have more BAT.
- Babies have ~5% BAT that helps keep them warm because their neurons have yet to be wired for shivering.

BEIGE adipose fat:

- It is also stored in the neck and upper back areas.
- BEIGE fat also contains iron-rich mitochondria, more than WAT but less than BAT. Hence, its color is a combination of both WAT and BAT.
- Beige fat can also form within deposits of WAT cells from beige cell precursors.

White adipose fat (WAT):

- The typical adipose fat is stored all over the body, subcutaneously and viscerally.
- It has fewer mitochondria; thus, it burns fewer calories (but is plentiful for providing energy when metabolized).

FAT AND CALORIE BURNING

- Both BAT and BEIGE fat can burn large amounts of calories.
- BAT expresses high levels of a protein called UCP1 that the mitochondria require to burn calories and generate heat when the body is cold.
- BEIGE fat can also turn on high levels of UCP1 in response to cold. During strenuous exercise, the hormone Irisin is released, allowing BEIGE fat to burn calories nearly as effectively as BAT.
- Irisin can also convert WAT to BAT and BEIGE fat.
- Succinate is a chemical compound that plays a role in energy production in mitochondria. Specifically, it is an intermediate

in the Krebs (TCA) cycle used to produce the energy molecule adenosine triphosphate (ATP).

- Shivering increases the succinate to increase the burning of BAT and BEIGE adipose fat.
- BAT activates the hypothalamus in the brain to activate cold receptors to release the hormones noradrenaline and cortisol to increase the shiver response.
- BAT can be used as energy without beta-oxidation in the Krebs/TCA cycle, making it more efficiently burned.

BENEFITS OF COLD THERAPY:

- Increases Dopamine (25%) & Epinephrine (53%).
- Increases metabolism.
- Increases testosterone and sex drive.
- Decreases inflammation.
- Lowers anxiety levels.
- Increases BAT and BEIGE adipose fat thermogenesis.

GENERAL COLD THERAPY PROTOCOL:

- Use an uncomfortable water temperature between 50 to 70⁰ Fahrenheit.
- Submerging the body up to the neck is best, 2nd is a cold shower is second best, and 3rd best is being outside in cold temperatures is third best.
- In the cold for 1:00 – 2:00, then out without drying for 2:00 – 3:00.
- Accumulate 11:00/week between one and five sessions.
- A contrasting method can be used with sauna heat for 15:00 alternating with the 1:00 – 2:00 cold bouts.

- Shivering is the key because it releases succinate to convert BAT and BEIGE adipose fat.

GOOD TO KNOW:

- STUDY: Cooling the palms can increase muscle strength due to the enzyme pyruvate kinase's inability to function in high heat.
- To increase the number of strength training repetitions, try gripping a cold bar for :30 before an exercise set.
- Avoid direct cooling of the core muscles, back of the neck, and front upper torso/chest.
- Avoid cold therapy following hypertrophy-based strength training workouts.