

ADAPTATIONS TO THE THERMAL ENVIRONMENT

Humans live in a wide variety of habitats, ranging from exceedingly hot (in excess of 120° F) to bitter cold (less than -60° F). In order to maintain internal constancy, or homeostasis, the body must adapt. ¹

Response to Heat

IMPORTANT POINT!

Vasodilation occurs when capillaries near the skin's surface widen to allow increased blood flow which permits heat to be emitted to the surrounding air. ²

Sweating allows us to dissipate heat through evaporative cooling. ²

Lack of Body Hair increases exposure to skin which enhances cooling. ¹

People in warm climates tend to be thin, tall, and long-limbed because these traits promote heat loss.

Rules about Body Size and Proportion

Bergmann's Rule

Body mass tends to be greater in populations that live in colder climates in order to reduce heat loss and lesser in warm climates. ²

Allen's Rule

In colder climates, shorter arms and legs are adaptive because they are more effective at preventing heat loss. In warmer climates, longer arms and legs are adaptive because they are effective at creating heat loss. ²

Response to Cold

IMPORTANT POINT!

Vasoconstriction occurs when capillaries constrict to lessen blood flow to the skin, reducing heat loss at the skin's surface. ²

Bergmann's rule applies to polar bears too! ³

People in cold climates tend to be short, stocky, and heavier because these traits prevent heat loss.

Shivering generates muscle heat causing a short term warming of the body. ²

Having subcutaneous fat provides an insulative layer throughout the body. ¹

The Inuit diet is high in animal protein and fat which maintains the high metabolic rates required by exposure to chronic cold. ¹

Change in blood flow patterns:

Intermittent periods of vasodilation provides periodic warmth to the skin that helps prevent frostbite, while intermittent periods of vasoconstriction restricts blood flow to the skin, retaining heat at the body's core. ¹

Our human ancestors evolved in the warm climates of Africa. When they migrated further from the equator to colder climates, their bodies adapted.

Today, there are humans successfully living in thermal environments of all kinds around the world.

Works Cited

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3. Bergmann's rule. (2013, January 22). *New World Encyclopedia*. https://www.newworldencyclopedia.org/p/index.php?title=Bergmann%27s_rule&oldid=966445.