Heating by Cooling

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Abstract

When a body is quickly cooled by thrusting it in a very cold medium, does its internal temperature go up? We examine the case of a heatstroke patient thrust in ice-water to lower his or her temperature. Recent research in photon science suggests that core temperature increases.

We know that cells in the human body burn carbohydrates to produce heat. The process however is quite complicated. The carbohydrate molecule has to be converted to glucose. The glucose then has to be metabolized to carbon dioxide and water through a large number of chemical steps that builds ATP molecules. Cells produce heat while burning the glucose and using the ATP. [1] The control of heat production is the function of a hormone in the thyroid gland. [2]

As we can see, the above process is quite involved and requires a relatively long time. The production of thermal photons, however, is instantaneous by comparison. These are produced by adjustments in energy levels of molecules and atoms in the cooled substance. [3] We now know that thermal photons are heat. [4,5,6] We used to think they were responsible for inducing heat, but that belief is no longer tenable. A photon is heat and its production by atoms and molecules will raise the internal temperature of the material.

We look at Planck's law and equate it to Boltzmann's law,

$$hf = kT \tag{1}$$

where h is Planck's constant, f is thermal photon frequency, k is Boltzmann's constant, and T is the thermal photon's temperature in kelvins. For example, a thermal photon of frequency 10^{13} Hz has a temperature of 480K. The reason the body does not reach that temperature is because the thermal photon is a very large and diffuse structure that encompasses a billion molecules. [7,8,9] But when a heatstroke patient is thrust suddenly in ice water, the imposed large ΔT instigates multiplicities of atoms and molecules to produce thermal photons in an avalanche, which means the intensity of heat increases and temperature goes up. Since photons do not obey the second law of thermodynamics, they go everywhere and anywhere, including toward the core, thus elevating core temperature. [10] It seems then that the process of rapid cooling the patient in fact worsens the problem for a quite long period of time. It seems on this basis that quick cooling of a heatstroke patient in an ice-water bath is contraindicated.

General tests of our theory can be performed by any materials scientist. A soft material at room temperature can be subjected to a large ΔT by immersion in ice water. An encapsulated thermocouple in the interior can record the time rate of temperature change. If an increase in internal temperature is observed, the thermophysiologist can then go to work studying the internal effects of sudden cooling on living structures.

References

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