

Studies cited in support of SBC in non-rete species are invalidated by temperature measurements at inappropriate sites or confounded by thermal inertia of the brain (1, 2). In horses, for example, through inertia, brain temperature fell below arterial blood temperature briefly at exercise onset when body temperatures were increasing rapidly, but otherwise always exceeded arterial blood temperature, including at maximum blood temperature (3). Similarly, the temperature of jugular venous blood draining from the head consistently exceeded arterial blood temperature in exercising hyperthermic humans, including at maximum temperature (6). The existence of SBC in humans is not “hotly debated”; there is no evidence that humans (4) or any other species without a carotid rete can implement SBC.

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SELECTIVE BRAIN COOLING IN HUMANS: WE DON'T FLY, BUT WE WALK JUST FINE

TO THE EDITOR: There seems to be consensus that the human brain is cooled by arterial blood; that humans possess neither a true carotid rete nor a prominent panting response; and that, during hyperthermia, emissary veins (including the angular) direct cooled blood from the head surface to internal networks (including the cavernous sinu, which host the internal carotids). However, there are two debates (4, 6).

The first is about the validity of tympanic thermometry, the method used to demonstrate selective brain cooling (SBC) in humans. Although ear thermometry can be disastrous (5), properly placed tympanic thermocouple probes produce convincing data. When the angular vein is occluded with topical pressure in a hyperthermic subject, the tympanic temperature rises at a higher rate (3), and it is hard to ascribe this rise to contamination with the meatus wall temperature. Clearly, mechanisms of SBC are functional in humans.

The second is disagreement about the extent of SBC. Direct measurements are scarce and are missing completely at high

(2) body temperatures; estimates of the drop in blood temperature between the aorta and the brain vary from negligible (4) to substantial (1); and the current definition's requirement that the brain must be cooler than the aorta seems overly demanding. Indeed, if arterial blood is cooled by specialized mechanisms before entering the brain, so that it removes locally produced heat while keeping brain temperatures at near-aortic levels, would this not be SBC at work? Rephrasing Nybo and Secher (4), we may not fly, but we seem to walk just fine.

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A VOICE IN SUPPORT OF COOL THINKING

TO THE EDITOR: Human SBC, due to a campaign against it, has been one of the hottest topics in thermal physiology for over 30 years. I find the campaign rather emotional than rational. Accordingly, in the opponents' papers (2, 4) there are some traces of deliberate attempts to deny the existence of human SBC. Firstly, in human experiments (4) 5 min face fanning (why not longer?!) is a priori by no means sufficient to cool the bulky human brain, secondly in the baboon model radiant heating directed toward the monkeys' heads (2) must have, obviously, resulted in selective brain heating, counteracting SBC.

Moreover, because heat exchange between cool venous blood of dural sinuses, cerebrospinal fluid, and thin-walled subarachnoid and pial arteries (1) seems to play a crucial role in human SBC, calculations showing insignificant countercurrent heat-exchange between carotid arterial and intracranial venous blood (3), even if they are correct, should not be used to refute SBC.

Concerning direct evidence of human SBC (6) I would like to add one more argument in support. I propose a reinterpretation of postoperative brain (T_{brain}) and rectal (T_r) temperature changes in a man suffering from a huge cerebral hemorrhage (5). After 2 days of a high fever, when his T_{brain} exceeded T_r , he suddenly switched to anapyrexia and his T_{brain} dropped to 33.0°C, while T_r stabilized at 36.0°C. This is an example of extreme SBC under a threat of death. Unfortunately, this adaptive response was too late and the patient died 3 days later, but his thermoregulatory system remained precise and exhibited a clear-cut circadian rhythm until the end.