Remarks on Physiology and Tissue Response in Animals

John Bligh
Division of Life Sciences and Institute of Arctic Biology, University of Alaska, Fairbanks, Alaska 99701

A question that was asked of me earlier was whether we know anything about brain temperature in humans. The answer is that it was impossible to measure brain temperature directly because these were all normal subjects. In 3 species which have carotid rete structures there certainly is local cooling of the brain during panting. Differences between the directly measured brain temperature and a general core temperature during panting in 3 species (rabbit, dog, and Thompson’s gazelle) can be compared with the difference between tympanic membrane temperature and esophageal temperature of exercising humans during facial cooling. In these 3 species of animals, brain temperature is below other core temperatures while the animals are panting. Cabanac’s results are essentially comparable; the tympanic membrane temperature is below esophageal temperature in hyperthermic humans during facial cooling. I do not want to press this point unduly, but after the earlier discussion on my paper (1), I have been thinking about some of the questions that were asked. I have the impression that whole-body hyperthermia continues to be considered unduly dangerous and that the preference is for regional or local heating.

I would like a clear statement on the level to which whole-body temperature would have to be raised to be effective either by itself or in conjunction with other treatments. From some statements, it would seem that core temperatures as high as 44°C might be necessary. If that is really so, I think we have to forget all about whole-body heating, since we do know that humans seldom survive a “runaway” fever or accidental hyperthermia when body temperature rises above 44°C.

In such cases of severe hyperthermia, the subject first becomes disoriented and then loses consciousness. When the body is cooled sufficiently early and sufficiently quickly and there is recovery to consciousness, the evidence of lesions relates mostly to the central nervous system.

It seems to come down to this: if a body temperature of 42°C maintained for 12 hr, with or without other concurrent therapy, is accepted as being beneficial, local cooling of the brain effected by local cooling of the face may increase the safety margin very considerably and render this degree of hyperthermia both feasible and safe. I want to know whether I should give this problem any more thought or just concentrate on those other aspects of thermoregulation which interest me. Therefore, what degree of whole-body temperature heating is necessary for effective treatment of cancer?

If it is substantially above 42 or 43°C, then what I have presented today is of no help to you whatever, and I rather doubt whether whole-body hyperthermia could ever be a safe form of therapy.

References

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