

An instrument for the accurate measurement of Tympanic temperature without physical contact by use of infrared optic fibers.

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# 1991 Fiscal Year Final Research Report Summary

An instrument for the accurate measurement of Tympanic temperature without physical contact by use of infrared optic fibers.

Research Project

## Project/Area Number

01870008

## Research Category

Grant-in-Aid for Developmental Scientific Research

## Allocation Type

Single-year Grants

## Research Field

環境生理学(含体力医学・栄養生理学)

## Research Institution

Kanazawa University

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## Project Period (FY)

1989 - 1991

## Keywords

tympanic temperature / infrared ray / without physiol contact / thermopile / hyperthermia / selective brain cooling

## Research Abstract

The purpose of this study was to design a conventional device for accurate measurement of tympanic temperature without physical contact, with which one can explore mechanisms of selective brain cooling of the humans exposed to hot-humid environments. 1. Designing an infrared device for tympanic temperature measurement. This device detects infrared ray emitted from the tympanic membrane, which is directly related to the tympanic temperature. We have first attempted to build a device using infrared optic fibers with which the infrared ray will be collected and detected by the sensor located outside the auditory canal. However, this device was greatly influenced even by a small change of canal temperature, then we have discarded and revised the device.

The newly designed device consisted of (1) infrared sensor, a. a fine thermopile consisted of 56 pairs of thermocouples. b. outer holder and c. protecting cover. 2. Validity of the device. Tests were repeated in vitro using a model of the skin and using actual tympanic membrane of human subjects. The tests confirmed that the device has a rapid response time and was able to reach a 95% of the maximum value within several seconds. However, the amount of output signals varied if the distance of tympanic membrane and the temperature sensor changed. 3. Comparison with a contact thermometer. Tympanic temperatures in both sides were measured, one by this device and another by a thermistor of direct contact with the tympanic membrane. There was a good correlation between the values measured by the two devices at a thermoneutral ambient temperature without any detectable wind. When the face was fanned in a warm condition. however, this. device indicated lower values compared with those recorded by the contact device. We thus conclude that in its current form the designed temperature sensor may not yet be used under the conditions where air temperature around the head changes to a great extent, and a further revision will be needed before actual use.▲ Less

## Research Products (11 results)

All Other

All Publications (11 results)

- [Publications] NAGASAKA,Tetsuo: "Role of the veins of the face in brain cooling during body warming in human subjects." Japanese Journal of Biometeorology. 27. 113-120 (1990) ▼
- [Publications] BRINNEL,Heiner: "The efficiency of selective brain cooling during hyperthermia in humans in upright versus supine position." Strahlentherapie and Onkologie. 166. 508 (1990) ▼
- [Publications] HIRAI,Atsuo: "Enhancement of finger blood flow response of postprandial human subjects to the increase in body temperature during exercise." European Journal of Applied Physiology. 62. 221-227 (1991) ▼
- [Publications] HIRASHITA,Masami: "Blood flow through the ophthalmic veins during exercise in humans." European Journal of Applied Physiology. 64. 92-97 (1992) ▼
- [Publications] SAKURADA,Sohtaro: "Mechanism of vasoconstriction in the rat's tail when warmed locally." Journal of Applied Physiology. 71. 1758-1763 (1991) ▼
- [Publications] 永坂 鉄夫: "ハイパー-サーミアその生理と病態ー" 日本温泉物理気候医学会雑誌. 55. 13-15 (1991) ▼
- [Publications] NAGASAKA, Tetsuo: "Role of the veins of the face in brain cooling during body warming in human subjects." Jpn. J. Biometeor.27. 113-120 (1990) ▼
- [Publications] BRINNEL, Heiner: "The efficiency of selective brain cooling during hyperthermia in humans in upright versus supine position." Strahlenther. Onkol.166. 508 (1990) ▼
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