



CASE TEACHING NOTES for "Left Out in the Cold: A Case Study in Thermoregulation"

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CASE OVERVIEW AND BACKGROUND

Purpose of case: In order to review and integrate the physiological responses inherent to maintenance of normal body temperature during cold exposure. The case will also allow discussion of cardiovascular, neural, and endocrine systems/functions that are related to the physiological responses to cold. Lastly, the case will introduce physiological consequences of prolonged cold exposure and inability to maintain normal body temperature that are clinically based.

Where the case can be used: Upper-level physiology, exercise physiology, and other courses in which integration of physiological systems and clinical outcomes are a primary focus.

Student population: Students in programs that emphasize physiology, with emphasis on integration of systems, will benefit from this case.

Objectives

- Understand the basic mechanisms by which heat is lost or gained by the body.
- Identify the basic physiologic responses to cold exposure and the neural and endocrine control mechanisms of these responses.
- Identify the physiologic consequences of the normal responses to cold exposure.
- Identify consequences of prolonged cold exposure.

BLOCKS OF ANALYSIS

This case is divided into three parts and is intended to be used in a progressive disclosure manner. The intention is to introduce the basic concepts of thermoregulation and then to integrate the basic concepts into a more advanced discussion of consequences to other body systems. The discussion will also allow introduction of other factors that can affect thermoregulation that vary among people in general and are relative to age and gender. Lastly, discussion can focus on medical consequences of prolonged cold exposure.

Student Preparation

Prior to the use of this case the following information and concepts should be reviewed:

- General knowledge of the mechanisms of thermoregulation to include the following systems: neurological, cardiovascular, endocrine, renal, muscular, and integument.
- Knowledge of cardiovascular, endocrine, renal, and metabolic function as it relates to perturbation of homeostasis.
- Knowledge of consequences of prolonged cold exposure.

ANSWER KEY

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to [the key](#). You will be prompted for a username and password. For the username and password, contact the National Center for Case Study Teaching in Science administrator at answerkey@sciencecases.org.

CLASSROOM MANAGEMENT

Ideally, this case will be addressed by small groups of students (4 to 6 students) working together within a larger classroom. This would then allow expansion of the topics brought out by the discussion questions and integration of these topics into the larger framework of the course objectives. This case is divided into three distinct sections, which allows the use of a progressive disclosure format with later topics building on and reinforcing previous topics. If the case is used in the three-section format, allowing 15 minutes of discussion for each section permits the case to be easily managed in a one-hour class period. Depending on the depth of discussion and range of topics covered, the case can be extended into a longer period. This will allow for greater flexibility in integration and synthesis of the topics available.

REFERENCES

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- Rowell, L.B. 1993. *Human Cardiovascular Control*. New York: Oxford University Press.

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