Case Teaching Notes for "A Typical Cold?"

by
Brent J.F. Hill
Department of Biology, University of Central Arkansas

Introduction / Background

This case study was developed for a two-semester anatomy and physiology class that is aimed at sophomore and junior level undergraduate students. The students are typically biology or health science majors who are pre-med, pre-nursing, or pre-physical therapy.

The case has been used in class sizes from 24 to 65 students. It is introduced about the second week of class (first semester) as cell physiology is being introduced. The following weeks we cover tissues/histology in lecture and lab, and then use the integumentary system as an example to discuss organ systems. During these weeks, students work on their case study to understand the cell physiology and tissue anatomy associated with the case. The case is designed to give students enough obvious clues so that they can determine the medical condition the patient suffers from.

Objectives

- Content Objectives—Cellular
  Students will learn:
  - that cells have an electrical potential,
  - what an electrical and chemical gradient is for an ion,
  - the principles behind osmosis, and
  - how membrane surface area and thickness influence diffusion rates.
- Content Objectives—Tissue
  Students will:
  - be introduced to the tissues and organs of the body and their respective functions, and
  - learn the location and function of many exocrine glands of the body.
- Skill Objectives
  Students will learn to work in a cooperative manner to solve a problem. This will engage their communication, organization, and time management skills. This exercise creates an active environment for students to research and engage in the vocabulary of the discipline.

Classroom Management

Because this case is introduced at the beginning of the course, the students will not have been exposed to a lot of background information. However, as students progress through the case (which takes approximately four weeks), the classroom lectures on cell physiology and tissue anatomy cover several principles that the students will need to understand and research to complete the case study. For cell physiology, these principles include the ionic distribution across a cell membrane, passive and active cell transport mechanisms, and water movement across membranes. In lecture and lab, students learn tissue (epithelial, connective, muscle, and nervous) histology and the functional significance and general location of each tissue type.

This case is written for use in a problem-based learning (PBL) context. As such, the case is an investigative activity that students must complete by themselves and the instructor only serves to facilitate the activity. I encourage students to ask questions; however, I will not directly answer them but will attempt to help point them in the right direction.

Students are randomly placed in groups of approximately five students (based on their lab section). This number allows active participation while allowing for students to drop the course, which happens at the beginning of the semester. I have found that groups below four students or above six do not work as well. Too few students causes problems if several of the students are weak academically or do not take responsibility for the assignments. Likewise, too many students allow some individuals to dominate the group, and thus, a couple of students may not actively participate in the process of the assignment. As mentioned above, students are grouped based on their lab section. This is done so students can meet and communicate with each other during lab; thus, it provides a community for the students.

This case study is implemented in three sequential parts. Part I is an exploratory exercise that is used for students to get to know their group members, brainstorm about the problem, and formulate one or more hypotheses about the case. Within each group students must assume a role, such as group leader, secretary, typist, and editor. Creating roles for students within the group helps to deter students from not participating and enables me to identify where problems may exist. Also, I have students rotate roles for each PBL exercise I assign during the semester. I encourage the group leader to inform me of the group's progress, which enables me to prevent the group from misdiagnosing the condition. I devote a lab period to this first part. We usually meet at the library, and after I present the first part of the case, the students work on Part I in their groups. After about 45 to 60 minutes, they are required to submit a group report based upon the Part I objectives.

After students submit their group reports, I give them Part II. They spend the remainder of the lab time identifying the "learning issues" for their group. "Learning issues" are the concepts the group members feel are necessary to investigate to solve the case. Each person in the group is then assigned one of the learning issues to investigate. Thus, if there are five group members, they will come up with five learning issues. If the group comes up with more learning issues than group members, I encourage them to identify the most significant issues to investigate (often times they will seek my advice) or have a couple of people research the "extra" learning issues. Group members are expected to write an individual report about their learning issue, which is due in one week.

Upon completion of their individual report, students are given Part III. After handing out Part III, I devote 20 to 30 minutes of class time to let students discuss what each person has found and to get organized for Part III. They will complete this part of the case study outside of class; it is usually due in two to three weeks. I devote more time for the completion of this third part because students will need to meet and communicate as a group for its completion.

Upon completion of the final group report (Part III), we have a group discussion concerning the answers to the objectives and how the case is connected to the material discussed in lab and lecture.

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. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online** or write to **answerkey@sciencecases.org**.

References

Beers, M.H., and Berkow, R., editors. 1999. *The Merck Manual of Diagnosis and Therapy, 17th ed.* New Jersey: Merck Research Laboratories, pp. 2366–2371.

Goldman, L., and Bennett, J.C. 2000. *Cecil Textbook of Medicine, 21st ed.* Philadelphia: W.B. Saunders Company, pp. 401–405.

Quinton, P.M. 1999. Physiological Basis of Cystic Fibrosis: A Historical Perspective. *Physiological Reviews* 79 (suppl. 1):S3–S22.

Acknowledgements: Review and publication of this case on the National Center for Case Study Teaching in Science website was made possible with support from the National Science Foundation (NSF Award #0341279).