

CASE TEACHING NOTES

for

“Why Does Grandpa Ignore Grandma? A Case Study in Hearing Loss”

by

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INTRODUCTION / BACKGROUND

This case is intended to reinforce concepts central to the transduction of environmental sound to hearing. More generally, the case can be used as a model for thinking about sensory signal transduction (sight, smell, taste, and touch). The case was written for a medical physiology course taken by postgraduate students in physical therapy and physician assistant professional programs and for graduate students in a cell and molecular biology program. The case could be adapted for use in general education human biology or human aging courses or in a majors undergraduate physiology course. The two-part case is designed in an interrupted case format.

CLASSROOM MANAGEMENT / BLOCKS OF ANALYSIS

Part I—Introduction

Objectives:

- To review general function of the sensory nervous system.
- To review the structures important to sound transduction to the Cochlear nerve.
- To become familiar with structural interactions that result in sound transduction.
- To distinguish the environmental factors important to hearing.
- To recognize that sound transduction ability declines with age.

Part I could be assigned to students to work on in small groups at the beginning of a class session. While much of this section involves rote learning of a fairly well understood phenomenon, there are several things that may challenge students. Which areas prove challenging will depend upon the depth to which the students are expected to understand the signal transduction pathway. For example, medical physiology students generally need some clarification about the function of tip links on stereocilia, the role of the oval window, and the interpretation of pitch by the temporal hearing centers. The amount of time necessary for this part of the case will vary depending upon the expectations. Medical physiology students are generally able to work through the material in 30–45 minutes.

Part II—The Check-Up

Objectives:

- To interpret data related to age changes in hearing ability and relate them to signal transduction physiology.
- To apply knowledge of normal hearing to altered hearing ability and propose mechanisms for nonpathological hearing loss.

Following completion of Part I, students in our graduate medical physiology class are given Part II near the end of the class period without the questions and told to come to the next class prepared to answer a set of questions (in their groups) about Grandpa Carl's condition. Our expectation is that our graduate students will explore the causes of presbycusis outside of class and then address the questions in class the next time we

meet, with the focus on applying their knowledge to a novel situation rather than on diagnosing a patient. In our experience, if we do not give the students the questions ahead of time they gather information on a broader basis than if they are given the questions. When they arrive in class, they then have to apply their broad knowledge base to the specific questions, which they are seeing for the first time. They use the last few minutes of the previous class period reading and discussing Part II in their groups to determine where they need to focus their efforts to best prepare for the types of questions they are likely to face the following class.

In undergraduate classes the instructor may want to give the questions to the students as they leave the class to provide a more directed focus to guide the students.

This section could also be adapted for clinical or general education expectations by simply changing the questions.

Altogether, this part of the case takes 20–30 minutes of class time to complete.

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.

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FURTHER READING

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