

CASE TEACHING NOTES

for

“The Tired Swimmer: A Case Study on the Nervous System”

Phil Stephens
Biology Department
Villanova University

INTRODUCTION / BACKGROUND

Annie is on a college swimming scholarship. Recently she has been feeling tired and her times have been getting slower. She suffers from blurred vision, but she thinks it's because she has had mid-term exams and papers to type. She feels that she is losing her strength so she goes to her family physician over mid-term break. He sends her to a neurologist who finds that Annie is suffering from something more than just fatigue.

This interrupted case study takes students through a series of stages that describe Annie's problems and symptoms. Students use their knowledge of nerve and muscle physiology to fit the pieces together and determine what is wrong with Annie.

The case was developed for use in a one-semester animal physiology course that is taken by sophomore and junior science majors. It could also be used in an anatomy and physiology course.

Objectives

- To understand nerve and muscle function.
- To understand the function of chemical synapses.
- To understand the role of acetylcholine receptors.
- To determine how Annie's problem can produce a decline in nerve-muscle function.

CLASSROOM MANAGEMENT

The class is divided into groups of five or six students, and the case takes about 75 minutes to fully develop.

Board Management

I use a whiteboard in class to record student answers and ideas. The whiteboard has four panels. I use the first area to list Annie's signs and symptoms. I use the central two panels to project the flow diagram in Part III that forms the basis for the subsequent diagnosis of Annie's problems. I project the diagram and students use markers to fill in the blanks with markers. I use the fourth panel to record what students think could be wrong with Annie (possible diagnoses) and the tests suggested by the students. Entries are made on the first and fourth areas of the whiteboard throughout the case as information is provided. If a certain diagnosis loses favor, I ask the original group if it is reasonable to delete their entry. If they (and the class) agree, an "x" is placed in the margin next to the entry. I do not erase the diagnosis because someone may wish to reconsider it at a later date and it is easier to erase an "x" than write out a diagnosis again.

Case Management

Students are given each part of the case in sequence and asked to read the passage and then discuss the material and answer the questions. Students are told how much time they have for each part of the case study

and are permitted to use books, notes, and the Internet for reference. After the prescribed time period (typically 10 to 20 minutes for each part of the case), the class is called together to share ideas, with the questions forming the basis for the discussion. Groups take turns going first, and different members of each group are called upon for input. In this way, all of the students have an opportunity to participate in the case study.

Part I—Meet Annie

Annie's signs and symptoms are written on the first area of the board. Groups (and individuals) are encouraged to suggest diagnoses, which are written on the fourth area of the board, though at this stage it is rare for students to offer a diagnosis. Many people think that Annie may be fatigued and may just need rest.

Part II—The Doctor's Office

The additional signs and symptoms are added to the list. The reflex diagram (contained in the Answer Key) may be drawn (or projected) on the board in the middle two panels, but be sure to position it at the top left or top right and not in the center or it will get in the way of the flow diagram in the next section.

The doctor says there is muscle weakness, which provokes diagnoses like muscular dystrophy, amyotrophic lateral sclerosis (ALS), and multiple sclerosis. Students may be encouraged to explain what they think may be wrong rather than come up with a specific disease. Students often state that there is something "wrong" with the muscles.

Part III—The Neurologist

Students may need help here because they are sometimes perplexed by the observation that the nerves and muscle are functioning but the neuromuscular system is not working well as a unit. Encourage them to skip to the flow diagram. Students seem to enjoy this part of the case, as they are encouraged to come to the board and write their answer. The chart could be duplicated on the board or projected onto a white board. Students from each group can be randomly selected to fill in a blank by writing on the board. You can discuss each answer and ask the class whether they agree or disagree; some friendly rivalry can result.

If the class has a hard time with Question 3, the answer usually comes to them after they have completed the flow diagram. The dysfunction question (#5) at the end of this part brings up the possibility of synaptic dysfunction. Make a list of the students' suggestions and ask the class to vote on the most likely, and then what they think may be wrong at the synapse; write these possibilities as diagnoses..

Part IV—The Neurologist Continued

Part IV winds up the case. The antibodies question gives a big hint, if you assume that antibodies do not enter cells (i.e., the nerve and muscle). Clearly it must work on the transmitter or the receptor. The role of receptors in producing postsynaptic depolarizations (endplate potentials) to threshold can be discussed, together with the effect of a functional down regulation of the receptors on the muscle membrane.

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

Myasthenia Gravis Foundation of America (MGFA)

<http://www.myasthenia.org/>

National Institute of Neurological Disorders and Stroke Myasthenia Gravis Information Page

http://www.ninds.nih.gov/disorders/myasthenia_gravis/myasthenia_gravis.htm

Myasthenia Gravis Links

<http://pages.prodigy.net/stanley.way/myasthenia/>

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