

# CASE TEACHING NOTES

for

## "Chemical Eric: Dealing with the Disintegration of Central Control"

by

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### INTRODUCTION / BACKGROUND

This case is designed to teach introductory biology majors about the role of the pituitary in controlling hormones. It presents an actual case in which the pituitary is seriously disrupted. By examining the various effects of pituitary disruption and tracing them back to their hormonal causes, students gain an understanding of the role of the pituitary in controlling a variety of hormones, and in the cascade of effects triggered by high-level pituitary hormones.

The story is a true one, and the pictures are pictures of the boy affected. Some of the events have been collapsed together, and I have omitted much of the tedium of frequent doctor visits, arthritis, some of the less obvious complications, and the side effects of drugs.

### *Objectives*

- To present a story of pituitary disruption, and thus bring the list of pituitary functions to life.
- To see the effects of the pituitary on a variety of physiological functions.
- To introduce students to problem-solving and working from data to theory.

### CLASSROOM MANAGEMENT

I teach this case in my first-year, first-semester biology class. We have only 20 students per class, and I use cases extensively, typically about eight per semester. However, this case could easily be applied or modified to fit a variety of other courses, including a non-majors introductory biology course or any of a variety of human health-related courses (human anatomy and physiology in particular).

This case is designed to be the first case we examine. I use it as the first case for several reasons. First, I use it because one of the first chapters we read covers homeostasis and animal hormones; second, because one of my goals is for all of us to better understand each other, and this case happens to describe me. Third, I find this case is a fairly good introduction to the concept of case analyses. Since we do eight cases, it is important to make sure students understand the need for problem solving and the need to be involved in the class discussion. With some guidance the problems are fairly easy to solve, and the students can see how a rather dry laundry list of hormonal effects becomes transformed into a real-life scenario.

The case, as presented here, is formatted so that students receive a section at a time and work through the material (and the questions) in each section before being given the next section to work on. However, in a more advanced class I could imagine handing out all of the sections at one time and telling the students to read and answer the questions for each part before going on, with the last set of questions assigned as either a small group or an individual written assignment.

I hand out Part I of the case at the end of class and tell the students to read it and try to figure out answers to questions 1 and 2 for next class. I also tell them to bring their textbook to class and to use the chapter on hormones to help answer the questions. This hint is usually enough to enable some of them to figure out that the most likely reason for a variety of hormonal dysfunctions is a pituitary problem.

Next time class meets, after discussing questions from Part I, I hand out Part II. We discuss the questions in Part II, and then I hand out Part III. We continue on through Part III's questions. When we are done with Part III, I hand out Part IV. We read Part IV, briefly discuss it if we have time, and I assign the three questions as a written follow-up assignment to be turned in the following class period, which for us is on a Monday.

## BLOCKS OF ANALYSIS

In addition to the points raised in the answer key (see below), some students may ask why the protagonist of the case was being given end-product hormones like testosterone rather than earlier-stage hormones like TSH. This is a good question. You can talk with your students about the difficulty of synthesizing or extracting hormones. The HCG (human chorionic gonadotropin), for example, had to be injected three times a week versus once every two weeks for the testosterone, and is also much more expensive to purchase. Remember that many of the higher-level hormones are produced in tiny amounts, so another factor is that regulating their doses becomes trickier. Many hormonal chains include a form of magnification, where the end product is much more abundant than the initial trigger.

Other students might note that it was a good thing the protagonist wasn't female, because a pregnancy would have been difficult to manage due to the complex mix of hormones that regulate pregnancy and lactation. You can use this as an opportunity to discuss these hormones and their effects if you desire.

I have deliberately included Dr. Lee's disillusionment with her career. Some of my students want to go to medical school. Typically they think being a doctor is an easy route to financial success and high social status. However, my friends who are doctors have told me that many of them have struggled with their career choice. The rates of divorce and dysfunctional lifestyles in the medical profession are high. It is easy for my students to see the power of a doctor, and hard for them to see the long hours, the intense focus required, and the difficulties of balancing a career and a family. Dr. Lee probably wishes she could spend more time with her family.

Finally, you might want to bring up the issue of blood calcium levels. If Eric in the story isn't producing calcitonin, why don't they have to manage his calcium levels carefully? The answer is that calcium is one area where there are multiple feedback controls to regulate the concentration in the blood. His body seems to be managing this aspect quite well.

## 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](mailto:answerkey@sciencecases.org).

## FOLLOW-UP

Curiously, when I teach this case my students want to know that the outcome is a happy one. Therefore, I get comments like, "But everything is OK now, right?" The answer is slightly more complex than they prefer.

While I did not incorporate all of these in this case, other side effects of a tumor like the one described here include high blood pressure, a tendency to develop colon cancer, optic nerve damage, and joint problems. We are managing the high blood pressure through diet and medicines, I get a colonoscopy every five years, I'm bothered by occasional arthritis and more frequent joint pains, and I've lost virtually all of my peripheral vision. It also turns out that a possible complication of irradiation is damage to arterial walls. I have had an aneurysm where an artery branches into two near the pituitary which required a craniotomy, and three years ago I had a mild stroke. On the other hand, I'm still here, I'm generally able to ignore all of this and live a good life, and while my daughter recently asked "Dad, why do you hop so funny when you run down the basketball court?" I'm still able to play basketball; I just wish I could play it better

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*Has a good picture of a pituitary tumor and descriptions of tumors, identification, and effects.*

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## FURTHER READING

### Books

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