**Title:** A Case of Severe Insulin Resistance

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**Abstract**:

This case discusses the consequences of a mutation in a kinase (Akt-2), involved in insulin signaling, at the interface of biology and chemistry. It is focused on understanding the molecular cause(s) of observed symptoms, and how that leads to diabetes mellitus. You will begin by reading a short story about Megan, Jade, and Joanna, where Megan learns about Joanna’s recent diagnosis of insulin resistant diabetes mellitus. Since Megan is a biochemistry student, she wants to learn about the cause(s) of insulin resistance. She looks in the scientific literature and stumbles upon an interesting paper that forms the basis of the case. Interestingly this inheritance pattern is similar to Joanna’s. Along with Megan, you will explore bioinformatics resources and the literature to learn about key players in the insulin signaling pathway using the KEGG Pathways database and figure out the role of Akt-2 in insulin signaling. You will search for and find relevant structure(s) in the Protein Data Bank (www.rcsb.org), visualize and analyze them to figure out the molecular structural basis for her main symptom. The molecular explorations in this section concludes with Megan understanding why the mutation in Akt-2 was leading to diabetes. However, she also realizes that there may be many other scenarios leading to insulin resistant diabetes that perhaps would not benefit from treatment with insulin. Finally, when Megan attends a lecture, she understands a possible way to treat insulin resistance. Megan is excited and wants to share her new knowledge with her musician friend. As students participating in the case, you will help Megan write the letter to her friend.

The case was developed to enable introductory biology students to explore intra- and inter-molecular chemical interactions that stabilize the structure and functions of biological molecules. In addition, the case includes an assessment suggestion.

**Subject Headings**:

Biology (General), Cell Biology, and Biochemistry

**Objectives**:

*A. Biology/ Cell Biology Learning Objectives*: Student should be able to …

*B. Biochemistry Learning Objectives*: Student should be able to …

*C.* Competencies:

*D. Modeling and Presentation Learning Objectives*: Student should be able to …

**Keywords**:

Insulin signaling; mutation; diabetes; inherited; kinase; phosphorylation

**Topical Area**:

Scientific method; Molecular structure representation; Visualization

**Educational Level**:

Undergraduate lower division

**Formats**:

PDF and Website

**Type/Method**:

Directed, Interrupted

**Language**:

English

**Date Posted**:

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**Copyright**:

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