**Title:** Happy Blue Baby

**Author:**

Shuchismita Dutta (contact author: sdutta@rcsb.rutgers.edu)

Institute of Quantitative Biomedicine, Rutgers University, Piscataway NJ 08854

**Abstract**:

This case discusses the consequences of a rare mutation in fetal hemoglobin at the interface of biology and chemistry. It is focused on understanding the molecular cause(s) of observed symptoms, and its impact. This interrupted case is divided into sections. The titles and brief descriptions of these sections are included below:

1. *A special baby girl*: here students will read a news article published in a local Toms River Newspaper describing the case of a little baby girl who was brought into the Children's Hospital of Philadelphia. Students will discuss the symptoms she had, tests that were done on her and the results of those test.
2. *Grandma provides a clue*: In this section of the case a comment made by the baby’s grandmother helped understand the diagnosis. Students will also explore key figures from a scientific publication to discuss the implications of grandma’s comment.
3. *Molecular basis of cyanosis*: The third section of the case focuses on understanding the molecular causes leading to the baby’s symptoms. Students 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.
4. *Binding and Release*: In the version of the case for Biochemistry students, this section reviews and discusses the oxygen association and dissociation properties of native and mutant proteins to shed light on the biochemical properties of the mutant protein.
5. *Happy ending*: The final section of the case reveals that the baby has grown up to be a healthy girl. Students will discuss the molecular basis for the baby’s “cure”.

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. A variation of the case is also presented to include oxygen binding discussions that are suitable for a biochemistry class. In addition, the case includes an assessment suggestion where students explore the consequences of a related condition in molecular detail. The assessment is designed to uncover student learning (in disciplinary content (biology and biochemistry), molecular visualization skills, understanding of structure function crosscutting concepts, and familiarity with science practices). Teaching notes, and keys for the case are also available.

**Subject Headings**:

Biology (General) and Biochemistry

**Objectives**: Learning objectives may span the following fields

*A. Biology*

*B. Biochemistry*

*C. Modeling and Presentation*

**Keywords**:

hemoglobin; mutation; anemia; cyanosis; hydrophobic; Heme; Oxygen binding

**Topical Area**:

Scientific method; Molecular structure representation; Visualization

**Educational Level**:

Undergraduate lower division

**Formats**:

PDF and Website

**Type/Method**:

Directed, Interrupted

**Language**:

English

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