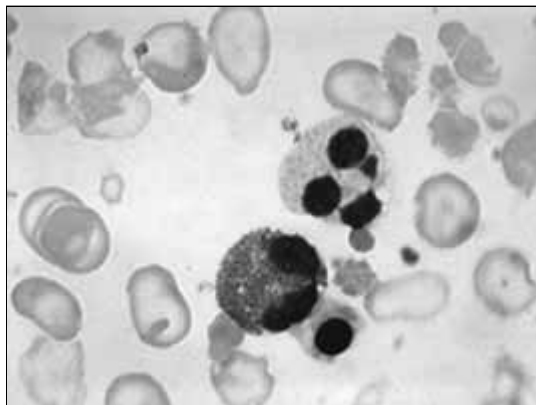


CASE TEACHING NOTES

for

The Chemistry of Cooley's Anemia

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INTRODUCTION / BACKGROUND

This case study was developed to introduce students to the role of metal ions and coordination chemistry in biological systems. It can also be used in the development of decision-making skills. It would be applicable to any of a number of courses at the interface of biology and chemistry, including Biochemistry, Molecular Biology, Bioinorganic Chemistry (the study of the involvement of transition metals in biological systems), Bioethics, and others. We have used it in both upper and lower division courses ranging from Advanced Inorganic Chemistry (where it is used to show the application of coordination chemistry to living systems) to Introduction to Organic Chemistry and Biochemistry for Nurses (where it is used to initiate a discussion of the structure and function of hemoglobin).

Students are presented with a case in which two young parents learn that their child is suffering from the genetic disorder thalassemia, also known as Cooley's anemia. The treatment for this disorder requires a lifetime commitment to whole blood transfusion and chelation therapy (both administered on a daily to weekly basis). The biggest obstacle to long term survival is patient non-compliance. The students read the case study and then investigate a series of questions. They must, ultimately, decide how they would treat the child if they were his parents.

Objectives

Upon completion of this case, students should be able to:

- identify the significance of chemistry to biological systems;
- understand and discuss the causes, symptoms, and treatment of the genetic disorder thalassemia;
- understand and discuss the role of iron in the body;
- understand and discuss the use of chelating agents in the treatment of iron overload; and
- make an informed decision based on developed critical thinking and reasoning skills.

CLASSROOM MANAGEMENT

This case is set up in the decision or dilemma mode. Students read the case individually and then are placed into small groups of four or five. Group members choose a spokesperson, a reader, and a facilitator. The reader then rereads the case to the entire group, with the questions being considered as the

case is reread. The facilitator leads this discussion and keeps the group focused. Each group is then given until the following class session (individual instructors may want to give more time) to research answers to the study questions; for upper division courses we provide copies of the articles listed in the [References](#) section. The amount of detail expected of the students will depend on the level of the course. When the case study is taken up again, the instructor leads the discussion by considering each question in turn; the spokesperson for each group presents to the class their group's answer to the respective questions. Following this discussion of the class as a whole, individual groups reconvene to consider, in their role as Peter's parents, their decision as to Peter's fate. Each group briefly defends their reasons for making their particular decision. These are shared with the class and then collected by the instructor.

BLOCKS OF ANALYSIS

The major blocks of analysis covered in this case study include the types, causes, symptoms, and treatments of thalassemia; coordination chemistry; iron transport and storage; the toxic effects of iron overload on the body; and chelation therapy.

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. For the username and password, contact the National Center for Case Study Teaching in Science administrator at answerkey@sciencecases.org.

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