

Quagga Quandary

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Target grade/subject: Grade 10 Biology

Lesson Overview:

Upon completion, students will be able to identify and articulate the importance of maintaining the correct balance of nutrients across cell membranes and be able to recognize and construct a toxic environment necessary to destroy quagga mussels.

Lesson Context:

This lesson will follow instruction on basic information regarding osmosis and diffusion, and run concurrently with instruction about the balancing of elements in cells. This lesson should not only support the understanding of back and forth movement of materials through cell membranes, but also identify the time necessary to destroy a species by immersion in a saline solution.

Websites [– need to list host of each website](#)

<http://nas.er.usgs.gov>,

<http://seagrant.umn.edu>,

<http://greatlakesseagrant.org/>

http://www.cce.cornell.edu/aquaticinvaders/nan_ld.cfm,

<http://techalive.mtu.edu/glmri/index.htm>,

<http://www.windows2universe.org/earth/Water/salinity.html>

[Learning Objectives?](#)

Benchmarks:

B2.1C Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products.

B2.3A Describe how cells function in a narrow range of physical conditions, such as temperature and pH, to perform life functions.

B2.3B Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.

B2.4d Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes.

B2.5h Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport)

B2.5i Relate cell parts/organelles to their function.

B3.4C Explain the negative impact of human activities.

Materials:

Live Quagga Mussels (gathered from nearby waters)

pond/lake water

3-10 containers capable of holding 0.5-2 gallons of water (numbers variable depending on size of class and teacher choice of group sizes.)

Aquarium salt

Hydrometer (optional)

Vocabulary:

Crenation - Cell shrinking

Hemolysis - Cell explosion

Saline -Salt water solution

Niche - the role a species plays in its environment including survival and reproduction

Ballast - Heavy material stored in ships holds to provide stability

Focus Questions: Brainstorm with students the answers to questions regarding the uses of salt. Why is salt used to dry things out? What happens to cells placed in high/low saline solutions?

Procedure

1. Show students photos of quagga-covered items under water.
2. Break students into two groups; one to study Quagga mussels, and the other to study ocean salinity.
3. Within the two groups, give these items to study:

Mussels:

Description

Life Cycle

Point of Origin

Niche

Ocean Salinity:

Percent of salt/freshwater world-wide

Range of salt content and average

Common ocean species

Students present to classmates. Use Collaborative Rubric for both self and group assessment.

Teacher will give general overview of the importance of ballast water in shipping. Instruction will include balance and displacement, uptake and discharge methods, and geographic range and location of common items shipped into the Great Lakes from international sources.

Then let students brainstorm pros and cons of international shipping. If necessary, lead students to invasive species entering the Great Lakes through ballast water (Quaggas). Explain "Spit and Swish" - changing of ballast water before entering the Great Lakes.

Create lab groups.

Question: How long must a Quagga be submerged in ocean water to die?

Hypothesis: Assorted, student-led

Materials: Two containers each group*, water, salt, mussels

Procedure: One container has pond/lake water as control, one container is brought to average ocean salinity using aquarium salts and hydrometer (optional). Place equal number of mussels in each container, check daily for attrition. Plot information to find average.

* If possible, true aquariums with aerators could be used. However, students should understand not only that ballast water becomes sealed in a non-aerated container (ship hold), but also that given equal conditions, (non-aeration in each available container) measurable results are effective.

Assessments:

Collaboration rubric for group research with self-assessment (included)

Vocabulary quiz with five words, and lab report

Collaboration Rubric

4 - Thorough Understanding

- Consistently and actively works toward group goals.
- Is sensitive to the feelings and learning needs of all group members.
- Willingly accepts and fulfills individual role within the group.
- Consistently and actively contributes knowledge, opinions, and skills.
- Values the knowledge, opinion and skills of all group members and encourages their contribution.
- Helps group identify necessary changes and encourages group action for change.

3 - Good Understanding

- Works toward group goals without prompting.
- Accepts and fulfills individual role within the group.
- Contributes knowledge, opinions, and skills without prompting.
- Shows sensitivity to the feelings of others.
- Willingly participates in needed changes.

2 - Satisfactory Understanding

- Works toward group goals with occasional prompting.
- Contributes to the group with occasional prompting.
- Shows sensitivity to the feelings of others.
- Participates in needed changes, with occasional prompting.

1 - Needs Improvement

- Works toward group goals only when prompted.
- Contributes to the group only when prompted.
- Needs occasional reminders to be sensitive to the feelings of others.
- Participates in needed changes when prompted and encouraged.