

Information for Teachers

B.R.A.I.N.

ALS Competition

What will the students do?

1. Learn about ALS or Motor Neuron Disease using the following resources

ALS a patient tutorial

<http://www.nlm.nih.gov/medlineplus/tutorials/amyotrophiclateralsclerosis/htm/index.htm>

Read about Stephen Hawking and his life with ALS: <http://www.hawking.org.uk/>
Neuroscience for kids, they should study the following sections:

<http://faculty.washington.edu/chudler/neurok.html>

- i. common questions about the brain and neuroscience
- ii. another day another neuron
- iii. becoming a neuroscientist a game of survivor
- iv. neuroethics
- v. how the nervous system interacts with other systems
- vi. millions and billions of cells types of neurons
- vii. making connections – the synapse
- viii. they search for three articles on the site – one on virus infections and ALS and two on ALS and Gulf War veterans

2. Learn about cells

For this they can use a variety of resources such as the textbooks available in your schools and test their understanding using the interactive cell at The Centre of the Cell

<http://www.centreofthecell.org/index.php>

3. Learn about Enzymes and specifically SOD1

Dr. Saul's Biology in Motion cartoon of enzyme characteristics

<http://biologyinmotion.com/>

http://peer.tamu.edu/curriculum_modules/Cell_Biology/index.htm only use the section on *making protein machinery to do things*

The *Molecule of the Month* article on SOD1 www.pdb.org choose molecule of the month previous features. Follow link for SOD1

Newton's apple on proteins video

<http://www.newtonsapple.tv/video.php?id=1672>

students should be able explain how the video would differ for SOD1

4. Construct a protein folding map and model protein using

Paper

Toobers

Information at www.pdb.org file number 1N19,

Which is based on the work of Cardoso, R.M.F., Thayer, M.M., DiDonato, M., Lo, T.P., Bruns, C.K., Getzoff, E.D., Tainer, J.A. (2002) *Insights into Lou Gehrig's disease from the structure and instability of the A4V mutant of human Cu,Zn superoxide dismutase*. J.Mol.Biol. 324: 247-256

What will the competition involve?

1. Students will work in teams
2. The students will make a protein folding map and toober model of the protein at your school
 - a. We will have training sessions for the teachers
 - i. March 18 at 4:00
 - ii. March 21 at 10:00
 - b. We will supply the toobers, the students can make creative additions as they wish
 - c. The models are due at Stony Brook for judging by May 5, 2009
3. On the day of the competition,
 - a. Three students can attend the competition for each team
 - b. The event will include
 - i. creating a protein map and building a toober model
 - ii. completing a write-it do-it assignment as in the Science Olympiad
 - iii. answer questions written or oral based on the assigned reading question formats will include word match, multiple choice and very short answer

Alignment with Standards and detailed

- ❖ Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design as appropriate, to pose questions, seek answers, and develop solutions.
 - Scientific Inquiry: Students will construct, an explanation for nerve to muscle communication and the breakdown that occurs in ALS
 - Engineering Design: Students develop protein maps and create a 3-dimensional model of a protein
 - They will use a variety of resources to understand the relationship between protein structure and function
- ❖ Standard 2: Students will access, generate, process, and transfer information using appropriate technologies.
 - Students will use online health and education resources to research ALS
 - Students will use scientific databases to learn about the protein SOD1
 - Students will use a free, web-based computer software program to examine the protein SOD1
- ❖ Standard 3: Students will use mathematics to design their model and evaluate the link between SOD1 and ALS.
- ❖ Standard 4: Students will understand and apply scientific concepts, principles, and theories related to nerve function and ALS
 - 4.3 Oxygen is essential for our cells but can also damage them
 - Cells use chemical reactions and enzymes such as SOD1 to detoxify oxygen
 - 4.3 Proteins are molecules made by cells
 - Proteins are chains of amino acids

- Proteins have parts (sidechains) that can be hydrophobic or hydrophilic and positively or negatively charged
- These variations in charge affect the shape of the protein and its function
- 4.3 The Living Environment
 - The nervous system is made from several cell types
 - Students will be able to match cell type name with function
 - Students will be able to describe the communication between cells of the nervous system and muscles
 - Students will construct an explanation for the changes that lead to ALS
 - Student will differentiate between familial ALS and non-familial
 - ◆ And be able to explain why scientists study familial ALS in the hope of understanding non-familial
 - Cell Biology
 - Students will be able to identify and describe the function of the primary parts of a eukaryotic cell
 - Students will be able to describe the role of oxygen in a eukaryotic cell
 - Students will be able to describe general enzyme function and relate that to the description of SOD1 in the *Molecule of the Month* article
- ❖ Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions. This program will raise the students' awareness of ALS in the community, of current research on motor-neuron disease and opportunities for future careers.