Rabies – The Global Connection!

By

Sabrina Grossman
Bloomington South High School
Bloomington, Indiana

Denise Michaelsen
Chetek High School
Chetek, Wisconsin

In Collaboration with
Kira Christian, DVM, MPH and Paula Orlosky, MA
Centers for Disease Control and Prevention

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Rabies — The Global Connection!

Sabrina Grossman
Bloomington South High School
Bloomington, Indiana

Denise Michaelsen
Chetek High School
Chetek, Wisconsin

Summary
This lesson is designed for high school students in grades 9–12 in a biology or health class. In this lesson, students will explore the impact of rabies at both the local and global level. Students will understand the epidemiology of rabies, including how to prevent and treat the disease. Students will also learn the problem-solving skills required related to controlling disease transmission by following protocol. The lesson will conclude with the students creating educational materials to raise awareness about rabies and distribute within the school and community.

Learning Outcomes

- The students will eliminate the misconceptions about rabies.
- The students will analyze the importance between locally and globally controlling rabies.
- The students will determine the protocol used in controlling disease transmission.
- The students will educate the community on the epidemiology of the rabies virus.

Materials

1. Photocopies of Pretest: Rabies: The Global Connection — one copy for each student
2. Photocopies of Rabies Case Studies/Fact or Fiction? — one for each student
3. Photocopies of Rabies Webquest: An Internet Scavenger Hunt — one for each student
4. Photocopies of Public Health Problem: Rabies in India — one copy each per 3–4 students
5. Photocopies of Rabies: Educational Pamphlet — one for each student
6. Photocopies of Rubric: Rabies Educational Pamphlet — one for each student
7. One computer per student with internet access
8. Poster paper, tape, and markers — 1 for each group of 3–4 students

Total Duration: 4 Hours

Procedures

Teacher Preparation
Teacher will review the World Rabies Day PowerPoint presentation for important background information on rabies. The teacher should preview websites that are used in the Rabies Internet Scavenger Hunt. The teacher should make copies for each student of

- Pretest: Rabies — The Global Connection, **Step 1**
- Rabies Case Studies/Fact or Fiction, **Step 2**
- Rabies Webquest: An Internet Scavenger Hunt, **Step 3**

- Rabies Educational Pamphlet, **Step 5**
- Rabies Educational Pamphlet Rubric **Step 5**

The teacher should also make copies of Public Health Problem: Rabies in India assignment sheets, **Step 4** for each group of 3–4 students in the class.

Web Resources
Title: Rabies Statistics for the United States
URL: http://www.cdc.gov/ncidod/dvrd/kidsrabies/Statistics/usmap.htm
Description: This website is a great resource for individual state information on the occurrence of rabies and statistics for each state. The website will help you obtain information about rabies incidence in your particular area if you are interested in creating a personal link for your students.

Title: World Rabies Day PowerPoint (2008)
URL: http://www.worldrabiesday.org/EN/Education-Bank/english.html
Description: This website contains the PowerPoint on World Rabies Day and contains other educational resources for teachers.

Title: World Rabies Day/Personal Stories
URL: http://www.worldrabiesday.org/EN/Get_Involved/personal-stories.html
Description: This website gives personal accounts of rabies and can be used for background information with **Step 2**: Fact or Fiction.

Title: Kids Health/Infections/Rabies
URL: http://kidshealth.org/parent/infections/bacterial_viral/rabies.html
Description: A simple educational resource about the transmission and signs and symptoms of rabies.

Title: Kansas State Veterinary Diagnostic Lab — Rabies Lab
URL: http://www.vet.ksu.edu/depts/dmp/service/rabies/index.htm
Description: This website discusses local rabies cases in the Midwest and also explains testing for rabies and the human rabies vaccine.

Step 1 **Duration: 10 minutes**
Introduction
Begin this lesson by giving students the Pretest: Rabies — The Global Connection. This will help assess their prior knowledge of transmission, prevention, and treatment of rabies. After the pretest is complete move onto **Step 2** without discussing the answers or providing any new information on rabies.

Supplemental Documents
Title: Pretest: Rabies — The Global Connection
Description: This pretest that can be used to assess the student's preliminary knowledge of the rabies virus.

Title: Pretest: Rabies — The Global Connection Answer Key
Description: This is the pretest answer key that can be used to discuss students' responses to the pretest.

Step 2 **Duration: 25 minutes**

After the pretest has been completed, pass out the worksheet Rabies Case Studies/Fact or Fiction? Ask the students to read the three case studies provided (to themselves). Once all students have completed the reading, organize them into groups of three or four and have each group determine and record whether each case they reviewed is *fact* or *fiction*.

As a class, have each group present their fact or fiction responses for every question to the class. Once all groups have provided feedback on the reading, the teacher will notify the class that all three case studies were fact. This provides an opportunity to dispel misconceptions surrounding the disease and begin a discussion about the health risks of rabies.

Supplemental Document
Title: Rabies Case Studies/Fact or Fiction?
Description: Students will read this case study worksheet individually, and then in groups of 3 or 4, determine whether the story is fact or fiction.

Step 3 **Duration: 25 minutes**

After the students have completed their pretest, they will be able to determine whether they answered their questions right or wrong by completing a webquest about rabies. The teacher should distribute Rabies Webquest: An Internet Scavenger Hunt and guide the students to use specific websites to obtain information about rabies virus facts.

Students will visit the World Rabies Day website, the World Health Organization website, and the Centers for Disease Control and Prevention (CDC) website to understand the biology and the epidemiology of the rabies virus. The rabies webquest is included along with an answer key in the supplemental documents. The teacher should lead a discussion about the misconceptions of rabies and discuss whether the information that the students learned during the webquest surprised them.

Web Resources
Title: World Rabies Day
URL: www.worldrabiesday.org
Description: The World Rabies Day website describes the mission of worldwide rabies eradication. It also provides basic educational facts on the rabies virus.

Title: Human and Animal Rabies
URL: http://www.who.int/rabies/en/
Description: This website sponsored by the World Health Organization frames rabies with a global perspective.

Title: Centers for Disease Control and Prevention — Rabies
URL: http://www.cdc.gov/rabies
Description: The CDC website provides excellent information about exposure and response to rabies.

Supplemental Documents

Title: Rabies Webquest: An Internet Scavenger Hunt
Description: This document has students use three websites to learn basic information about the rabies virus. The webquest will allow students to discover their answers to the pretest.

Title: Rabies Webquest: An Internet Scavenger Hunt Answer Key
Description: The answer key for the Rabies Webquest: An Internet Scavenger Hunt.

Step 4 **Duration: 60 minutes**

The teacher will review the internet scavenger hunt with students and determine through a formative oral assessment if they have an understanding of the rabies virus. The teacher will inform the students that due to their understanding of the rabies virus they have been assigned to work at the CDC on a global rabies eradication project.

The teacher will divide students into groups of four and each group will receive a Public Health Problem: Rabies in India assignment sheet. The assignment sheet describes how the students will be part of a global task force to eradicate rabies in India. The students will be responsible for reading a background research report on the rabies problem in India. They will determine a case definition of the rabies problem in India. They will also need to describe the importance of working to solve global health problems and explain why the CDC might take an interest in investigating rabies in India.

After they develop their case definition, the students will have to develop an immediate plan of action to remediate the rabies problem in India. They will have to explain this problem in detail and include their plan goals and expectations. They will also need to include a detailed description on how they will implement their plan and what other governmental and non-governmental agencies might be involved in their plan. The students will then develop a 5-year rabies eradication plan for India. Students should pay consideration to the socioeconomic and cultural factors. Students should outline their 5-year plan by stating specific goals and detailed steps on how to achieve these goals.

Once groups have completed their three-part mission, they will transfer their case definition, immediate action, and 5-year eradication plan to a sheet of poster board. They will tape the poster board along the wall of the classroom. All groups will have their public health plans taped to the walls. The students will then complete a museum walk by strolling by the different posters to see their classmates' ideas. After all groups have viewed every poster, a classroom discussion will begin about the different approaches to developing a protocol to solving the rabies problem in India. This discussion should also touch on how this protocol could be used for other infectious diseases.

Supplemental Documents

Title: Public Health Problem: Rabies in India
Description: This document contains background information on rabies and questions to direct students on their mission as the Global Rabies Eradication Task Force.

Web Resources

Title: Public Health Rabies in India.
URL:www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pmcentrez&artid=2244675

Description: A journal article from the *Canadian Medical Association Journal* that has been published on PubMed Central. The article describes the rabies virus in India from an incidence, management, and recommendations perspective.

Title: Assessing the Burden of Human Rabies in India: Results of a national multi-center epidemiological study.
URL:www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed&uid=16678463&cmd=showdetailview&indexed=google
Description: An article from the Association of the Prevention and Control of Rabies in India describes a community-based survey that estimates the annual incidence of human rabies in India.

Title: Human Rabies India
URL: http://www.istm.org/publications/news_share/199803/humrab.aspx
Description: This International Society for Travel Medicine website provides an abbreviated version of a lecture on human rabies control in India by Professor M. K. Sudarshan from the Rabies Epidemiology Unit, Kempegowa Institute of Medical Sciences, Bangalore, India.

Conclusion **Duration: 2 hours**

Now that the students have learned the necessary background information about rabies, the students will complete the assignment in Rabies: Educational Pamphlet (to be worked on individually). They should use the Internet for resources and Microsoft Publisher (or any other word processing program).

Pass out the assignment — Rabies: Education Pamphlet and Rabies: Educational Pamphlet Rubric. Review the assignment and rubric to be used for grade evaluation. Explain to the students they should direct the pamphlet toward educating students, parents, and community members about rabies prevention, diagnosis, and treatment at the local level, as well as raising awareness of the global problems associated with rabies.

Supplemental Documents

Title: Rabies: Educational Pamphlet
Description: This document provides the directions for completing the educational pamphlet.

Title: Rubric: Rabies Educational Pamphlet
Description: Because all student pamphlets will be unique, there is not a key for this assignment. This document contains the rubric for grading the pamphlet created in the **Conclusion**.

Assessment

The Rabies Webquest: An Internet Scavenger Hunt will serve as a preliminary assessment tool for this lesson. The culminating activity of the lesson Rabies: Educational Pamphlet will serve as the final assessment of this rabies lesson.

Modifications

Extensions

Examining the portrayal of rabies in the media: View a clip movie such as *Old Yeller* or another media source that examines rabies. Students should evaluate the misconceptions and if the portrayal of the rabies virus in the media.

Guest speakers: Invite a speaker from animal control, the local department of health, or the animal shelter to answer more questions on the rabies.

Celebrate World Rabies Day: Assist students in planning an event such as a 5K run or dog wash to alert and educate the community about rabies.

Community Service Opportunities: Encourage students to contact the local animal shelter and assist in educating about proper pet vaccination, which is essential for controlling this disease.

Web Resources
Title: World Rabies Day
URL: www.worldrabiesday.org
Description: The World Rabies Day website describes the mission of worldwide rabies eradication. It also provides basic educational facts on the rabies virus.

Other Modifications

Rabies: Webquest: An Internet Scavenger Hunt: Students may work in groups and collaborate with other students in the event that there is restricted computer time available.

Rabies: Educational Pamphlet. Students who need shortened assignments can complete a flyer, a 1-page fact sheet, or have extended time. If internet access is not readily available, students may create a poster.

Education Standards

National Science Education Standards

SCIENCE AS INQUIRY, CONTENT STANDARD A
As a result of activities in grades 9–12, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

LIFE SCIENCE, CONTENT STANDARD C
As a result of their activities in grades 9–12, all students should develop understanding of the following:

- The cell
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES, CONTENT STANDARD F
As a result of activities in grades 9–12, all students should develop understanding of the following:

- Personal and community health
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

Pretest: Rabies – The Global Connection

Rabies — The Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

T F 1. Rabies is fatal nearly 100% of the time.

T F 2. 30–50% of all deaths due to rabies occur in children ages 5–15.

T F 3. Rabies can be easily treated with antibiotics.

T F 4. Rabies is 100% preventable.

T F 5. A person will foam at the mouth and swear profusely when infected with rabies.

T F 6. Rabies targets the central nervous system and skeletal system.

T F 7. An animal that has rabies exhibits personality changes (e.g. (timid animals become aggressive and aggressive animals become timid).

T F 8. Transmission of rabies most often occurs through a bite from a mammal.

T F 9. In the U.S. the most common mode of transmission is through the bite of an infected dog.

T F 10. Rabies is given as a part of the regular vaccination schedule in all children.

Pretest: Rabies — The Global Connection Answer Key

Rabies — A Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

1. Rabies is fatal nearly 100% of the time.
   (1 point) True.
2. 30–50% of all deaths due to rabies occur in children ages 5–15.
   (1 point) True.
3. Rabies can be easily treated with antibiotics.
   (1 point) False. (Rabies is caused by a virus and is unable to be treated with antibiotics.)
4. Rabies is 100% preventable.
   (1 point) True.
5. A person will foam at the mouth and swear profusely when infected with rabies.
   (1 point) True.
6. Rabies targets the central nervous system and skeletal system.
   (1 point) False. (Rabies targets the central nervous system.)
7. An animal that has rabies exhibits personality changes (e. g. timid animals become aggressive and aggressive animals become timid).
   (1 point) True.
8. Transmission of rabies most often occurs through a bite from a mammal.
   (1 point) True.
9. In the U.S., the most common mode of transmission is through the bite of an infected dog.
   (1 point) False. Most dogs in the U.S. have been vaccinated for rabies and the majority of occurrences in the U.S. are the result of bites from infected bats, skunks, and raccoons.
10. Rabies is given as a part of the regular vaccination schedule in all children.
    (1 point) False. The vaccine is only administered when exposed to animal saliva from a stray or rabid animal.

Reference

1. World Rabies Day. Learning to make rabies history [online]. 2008. [cited 2008 June 18]. Available from URL: http://run4rabies.org/assets/files/Learning%20to%20Make%20Rabies%20History_06012008.pdf

Rabies Case Studies/Fact or Fiction?

Rabies — A Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Case Study #1

In September 2004, a 15-year-old girl picked up a bat that she found in a church located in Wisconsin. She sustained a small bite on her left index finger, and having treated it with hydrogen peroxide, her mother decided not to seek medical attention. Thirty-seven days after the bite Giese developed neurological symptoms. She was admitted to the hospital with tremors and trouble walking. Her condition continued to deteriorate, and she was referred to a local hospital in Wisconsin. Doctors there began to suspect rabies, and their diagnosis was confirmed by laboratory tests at the Centers for Disease Control and Prevention.

Her parents agreed to an experimental treatment proposed by her doctors at a hospital in Madison, Wisconsin. It was known that most rabies deaths were caused by temporary brain dysfunction, not permanent brain damage. Her physicians consequently decided to use drugs to put her into a coma to protect her brain, and hoped that she would survive long enough for her body to fight off the virus. She was brought out of the coma after seven days.

After thirty-one days in the hospital, the girl was declared virus-free and removed from isolation. There was some initial concern about the extent of brain damage she had suffered, and while she had suffered some, the disease seemed to have left her cognitive abilities largely intact. She spent several weeks undergoing rehabilitation therapy and was discharged in January 2005. By November 2005 she was able to walk on her own, had returned to school, and had started driving automobiles. She graduated from high school in 2007.

Case Study #2

During July, 2007, a summer softball tournament was held at a recreational complex in South Carolina. Approximately 60 teams of about 12 players each from multiple states participated in this tournament. Spectators at the tournament included families and friends of the softball players and tournament coordinators and staff members.

On July 14, a softball coach from a North Carolina team found an apparently healthy and alert kitten in a barrel-shaped garbage bin located near one of the playing fields at which the tournament was held. The kitten was placed in a box and later brought to at least six different games (played at two recreational facilities) that same day. That evening, the kitten was transported by the coach via her private vehicle to her North Carolina home. On July 15, the kitten began behaving abnormally and became increasingly lethargic. The coach's housemate brought the kitten to an emergency animal hospital for care. After evaluation indicated that the kitten was severely ill, the kitten was euthanized and held for cremation. Rabies was not suspected by the attending veterinarian.

Three days later, the mother of a softball player from North Carolina, after learning from the coach that the kitten had become ill and was subsequently euthanized, contacted the emergency animal hospital and asked whether the kitten had been tested for rabies. The mother had been bitten while trying to feed the kitten during the tournament. The mother went to the clinic, requested the cat's body, and took it in her private vehicle to

her local health department. The kitten was diagnosed with rabies and the virus was identified as the eastern United States raccoon variant.

Of the approximately 60 teams participating in the tournament, 38 had players and associated family and friends who reported exposure to the rabid kitten. Twenty-seven persons were identified as having exposures that warranted PEP (post-exposure prophylaxis) — one from South Carolina, 15 from Georgia, and 11 from North Carolina. All recipients of PEP had reported actual exposure to a kitten's saliva, either through a bite, a lick on the oral or nasal mucosa, or a claw scratch. No accounts of human rabies were reported.

Case Study #3

In September 2006, a 10-year-old girl had pain in her right arm, and her parents noticed a skin eruption on her trunk and extremities. On October 3, she began vomiting and had increased arm pain and occasional arm numbness. During her initial visit to her family's primary health-care provider, radiographs of her arm and clavicle were normal. Three to five days after her initial symptoms began, the patient's speech became difficult to understand, and she had a decreased appetite, sore throat, neck pain, and a temperature of 101 F. She became irritable and agitated. The patient was hospitalized on October 7 at a community hospital, where she was found to have difficulty swallowing secretions. Her tongue had a whitish coating and was protruding from her mouth.

On October 8, neurologic involvement became more evident, and the attending physician arranged for transfer to a university-affiliated pediatric hospital. On arrival at the pediatric hospital, the patient was irritable, with intermittent movements of alertness, altered mental status, and lethargy. She had slurred speech and difficulty swallowing secretions and complained of a drowning sensation. The patient was intubated and placed on a mechanical ventilator. On the third day of hospitalization, it was suggested that the patient may have sustained an animal scratch or bite during June 2006. The patient was able to indicate that a bat might have scratched her. On the same day, samples were sent to the CDC for rabies testing. Rabies was confirmed and although therapy was attempted, the patient never regained consciousness. Life support was withdrawn and the patient died on November 2, 2006, on the twenty-sixth day of hospitalization. Rabies virus antigen was detected in brain tissue collected post mortem.

References

1. Healthlink Medical College of Wisconsin. Surviving rabies: A medical first takes place at children's hospital. [cited 2008 June 18]. Available from URL: http://healthlink.mcw.edu/article/1031002506.html

2. Centers for Disease Control and Prevention. Public health response to a rabid kitten — four states, 2007. MMWR Weekly 2007;56:1337-1340.

3. Centers for Disease Control and Prevention. Human rabies — Indiana and California, 2006. MMWR Weekly;56:361-365.

Rabies Webquest: An Internet Scavenger Hunt

Rabies — The Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Directions: Type in the website listed on the assignment sheet. Complete the answers the questions based on information from the websites provided

Website: World Rabies Day: www.worldrabiesday.org, Click on: Mission

1. Is rabies preventable? How can it be prevented?

2. How many people die from rabies each year?

3. What countries or continents have the highest mortality rates from rabies?

4. What is the most important global source of rabies?

5. How can rabies in humans be eradicated?

Website: Human and Animal Rabies: http://www.who.int/rabies/en/

1. What age group has the highest number of reported cases of rabies? Why do you think this age group has the highest number of reported cases of rabies?

2. What are some reasons why the vaccine is hard to get in some developing countries?

Click on: Fact Sheet

3. How is Rabies transmitted?

4. What are the symptoms of rabies? Include both the first symptoms and the acute symptoms.

5. What are the two different types of Rabies? How do they differ?

Website: Centers for Disease Control and Prevention: http://www.cdc.gov/rabies/.
Click on: Just for Kids — Rabies Fast Facts

1. What types of organism gets rabies?

2. Is rabies a virus or bacteria?

3. What body system does the rabies virus target?

Return to www.cdc.gov/rabies. Click on: Rabies Exposure.

Click on: Types of Exposure

4. What constitutes a rabies exposure?

Click on: Rabies Post-Exposure

5. What should you do immediately after an animal bite?

6. What does Rabies Post-exposure Prophylaxis involve?

Return to www.cdc.gov/rabies. Click on: Bats and Rabies.

7. In the United States, the most recent Human Rabies cases have been transmitted by what animal?

8. Why is it hard to determine if you are exposed to rabies from a bat bite?

Rabies Webquest: An Internet Scavenger Hunt – Answer Key

Rabies- The Global Connection
Sabrina Grossman and Denise Michaelsen, CDC's 2008 Science Ambassador Program

1. Is rabies preventable? How can it be prevented?

   Yes, It can be prevented through Post Exposure Prophylaxis Vaccine and through avoiding animal bites.

2. How many people die from rabies each year?

   Around 55,000.

3. What countries or continents have the highest mortality rates from rabies?

   Africa and Asia.

4. What is the most important global source of rabies?

   Uncontrolled rabies in dogs.

5. How can rabies in humans be eradicated?

   Adequate animal vaccination and control, educating those at risk, and enhancing access of those bitten to appropriate medical care.

Website: Human and Animal Rabies: http://www.who.int/rabies/en

6. What age group has the highest number of reported cases of rabies? Why do you think this age group has the highest number of reported cases of rabies?

   Children under age 15. Children are more likely to approach and play with stray animals.

7. What are some reasons why the vaccine is hard to get in some developing countries?

   Global Shortage and high prices.

Click on: Fact Sheet

8. How is Rabies transmitted?
   Close contact with the saliva of an infected animal.

9. What are the symptoms of rabies? Include both the first symptoms and the acute symptoms.

   First symptoms of rabies: Nonspecific, and suggest involvement of the respiratory, gastrointestinal, or central nervous systems. There might be a tingling or numbness at the site of the bite

   Acute stage: Signs of hyperactivity (furious rabies) or paralysis (dumb rabies). In paralysis, rabies eventually progresses to complete paralysis followed by coma and death in all cases, usually due to respiratory failure.

10. What are the two different types of Rabies? How do they differ?

    Furious and Dumb Rabies: Both types cause changes in personality. Furious rabies causes aggressive changes in behavior and hyperactivity. Dumb rabies will cause paralysis.

Website: Centers for Disease Control and Prevention: http://www.cdc.gov/rabies/
Click on: Just for Kids – Rabies Fast Facts.

11. What types of organisms gets rabies?

    Mammals.

12. Is rabies a virus or bacteria?

    Virus.

13. What body system does the rabies virus target

    Central Nervous System.

Return to www.cdc.gov/rabies Click on: Rabies Exposure

Click on: Types of Exposure

14. What constitutes a rabies exposure?

    Contact with infected saliva and nervous tissue.

Click on: Rabies Post-Exposure

15. What should you do immediately after an animal bite?

    Wash the animal bite with soap and water and contact a medical professional.

16. What does rabies post-exposure prophylaxis involve?

    A series of 4 shots of the vaccine and one HRIG immunization.

Return to www.cdc.gov/rabies Click on: Bats and Rabies.

17. In the United States, the most recent Human Rabies cases have been transmitted by what animal?

    Bat.

18. Why is it hard to determine if you are exposed to rabies from a bat bite?

    Bat bites are very small and their teeth are very sharp. If you are sleeping, you might not realize that you received a bat bite.

Public Health Problem: Rabies in India

Rabies — A Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Directions: Read your mission and highlight your responsibilities as a public health employee. Read the background information and highlight important statistics and facts you need to know to complete a public health assessment of rabies in India. Work together with your group to create a public health case definition, an immediate public health action plan, and a 5-year plan to stop the spread of rabies in India. You should write this information in a bulleted form on a poster board.

Mission: You are employed at the National Center for Zoonotic, Vector-Borne, and Enteric Diseases at the Centers for Disease Control and Prevention (CDC). You are assigned to the Global Rabies Eradication Task Force and your job will be to work with developing countries in creating a five year plan to eradicate rabies. Your first appointment is in India, which has the largest incidence of human rabies in the world. In order to understand this growing public health problem, you need to read research and background information on the rabies virus in India. Once, you have completed your background research, you will be responsible for writing a case definition of the problem identifying primary recommendations to take effect immediately in stopping the spread of rabies and a five year plan to eradicate the virus. In completing this task, make sure you consider social, cultural, and economic factors.

Background Information: India has the highest incidence of rabies of any country in the world. About 25,000 to 30,000 human deaths have occurred annually in India since 1985. The most current statistic from the National Multicentric Rabies Survey in 2004, which was conducted by the Association for Prevention and Control of Rabies in India, reported 20,565 annual deaths from rabies. This is an incidence rate of 2 per 100,000. However, rabies is not a notifiable disease and there is no organized surveillance system. Therefore, the actual number of deaths is estimated to be much higher. The National Multicentric Rabies Survey also reported that the majority of these victims were from rural areas and the main animals responsible for bites were dogs (96.2%). Most of the dogs were characterized as stray and the most common bite sites were on the extremities. Only about half of the victims sought medical assistance, and only 10% of the victims had taken a partial course of the Semple vaccine (nerve cell vaccine) or the cell culture vaccine.

This survey confirmed that the major cause of rabies in India is from dog bites; especially stray dog bites (60% stray and 40% pets). A person is bitten every two seconds and the incidence of animal bites is 17.4 people per 1,000. India has approximately 25 million dogs. It is estimated that for every 36 people in India, there is one dog. These dogs fall into four groups: pets, family dogs (dogs that can wander the streets, but have owners to depend on for nourishment and care), community dogs (dogs that wander the streets, but are partially cared for by the community), and feral dogs (stray). About 80% of the dogs in India fall into this latter category. This overpopulation of dogs is thought to be on the brink of causing an epidemic of rabies in India.

Much of this uncontrolled growth in the dog population is caused by changes in regulation of the population of stray dogs in 1998. The population of stray dogs used to be controlled by civic authorities (impounding and euthanizing stray dogs). However, based on pressure from animal rights groups, this practice was replaced by the Animal

Birth Control Policy. Instead of euthanizing the animals, the dogs are surgically sterilized and released back into their environment. In order for this program to be declared a success, 70% of the strays must be sterilized in one area in a six month period *before* the next reproductive cycle begins. However, this is a very difficult task to achieve.

Another reason for the high incidence of rabies in India is the lack of education about the post-exposure care and the proper post-exposure vaccination. According to the 2004 National Multicentric Rabies Survey administered by the Association for Prevention and Control of Rabies in India, over 60% of the bite victims did not wash their wound with soap and water and only 47% of the bite victims received a rabies vaccination. In addition to individuals not seeking out proper care, medical institutions were not always providing the most effective immunization. Many clinics were still producing the less effective nerve tissue vaccine until 2004 and the use of the human rabies immune globulin was only 2.1%. Many of the victims infected with rabies also resorted to indigenous remedies. In addition to lacking the education about the rabies immunization, the rabies vaccine is inconvenient and expensive. On average, a person receiving the proper post-exposure prophylaxis had to make four or more visits for treatment and miss two or more days of work. In addition, the vaccine costs between $30 to $50. India's economy also suffers from spending money to treat rabies. It is estimated that the annual number of person-days lost due to an animal bite is $38 million and the cost of the post-exposure prophylaxis is $25 million.

References:

1. International Society of Travel Medicine Human Rabies in India. [Lecture Summary] ISTM Publications. 1998 [cited 2008 June 18]. Available from: http://www.istm.org/publications/news_share/199803/humrab.aspx

2. Menezes, R. Rabies in India. Canadian Medical Association Journal. 2008 February. [cited 2008 June 18]. 178(5), 564-566. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2244675

3. Sudarshan, MK, Madhusudana SN, Mahendra BJ, Rao NS, Ashwath Narayana DH, Abdul Rahman S, et.al. Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey. International Journal of Infectious Diseases. 2007 January. [cited 2008 June 18]. 11(1):29-35. Available from: http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed&uid=16678463&cmd=showdetailview&indexed=google

Public Health Problem: Rabies in India

Rabies — A Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Directions: Answer these questions based upon your mission on the Global Rabies Eradication Task Force.

Case Definition: Explain the importance of your task and why the CDC should work on eradication of the rabies virus in India. Describe the location of the problem, who the problem affects, and why the problem exists.

Immediate Public Health Action Plan: What action would you take first to begin solving the public health problem? Explain why you chose this action, who would be involved, how you would implement the action, and what results you expect from this action.

Five Year Eradication Plan: Create a specific 5-year action plan that will assist India in eradicating the rabies virus. Identify specific goals and exactly how you implement programs to support these goals.

Public Health Problem: Rabies in India — Answer Key

Rabies — A Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Directions: Answer these questions based upon your mission on the Global Rabies Eradication Task Force.

Case Definition: Explain the importance of your task and why the CDC should work on eradication of the rabies virus in India. Describe the location of the problem, who the problem effects, and why the problem exists.

Answers may vary. Students may express that global health is an important moral and ethical matter. Students also may explain that with advanced travel, no health problem is isolated.

Immediate Public Health Action Plan: What action would you take first to begin solving the public health problem? Explain why you chose this action, who would be involved, how you would implement the action, and what results you expect from this action.

Answers will vary. Some answers may include making sure every medical clinic uses only the cell culture vaccine for post exposure treatment, education for medical clinics and individuals, and canine vaccination programs.

Five Year Eradication Plan: Create a specific 5-year action plan that will assist India in eradicating the rabies virus. Identify specific goals and exactly how to implement programs to support these goals.

Answers will vary. Answers should include a public education campaign, modern rabies vaccines, reduced cost of vaccines, increased availability of vaccines in rural areas, canine rabies control, and increased public health surveillance.

Rabies Educational Pamphlet

Rabies — The Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Task: Your assignment is to research rabies and make a pamphlet that educates the general public about the causes, treatment, and prevention of rabies. You will find out during your research that prevention and early detection are the best fight against rabies. This project is worth **40 points** (see rubric). Your assignment is due on _____.

Criteria:

1. Pamphlets must include all questions listed below.
2. You must use and site at least three credible sources (Hint: www.google.com is NOT a source, but rather a search engine to help you find sources.)
3. Pamphlets must include at least three rabies-related pictures or diagrams.
4. Your pamphlet should be clearly organized into sections so readers can easily locate information.
5. Scientific concepts should be clearly explained using simple, yet accurate terms — make sure an 8th grader can understand your pamphlet.
6. Everything should be in your own words.

Required Questions to address in pamphlet:

1. **What is rabies?** What pathogen causes rabies? What happens within the body to someone infected with rabies (from start to finish)? What body system(s) are affected? This section should be at least 1/3 of your pamphlet.

2. The following questions should be rabies specific.

    a. What are the different forms of rabies?
    b. How often does rabies occur? Compare the U.S. with other countries.
    c. Who is most likely to get rabies? (Females, males, older people, etc.)
    d. What are the symptoms/early signs of rabies?
    e. How is rabies diagnosed?
    f. What are possible causes of rabies?
    g. How can rabies be prevented?
    h. What is the prognosis (future outlook) for people diagnosed with rabies?
    i. What are the treatment options for rabies? (Any advantages or disadvantages?)
    j. What current scientific research/treatment trials are happening regarding rabies?
    k. Give at least two places that more information can be gathered about rabies (e.g., support groups, organizations, internet sites, etc.).
    l. Any other information that you feel is important to include.

Rubric: Rabies Educational Pamphlet

Rabies – The Global Connection
Sabrina Grossman and Denise Michaelsen
CDC's 2008 Science Ambassador Program

Name _____

CATEGORY	5	4	3	2
Writing and Organization	Each section in the brochure has a clear beginning, middle, and end.	Almost all sections of the brochure have a clear beginning, middle, and end.	Most sections of the brochure have a clear beginning, middle, and end.	Less than half of the sections have a clear beginning, middle, and end.
Writing and Grammar	No grammatical mistakes occur in the brochure.	Perhaps 1–2 grammatical mistakes in the brochure.	3–5 grammatical mistakes occur in the brochure.	Many (more than 5) grammatical mistakes occur in the brochure.
Spelling and Proofreading	Very few, if any spelling errors.	1–2 spelling errors.	3–5 spelling errors.	More than 5 spelling errors in the brochure.
Attractiveness and Organization	The brochure has exceptionally attractive formatting and well-organized information.	The brochure has attractive formatting and well-organized information.	The brochure has well-organized information.	The brochure's formatting and organization of material are confusing to the reader.
Sources	At least three reputable sources are used (.edu, .org, .gov).	1–2 reputable sources (.edu, .org, .gov).	1–2 sources, but not reputable (.com)	No sources and/or not reputable.
Question a-k on assignment sheet	Questions a–k answered thoroughly and scientifically accurate.	Most of the questions a–k are answered and most is accurate.	Few of the questions a–k are answered and little is scientific.	Hardly any of the questions a–k are answered and little scientific accuracy.
Graphics/Pictures	Three or more graphics are used and go well with the content.	1–2 graphics are used and go well with the content.	1–2 graphics are used, but one or more doesn't go with the content.	No graphics used and/or they do not go with the accompanying text.
What is Rabies?	Questions thoroughly answered. Takes up 1/3 of the pamphlet.	Most of the questions are answered.	Very few questions are answered and takes up less than 1/3 of pamphlet.	Random points of discussion and incomplete answers.
			Total Points	**_____/40**