Title: Studying Retroviruses across Species using Biotechnology

Laura Busta
Miami Sunset Sr. High

Abstract

This action plan will take students on a journey that will animate the world of the retrovirus and its impact on its host. Taking a route less traveled students will study retroviruses using both human and nonhuman models. The retrovirus host and disease they will study are: humans-HIV, nonhuman primates-SIV, felines-FIV and horses-equine infectious anemia. They will utilize a variety of methods to study retroviruses including an ELISA test simulation to diagnose hypothetical veterinary patients and view demonstrations of HIV and FIV diagnostic exams.

Rationale

Retroviruses have been around for thousands of years in a variety of vertebrate hosts recently through the emergence of HIV into the human population these viruses have gained popularity and research scientist have begun studying them in depth. Viruses that do not commonly affect humans are often overlooked in high school sciences and this is a disadvantage to our students since many emerging pathogens have evolved from strains that commonly affect other animals. These viruses are great platforms in achieving deeper understanding of evolutionary biology and modern methods in biotechnology.

Unit 1

Introduction to the retrovirus

Pre-study survey- this will serve to gauge the students’ knowledge of HIV and retroviruses in general.

Watching and answering questions on excerpt from HHMI DVD “AIDS Evolution of an Epidemic”. Students will learn what a retrovirus is and how it infects cells within the host, basic immunology and the anatomy of the virus.

Excursions in Science: students will watch “Structural Virology” with Dr. Mavis Agbandje- Mc Kenna

Students will build a retrovirus model with labels and descriptions of all the parts.

Unit 2

HIV and SIV

PowerPoint presentation and fill in the blank notes about the history and evolution of HIV from SIV.

Geography activity students will utilize a map of the world to show the spread of HIV using known dates and number of those infected.

Using Genbank the students will create a phylogenetic tree that shows the relationship of HIV to SIV. A special emphasis will be placed on the many different subtypes of both HIV and SIV.

Activity: The spread of a Virus through Sexual contact (phenolphthalein and sodium hydroxide).
Students will read journal article “Simian Immunodeficiency Virus infection of Chimpanzees” about the different subspecies of African chimpanzees and the corresponding strains of SIV. A focus will be made on understanding that all strands of SIV are not pathogenic to all species of non-human primates. Geographic regions will be highlighted.

**Unit 3**

**FIV, SIV, and Equine Infectious Anemia**

Web quest activity in which students will utilize various website to answer questions that will lead to the understanding of FIV, SIV, and Equine Infectious Anemia.

The diagnostic test utilized in veterinary hospitals to diagnose FIV will be demonstrated and antigens and antibodies will be explained in great detail.

Pipetting by coordinates activity- students will learn how to properly use a micropipetter and this will serve as preparation for ELISA testing simulation. ELISA test will be explained in great detail to the students.

Excursion in Science: Students will watch “ELISA Testing” with Linda Green.

Lab: ELISA test simulation- students will be given animal patient background information and will fill out paperwork and conduct the ELISA test simulation. The students will them type up an official report on the results of the test.

**Unit 4**

**Vaccines and Research**

PowerPoint presentation on different treatments, vaccines, and medicines associated with FIV, BIV, HIV, SIV, and Equine Infectious Anemia.

Show and explain to the research that Dr. J.K. Yamamoto has done in FIV and where her research is heading currently.

Discussion students will read excerpt from the book “The Octopus and the Orangutan” about the ethics related to utilizing primates for HIV research.

Excursion in Science: students will watch “Careers in Biotechnology”

Post study survey will be given to the students in order gauge learning gains.

**ICORE**

Locker Usage: Pipetting Stations (action proposal); Giant microbes with question cards (other);
Introduction to gel electrophoresis (other).

HHMI DVD “AIDS Evolution of an Epidemic”

CPET website- Excursion in Science
**Literature cited**


**Budget**

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Exploring SIV, FIV and EIA LESSON PLAN

KEY QUESTION(S): How are retroviruses identified in animal hosts? How does the ELISA test work in identifying retroviruses?

SCIENCE SUBJECT: Zoology and Biology

GRADE AND ABILITY LEVEL: High School Honors

SCIENCE CONCEPTS: Biotechnology, ELISA testing, Retroviruses, HIV, SIV, EIA, antibody, antigen

OVERALL TIME ESTIMATE: 6 – 60 minute periods

VOCABULARY: retrovirus, lentivirus, ELISA test, EIA, HIV, SIV antigen, antibody

LESSON SUMMARY: Students will carry out a simulation ELISA test while taking on the role primary investigator in a veterinary laboratory scenario. Through the use of animations and demonstrations the student will gain a thorough understanding of retroviruses and how they affect different mammals.

STUDENT LEARNING OBJECTIVES:

1. Student will demonstrate the ability to carry out an ELISA test and understand the mechanism behind this biotechnology.
2. Student will survey the impact that biotechnology has on the field of veterinary medicine.
3. Student will obtain specific knowledge of retroviruses and their impact on human and animal hosts.

Standards:

SC.912.L.16.70 Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.

SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

MATERIALS:
Day 1: Computer Lab Access (1 computer per student)
Day 2: LCD projector / computer for power point presentation; markers, glue, cardboard paper and pipecleaners.
Day 3: Micropipetters 1 set for every 4 students and activity “Micropipetting by Coordinates”
Day 4: FIV lab test (1 per class) and a blood sample to run the test. LCD projector / computer with internet access to play the ELISA test animation. One patient background/ scenario for every 2 students.
Day 5: BioRad ELISA Immuno Explorer Kit (1 kit for every 32 students); “Official” Diagnostic lab paperwork (1 set for every 2 students).
Day 6: Computer Lab access (1 computer for every 2 students).
BACKGROUND INFORMATION: Retroviruses are RNA viruses that utilize reverse transcriptase to produce DNA from its RNA. In this lesson students will compare retroviruses specifically lentiviruses in different animal hosts; equine infectious disease (EIA) in horses, feline immunodeficiency virus (FIV) in cats and simian immunodeficiency virus (SIV) in nonhuman primates. The enzyme linked immunosorbent assay (ELISA) is a diagnostic laboratory test that is used to detect the presence of antibodies or antigens in a sample. An antigen is any molecule that causes the immune system to produce antibodies against it and an antibody is a protein produced by B lymphocytes that have been activated by the binding of an antigen to a cell surface receptor. This test is often used to detect HIV in humans and can also be used to detect SIV, FIV and EIA. In horses retroviruses cause EIA and can be spread from one horse to another through mosquito bites and through bodily fluids. Horses exposed to EIA typically develop detectable immune responses to antigens of EIA within 45 days. A diagnoses is usually accomplished by using a coggins test but can also be diagnosed using the ELISA test; results are often confirmed using the western blot method. FIV is caused by a lentivirus and is found in many felines but immune system responses to the virus are usually seen in domesticated house cats. Big cats with FIV live for many years without showing any symptoms. The diagnostic test for FIV starts with a snap test which is a rapid immunoassay which detects antibodies for FIV in feline blood, serum or plasma. The presence of specific antibodies to FIV indicates the cat has been exposed to the virus; further testing utilizing the western blot method is employed. SIV is able to infect at least 33 species of African primates but infections in the natural host of the virus appear to be nonpathogenic. Diagnosing SIV can be accomplished through the use of the ELISA test and confirmed using the western blot system.

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES
Day 1- Take students to the computer lab and give them a 3 part webquest activity (give them specific websites in order to answer specific questions). The first part of the webquest should be on SIV, the second part of FIV and the third part on EIA. The webquest should answer the following questions: 1) which animal does this virus affect? How does it affect the animal? How is it transmitted? How is it diagnosed? How can it be prevented? Day 2- Use a power point presentation and printed out fill in the blank notes to explain how antibodies and antigens work. Have students get into groups of two and make antibody and antigen models in order to illustrate the concept; use cardboard paper, pipe cleaners and markers. Day 3- First 30minutes of period have students use micropipetters to practice using these tools utilize the ICORE micropipetting by coordinates. Second 30 minutes play the “Science Excursion” video on ELISA testing using the LCD projector and computer. Day 4- Demonstrate a real life FIV snap test and explain each step to the students. Play the ELISA test animation and quiz found at: http://highered.mcgrawhill.com/sites/0072556781/student_view0/chapter33/animation_quiz_1.html discuss the correct answers to the quiz. Handout veterinary lab scenarios and animal patient background information and have students read the storylines and start the “official” lab paperwork. Day 5- Utilize BioRad ELISA Immuno Explorer Kit and have students in groups run the lab tests for their patients; at the end of the lab the students should know which of their patients tested positive and be ready to type up an official lab report. Day 6- Take students back to the computer have them type up their lab findings in an official lab report format; make sure to have samples of what they should include.
ASSESSMENT SUGGESTIONS:
Objective 1- The animation used in day 4 has a quiz that can be utilized for assessment purpose. Students carrying out the ELISA simulation will show if the student understands the concept of the ELISA test.
Objective 2- Student/teacher discussion of laboratory test utilization in veterinary medicine will gauge student understanding of this objective.
Objective 3- The webquest utilized in day 1 of lesson assess this objective.

EXTENSIONS: Have students present their scenarios and results to the class. Confirm results of the ELISA testing using the western blot method and explain that this method is how positive results are confirmed in real veterinary diagnostic laboratories.

RESOURCES/REFERENCES:
http://www.vet.cornell.edu/fhc/brochures/fiv.html - FIV information
http://www.curtitsyacres.com/Education/Coggins/body_coggins.html - Equine Infectious Anemia information
http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/60218.htm - general information on lentiviruses
Studying Retroviruses across Species Using Biotechnology

By: Laura Busta

Abstract
This unit study will take students on a journey that will animate the world of the retrovirus and its impact on its host. Taking a route less traveled students will study retroviruses using both human and nonhuman models. The retrovirus host and diseases that will be covered are: humans-HIV, nonhuman primates-SIV, felines-FIV, and horses-equine infectious anemia. Students will learn about and utilize a variety of methods that are currently used in the study of retroviruses and their effects; including an ELISA test simulation to diagnose hypothetical veterinary patients and demonstrated FIV diagnostic exa.

Keywords: retrovirus, ELISA testing, HIV, SIV, FIV, EIA

Background Information
Retroviruses are RNA viruses that utilize reverse transcriptase to produce DNA from its RNA. In this lesson students will compare retroviruses specifically lentiviruses in different animal hosts; equine infectious disease (EIA) in horses, feline immunodeficiency virus (FIV) in cats and simian immunodeficiency virus (SIV) in nonhuman primates. The enzyme linked immunosorbent assay (ELISA) is a diagnostic laboratory test that is used to detect the presence of antibodies or antigens in a sample. An antigen is any molecule that causes the immune system to produce antibodies against it and an antibody is a protein produced by B lymphocytes that have been activated by the binding of an antigen to a cell surface receptor. This test is often used to detect HIV in humans and can also be used to detect SIV, FIV and EIA.

In horses retroviruses cause EIA and can be spread from one horse to another through mosquito bites and through bodily fluids. Horses exposed to EIA typically develop detectable immune responses to antigens of EIA within 45 days. A diagnoses is usually accomplished by using a coggins test but can also be diagnosed using the ELISA test; results are often confirmed using the western blot method.

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SIV is able to infect at least 33 species of African primates but infections in the natural host of the virus appear to be nonpathogenic. Diagnosing SIV can be accomplished through the use of the ELISA test and confirmed using the western blot system.

Introduction
Retroviruses have been around for thousands of years in a variety of vertebrate hosts recently through the pandemic emergence of HIV into the
human population these viruses have gained popularity as research subjects. Viruses that do not commonly affect humans are often overlooked in high school sciences this is a disadvantage to our students since many emerging pathogens have evolved from strains that commonly affect other animals. These viruses are good example that helps students achieve deeper understanding of evolutionary biology and modern methods in biotechnology.

This unit study consist of four modules that teach the student the mechanisms of a retrovirus; the effects of retroviruses in various species including humans; the evolution and history of HIV from SIV; the diagnostics, prevention and treatment associated with HIV, SIV, FIV and Equine Infectious Anemia; and current research. The four modules build upon each other and serve to deepen student understanding of virology, antigens, antibodies, biotechnology, evolution, and spread of disease.

Methods
-Module 1-

“Introduction to Retroviruses”

Have students take a pre-unit survey to gauge their knowledge and understanding of viruses and HIV (sample found in appendix A).

Students will then watch “AIDS Evolution of an Epidemic” (available through the Howard Hughes Medical Institute) which explains how the outbreak started in the USA, the mechanisms of HIV, and touches on the evolution of HIV from SIV. Students will then answer questions based on the information gathered through the documentary. Then have students watch Dr. Mavis Agbandje-Mc Kenna explain structural virology through “Excursions in Science” (which can be found at http://www.cpet.ufl.edu/eis/default.html) this will serve to highlight the importance of understanding the structure of viruses and expand your students thinking of possible science careers. Then group students have them build models of retroviruses with labels and information on the functions of the structural features of retroviruses.

-Module 2-

“HIV and SIV”

Delve deeper into the history and evolution of HIV from SIV with a PowerPoint presentation that focuses on the specific primate species from which HIV evolved from, the phylogeny of the virus and the influence African geography and customs had on the development and spread of HIV (presentation found in Appendix B).
Have students map out the spread of HIV from within Africa to the worldwide spread using known dates. This geography activity serves as a visual representation of the spread of a pandemic. Students should then participate in the lab Activity: The spread of a Virus through Sexual contact. For this activity give most students small cups of water but give one or two students a cup containing sodium hydroxide (note to yourself the students that receive the cup with sodium hydroxide) have students exchange fluids and have them fill out a data chart with the names and order of the people they exchanged fluids with. Then add the phenolphthalein to each of the student’s cup the ones that turn purple have been infected. Next, have the students take on the role of epidemiologist and as a class figure out which students were the ones to first have the disease.

Have students read excerpts from the journal article “Simian Immunodeficiency Virus infection of Chimpanzees” which is about the different subspecies of African chimpanzees and the corresponding strains of SIV. Focus on having students understand that all strands of SIV are not pathogenic to all species of non-human primates. This reading will provide greater depth to information presented at the beginning of the module (reading can be found at http://jvi.asm.org/content/79/7/3891).

-Module 3-
“FIV, SIV and Equine Infectious Anemia”

Have students complete a web quest activity in which they visit different websites in order to answer questions guiding them into understanding basic information about SIV, FIV, EIA and the ELISA testing method (web quest activity Appendix C).

If possible demonstrate the standard FIV test that is used in veterinary hospitals to diagnose FIV. Explain to students how the test functions and review basic information about antigens and antibodies.

Have students learn how to use a micropipeter by having them participate in “Pipetting by coordinates” activity. This is a valuable skill that will facilitate the smooth operation of the ELISA test simulation.

Explain to students what ELISA testing is and the many uses of ELISA testing principles; utilize “Excursion in Science”: ELISA Testing with Linda Green. This resource is available online and can be projected with an
LCD projector or students can watch on their own in a computer lab or as a home learning assignment (http://www.cpet.ufl.edu/eis/default.html).

Divide students into groups of two and give each student group a patient background worksheet; this will serve as background for the patients they will be testing during the ELISA test simulation lab (patient background worksheets found in Appendix D). Students should then utilize an ELISA test simulation kit and micropipeter to find out if their patient is infected with the virus. The student’s will then type up an official report on the results of the test (rubric used for assessment found in Appendix E).

-Module 4-

“Vaccines and Research”

Assign each student a specific virus (HIV, FIV, SIV, OR EIA) to research and have them answer questions that relate to availability of treatments and vaccines and what research is being carried out. Have students’ present research to peers through power point presentations. Provide a rubric to guide student projects (example of rubric Appendix F).

Have students read excerpts from the “The Octopus and the Orangutan” about the ethics related to utilizing primates for HIV research and have them write a question and a comment about what they read. Guide student through a discussion by calling on students to read their question or comment and having the class collaborate to answer it.

Conclusions

This unit study provides students with an introduction to biotechnology, immunology, and virology while highlighting the importance in understanding evolutionary biology. The scaffolding of the modules was purposely utilized in order to maximize student comprehension. Each module builds upon the previous and utilizes activities such as web quest, presentations, discussions, model building, and labs to keep the student engaged. This unit also serves to expose students to various forms of scientific careers and depicts the important role that scientist have in finding medicines and treatments for viruses.

Student and Teacher Resource

“Tracing the Origins of the AIDS Pandemic” is a reading found on the following website that gives scientifically sound information about origins of AIDS. http://www.prn.org/index.php/progr
The following website contains maps, timelines and general information about the AIDS epidemic. 
http://www.pbs.org/wgbh/pages/frontline/aids/

The “Excursions in Science” website contains video recordings of researchers explaining different topics and methods. 
http://www.cpet.ufl.edu/eis/default.html

This website contains phylogenetic trees and focuses on the evolutionary origins of HIV. 
http://evolution.berkeley.edu/evolibrary/article/medicine_04
SCIENCE LESSON PLAN FORMAT Sample

TITLE: Exploring SIV, FIV and EIA

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SIV is able to infect at least 33 species of African primates but infections in the natural host of the virus appear to be nonpathogenic. Diagnosing SIV can be accomplished through the use of the ELISA test and confirmed using the western blot system.

PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES

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Day 3- First 30 minutes of period have students use micropipeters to practice using these tools utilize the ICORE micropipetting by coordinates. Second 30 minutes play the “Science Excursion” video on ELISA testing using the LCD projector and computer.

Day 4- Demonstrate a real life FIV snap test and explain each step to the students. Play the ELISA test animation and quiz found at: http://highered.mcgrawhill.com/sites/0072556781/student_view0/chapter33/animation_quiz_1.html discuss the correct answers to the quiz. Handout veterinary lab scenarios and animal patient background information and have students read the storylines and start the “official” lab paperwork.

Day 5- Utilize BioRad ELISA Immuno Explorer Kit and have students in groups run the lab tests for their patients; at the end of the lab the students should know which of their patients tested positive and be ready to type up an official lab report.

Day 6- Take students back to the computer have them type up their lab findings in an official lab report format; make sure to have samples of what they should include.
**ASSESSMENT SUGGESTIONS:**
Objective 1- The animation used in day 4 has a quiz that can be utilized for assessment purpose. Students carrying out the ELISA simulation will show if the student understands the concept of the ELISA test.
Objective 2- Student/ teacher discussion of laboratory test utilization in veterinary medicine will gauge student understanding of this objective.
Objective 3- The webquest utilized in day 1 of lesson assess this objective.

**EXTENSIONS:** Have students present their scenarios and results to the class. Confirm results of the ELISA testing using the western blot method and explain that this method is how positive results are confirmed in real veterinary diagnostic laboratories.

**RESOURCES/REFERENCES:**
http://www.vet.cornell.edu/fhc/brochures/fiv.html -FIV information

http://www.curtitsyacres.com/Education/Coggins/body_coggins.html - Equine Infectious Anemia information


http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/60218.htm -general information on lentiviruses
Survey: HIV

1. What is the difference between HIV and AIDS?
   a. HIV is a virus and AIDS is a bacterial disease
   b. There is no difference between HIV and AIDS
   c. HIV is the virus that causes AIDS

2. Approximately how many people are living with HIV worldwide?
   a. 33 million
   b. 23 million
   c. 13 million

3. Can insects transmit HIV?
   a. Yes
   b. No
   c. Only mosquitoes

4. HIV can make a person ill because...
   a. It makes a person lose weight very suddenly
   b. It reduces the body’s core temperature
   c. It attacks the immune system

5. AIDS was first reported in the U.S. in...
   a. 1975
   b. 1981
   c. 1986

6. HIV is believed to have evolved from a similar virus found in which animal?
   a. Baboon
   b. Chimpanzee
   c. Elephant
   d. Guinea pig

7. Which country has the highest number of people living with HIV?
   a. South Africa
   b. Nigeria
   c. India

8. After taking a rapid HIV antibody test, how long must the patient wait for a result?
   a. 1 minute
   b. 30 minutes
   c. 24 hours

9. What does the standard HIV test identify?
   a. RNA strands
   b. T-cell count
   c. Antibodies
10. What is the leading cause of HIV infection in Russia?
   a. Mother-to-child transmission
   b. Sex with an infected person
   c. Sharing of drug taking equipment

11. How many primate species of mammals are susceptible to retroviruses like HIV?
   a. 2 species
   b. 33 species
   c. 50 species

12. Is HIV disease prevalent in the area you live in?
   a. yes
   b. no
   c. I don’t know
History and Evolution of HIV from SIV

Zoology
What is SIV?

- SIV stands for Simian Immunodeficiency Virus and it encompasses many strains of retroviruses that affect nonhuman primate populations in Africa.

- About 40 nonhuman primates species in Sub-Saharan Africa harbor their own version of SIV.

- These strains of SIV do not cause immune deficiency in their natural host.
HIV-1 & HIV-2

There are two distinct viruses that lead to AIDS in humans; HIV-1 and HIV-2.

HIV-1 is the most prevalent in infecting humans and HIV-2 mainly infects people living in Africa.

HIV-1 has 3 strands M, N and O; M being the most prevalent (A, B, C, D on the map are M stand).

HIV-2 has 2 strands A and B.
SIV to HIV-1

- HIV-1 evolved from SIV-chimpanzee.
- There are 4 subspecies of chimpanzees that carry SIV strains that have evolved into HIV-1.
SIV Chimpanzee

- SIV chimpanzee evolved from two other SIV strands that are found in nonhuman primates; red capped mangabey and the spot-nosed monkey.

- It is believed that chimpanzees were infected by eating these smaller primates.

- Spot-nosed Monkey
- Red Capped Mangabey
HIV-2

- HIV-2 has evolved from the SIV found in the Sooty Mangabey.
The most widely accepted theory as to how SIV jumped from a nonhuman primate host to a human host is one that revolves around bushmeat. African Bushmeat often times consists of meat from chimpanzees and other nonhuman primates. The butchering and consumption of bushmeat has provided SIV the opportunity to infect humans.
Spread of HIV in Africa

1. Humans butcher chimpanzees infected with SIV.

2. The virus is carried by people travelling along the river ...

3. ... to Kinshasa, where the epidemic begins.
Webquest:
Retroviruses and ELISA testing

Go to the websites listed and read the information provided. Answer the questions in a clear and concise way.

1. Go to http://en.wikipedia.org/wiki/simian_immunodeficiency_virus, read the webpage and answer the following questions.
   A. What is SIV? What type of virus is it?
   B. How many species of primates does SIV infect?
   C. Which two strains are said to have crossed into humans? What were the results of this cross over?
   D. SIV infections in their natural hosts appear to be nonpathogenic, what does this mean?

2. Go to www.vet.cornell.edu/ghc.brochures.fiv.html read the webpage and answer the following questions.
   A. What type of virus is FIV?
   B. What are the symptoms of an FIV infection?
   C. How is FIV diagnosed? Is there any prevention pet owners should take?

3. Go to www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/52800.htm and read the webpage and answer the following questions:
   A. What is EIA? What type of animal does it infect?
   B. How does an animal transmit EIA?
   C. How is EIA diagnosed?
   D. How is it treated?

4. Go to www.biology.arizona.edu/immunology/activities/elisa/main.html read the introduction and answer the following questions:
   A. What does the ELISA test detect?
   B. What principle is the ELISA test based on?
5. Click the next button at the bottom of the page and answer the following:
   A. What does the basic test determine?
   B. How many wells do the plastic test plates contain?

6. Click the next button and read the page and answer the following:
   A. What will the HIV antigens bind to?
   B. What is the purpose of the chromogen or substrate?

7. Click the next button two times till you get to the page titled “Data from three patients” and answer the following questions.
   A. Can different patients be tested on the same test plate?
   B. If the test is positive, what else is done?
Patient History:

11/24
An injured macaque monkey was found by the wildlife conservation officer at the national preserve. He seems to have bite wounds on his neck and arms but seems to be healthy otherwise. The macaque has been kept in isolation due to the nature of his injuries. There is a program in which Dr. Zindler could place the macaque but admittance into this program is dependent on the macaques health. Dr. Zindler needs to make sure that the macaque no diseases that could potentially infect other macaques.

11/28
The recently found macaques “Scrappy” wounds have been cleaned and stitched. Penicillin was administered via intramuscular injection. The wounds have been identified as bite wounds from a larger primate; a chimpanzee is suspected. Blood and urine samples have been collected.

1. What should Dr. Zindler do in order to assure that Scrappy does not have any transmittable diseases? Explain.

2. Could Scrappy have contracted any disease via his recently acquired bite wounds? Explain.

3. As a veterinarian, what test or exams should you conduct in order to rule out any transmittable diseases? Explain.

4. What are the symptoms of SIV? Is it possible for Scrappy to be positive for SIV and not show any symptoms? Explain.
Patient History:

11/28

The Houston ASPCA confiscated a male horse from a deserted factory farm on the outskirts Houston. The horse was found among the remnants of two dead horses and is severely emaciated. He has been given liquids via IV and blood samples have been collected.

12/5

The horse has gained 15lbs and is regaining strength and vigor. There is a local animal sanctuary that is interested in adopting the young horse but in order for the adoptions to occur the horse must not have any transmittable diseases.

1. What test do you recommend that the lab run on the blood samples? Explain.

2. What are the symptoms of EIA is this horse displaying any of them?

3. Why would a potential adopter need to know if the horse had any transmittable diseases? Explain.

4. What should happen to the horse if it is EIA positive? Explain.
Patient History:

11/10
A Miami Dade animal control officer picked up two young domesticated shorthaired male and female felines. The male feline shows signs of sickness, his coat is in poor condition and he is emaciated. The feline will be housed in isolation until transmittable diseases can be ruled out. The female feline seems to be healthy and pregnant; she will also be housed in isolation.

11/12
Blood, urine and fecal samples have been collected and laboratory test have been ordered. The female has clinical signs of an advance term pregnancy and x-rays depict six fetuses.

11/13
The male feline has been diagnosed with advanced liver and kidney infection and has been euthanized. The female has given birth to a litter of seven kittens and all seem to be doing well.

1. Could the male cat have been suffering from FIV?

2. If so, what implications does that have on the female that was found with him?

3. What test should be done on the females blood samples?

4. If the female is positive for FIV, are the kittens likely to be FIV positive? Explain.

5. Should cats with FIV be euthanized? Explain.
Rubric: ELISA Test Patient Results

The following should be taken into consideration when writing lab report:

1. Completion of “Patient Background Worksheet” ................... ____________/15

2. Hypothesis and rational.................................................................______________/15

3. Explanation of procedures and materials...........................................__________/10

4. Results of ELISA test............................................................ ____________/15

5. Conclusion.................................................................................. ________________/30

6. Grammar, spelling, punctuation.................................................... ________________/15

Total points = 100

100- 90 = A
89- 80 = B
79- 70 = C
69- 60 = D
59 OR LESS = F
Rubric: Retrovirus Research and Presentation

Take note of the following and use it as a guide for your presentation.

1. Transmission of retrovirus- explain how your assigned virus is transmitted\_________/30

2. Prevention- are there vaccines available or any preventative measures that can be taken \__________/30

3. Treatment- what treatments are available for organisms infected with your assigned retrovirus \__________/30

4. Presentation...\__________/10

100- 90 = A
89- 80 = B
79- 70 = C
69- 60 = D
59 or Less = F