The most important application of humoral immunity is a vaccine. During the humoral immune response, clonal selection & expansion produces antigen specific effector cells that make antibodies and MEMORY cells that circulate in the blood for months to years. Most vaccines are designed using this idea and often provide you with life-long protective immunity! This activity emphasizes the public health impact of immunizations-- but don't forget the immunological basis behind vaccine preparation for the Block 3 Quiz.

Immunizations have dramatically improved the quality of life for hundreds of millions of people. However, there are still some parts of the world where childhood vaccinations are a luxury and not the norm. This activity has **three parts**, where you will develop a vaccine for smallpox, measles, polio, and hepatitis B viruses, with help from the NOVA: Making Vaccines website. Then, watch as these vaccines are distributed around the world. Finally, watch Ending AIDS: The Search for a Vaccine (55 min) on the greatest biomedical and public health challenge of our time- the development of an effective HIV vaccine. Enter your answers into the Blackboard quiz function.

**Part I:**
**NOVA: Making Vaccines**
*You will need Flash media player to create the vaccines, which can be downloaded for free from [http://www.macromedia.com/go/getflashplayer/](http://www.macromedia.com/go/getflashplayer/) if you do not already have a copy installed on your computer.*

**Directions:** Access the NOVA website in the Activities folder. Click on the flashing icon located near the top right of the page, Go to “Making Vaccines.” Once the smaller Flash animation window pops up, choose a virus (located along the top menu) to develop your first vaccine. Make sure that you follow the steps and create a total of 4 vaccines in order to answer the following questions.

Question 1: What is the smallpox vaccine made from?

Question 2: Smallpox vaccines are made with _______ now.
Question 3: What is used to select for new strains of measles virus?

Question 4: How long did it take to create the virus currently used in the measles vaccine?

Question 5: Why do you need booster shots for this type of polio vaccine?

Question 6: What type of vaccine is hepatitis B?

Question 7: How did you “grow” the vaccine from your genetically engineered DNA?

Part II:
Fragile Lives: Immunization at Risk

You will need RealPlayer (available for free from http://www.real.com/) or Windows Media Player 9 to view the videos.

Directions: Access the Fragile Lives website from the Activities folder. The film is divided up into 7 video clips. You can either click on the Play now link or download the video clip link to your computer. The media player window will open & the clip will begin automatically. Please watch the following 4 clips and answer these questions about the video. You are welcome to watch the entire video if you are interested, but you will not be quizzed on material from those clips.

Part 1: Introduction and “The Last Case—Smallpox in Bangladesh”

Question 8: Vaccination increased from_____% in 1970 to nearly_____% in 1990.

Question 9: Name 4 things that can disrupt immunization.

Part 3: “False Rumors—Polio in Uttar Pradesh”

Question 10: Uttar Pradesh has what fraction of the world’s polio cases?

Question 11: Veena Gupta discovered that village Muslim families believed in rumors that polio immunizations would cause their children to become___________.

Part 6: “A Shortage of Vaccines”
Question 12: Children of the rich world and of the poor world are no longer receiving the same vaccines. The cost of 3 doses of hepatitis B vaccine in the US is _______. The cost of India’s genetically engineered hepatitis B vaccine is_______.

Question 13: What famous benefactor assists Andhra Pradesh to fund Hep B vaccinations?

Part 7: “The War Effect—Measles in Angola” + Closing and Credits

Question 14: How many children die every year from measles when there is a cheap vaccine to prevent it?

Question 15: Immunization can have a surprising side effect in wartime. What is it called?

PART III: 
Ending AIDS: The Search for a Vaccine (55 minutes)

Question 16: How many people are infected with HIV each day?

Question 17: “When it comes to ________________ (2 words), a__________ is the scariest thing in the world. When you don’t know the__________, you can’t make a ________ against it.”

Question 18: Once the AIDS virus was first identified in the 1980s, scientists predicted it would take how many years to have a vaccine ready?

Question 19: What new genetically engineered vaccine stirred hope of a vaccine for HIV from the biotech industry?

Question 20: “Nothing changes________________ (2 words) more dramatically than ____________ a__________.”

Question 21: Why was the US federal government unwilling to spend more money on AIDS research in the early 1980s?

Question 22: In 1985, who was considered the new face of AIDS? Why?
Question 23: At the International AIDS Conference (1986), Genentech announced a prototype AIDS vaccine developed to what region of the HIV virus?

Question 24: What agencies did the gay community shut down as it organized for AIDS drug research?

Question 25: Why would HIV positive people not “want” a HIV vaccine?

Question 26: AIDS is a______disease.

Question 27: What impact would government approval or disapproval of Genentech’s prototype vaccine have on AIDS research?

Question 28: After spending____ million dollars on a________ vaccine that the _____ would no longer support, Genentech_______AIDS vaccine research.

Question 29: “[HIV] comes in with a____-______around the_______protein ______pieces of it, so that the immune system can’t even______it. In addition, [HIV] can______and change and______the immune system.

Question 30:______are very specific. They only work against a protein that looks exactly like the one that they are made from. Some [HIV strains] have the same proteins that look a little bit different, with little nuances that make that____________. On multiple different levels, this is a very_______virus.

Question 31: In 1992, Harvard researcher Dr. Ron Desrosiers found what? What type of vaccine did he create?

Question 32: Why is a live HIV vaccine risky?

Question 33: What did another researcher find about Dr. Ron Desrosiers vaccine in newborn monkeys?

Question 34: A clinic in Nairobi, Kenya found what astonishing result in commercial sex workers?

Question 35: What assumption about HIV exposure did this study disprove?
Question 36: Reports of the same phenomena occurred in what other at risk population?

Question 37: What 3 mechanisms were proposed for this unusual protection? What did Oxford & Nairobi researchers find?

Question 38: VaxGen raised 89 million dollars to license the gp120 vaccine as the _____ phase _____ trial of an AIDS vaccine. What were the results from this study?

Question 39: Is it necessary to know how the immune system responds to HIV to make an effective vaccine? Why?

Question 40: Since the beginning of the AIDS epidemic, there have been _____ trials of _____ vaccine candidates. …. In the absence of a vaccine, by another _____ million people may be infected by HIV.