

Biotech Research—Virus Slayer

Be a scientist and simulate how researchers study and find therapies to kill harmful viruses. It's a race against the virus infecting the body and mutating!

Try this!

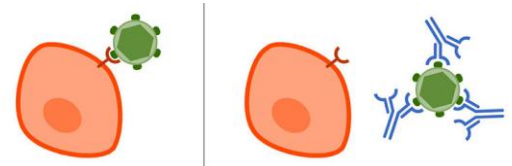
1. Pick up the Virus Slayer and make sure it is turned on (flashing red LEDs).
2. Select a region and begin inserting antibody pegs into the ports on the surface of the virus. Three (3) antibodies are required to neutralize each of the 3 regions on the surface.
3. Pay attention to the lights and sounds of the virus to know if you have inserted the antibody in the correct port.
4. When all the antibody pegs are in their correct ports, you have successfully neutralized the virus!
5. Connect the virus to the Virus Slayer tablet using the USB cord.
6. When prompted, take a picture with your defeated virus.
7. Upload the picture and email the picture to yourself. With your permission, allow your photo to be posted on the online virus slayer map with other virus slayers from around the world.
8. Remove all the antibodies from the virus to “mutate” the sequence and return the virus to the activity table for the next player.



What's going on?

Viruses are about a hundred times smaller than human cells. They come in many different shapes and are present wherever there are cells to infect. In fact, viruses are the most common biological unit on Earth, outnumbering all other types put together.

Our immune system works by recognizing the proteins on the surface of the virus. However, in certain types of viruses, these proteins keep changing as the virus mutates, so a vaccine developed one year might not work the next. The purposes of antibodies, also called immunoglobulins, are to neutralize the virus threat by attaching to the surface of a virus and preventing the virus from entering and infecting cells. Antibodies can also signal for t-cells inside the body to destroy marked viruses. Just like every lock has a single key, an antibody has a single virus key that attaches to specific viruses in specific locations. When the key is inserted into the lock, the antibody activates, neutralizing its target.



(Left) A virus (green) can attach onto the surface of a cell (orange) and cause infection.
(Right) Antibodies (blue) can bind to the surface of a virus, blocking the virus's ability to attach to cells.

By xspareta CC BY-SA 4.0-3.0-2.5-2.0-1.0 (via Wikimedia Commons)

How is this biotech?



A nurse injecting a vaccine into a patient. By Rhoda Baer via Wikimedia Commons

Scientists research and develop biotechnology products that can help save millions of lives. Scientists have been studying viruses for years. Some, like measles and smallpox, can be defeated with vaccines and drugs.

Vaccines “trick” our immune systems into recognizing viruses, without actually getting infected, so we can develop antibodies that effectively resist real viruses. Drugs are another line of defense. We may never be able to totally beat viruses, but by harnessing the power of vaccination, the latest anti-virals, and adopting the right behavior, we stand a good chance of keeping one step ahead of viruses' most harmful effects.

Visual Step-by-step Procedure

1. Pick up the virus and make sure it is turned on. Begin by selecting a region on the virus and plug in an antibody peg in one of the ports.



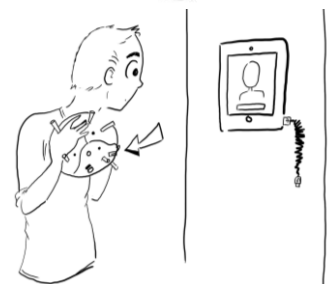
2. Complete each region by successfully plugging in 3 antibody pegs in the correct ports for that region. Pay attention to the virus's lights and sounds to know if you are on the right track (see "Game Code" hint). When one region is completed, move on to another one and repeat the process.



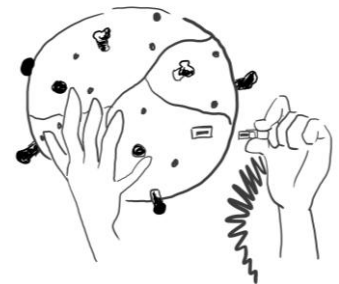
3. When all three regions have been completed the virus will indicate successful neutralization with sounds and lights (LEDs change from red to green).



4. Bring the neutralized virus to the Virus Slayer tablet stand.



5. Plug the tablet's USB cord into the virus to connect the virus with the tablet.



6. If the virus was completed successfully, the Virus Slayer program will automatically run. Pose with your neutralized virus in front of the tablet's camera and begin the camera countdown. After your photo has been taken, email the photo to yourself and give permission for the World Biotech Tour to post your results online!



7. Reset the virus by removing all the antibody pegs and return all the pieces to the activity table for the next player.

Biotech Research—Virus Slayer Presenter Guide

Learning Objectives

1. Scientists research and develop biotechnology products that can help save millions of lives.

Materials

- Virus Slayer (“virus”)
- 9 antibody pegs (additional 1 replacement)
- Game code sheet
- Rechargeable batteries (do not remove from Virus Slayer)
- Paperclip
- USB A to B cable
- Tablet with Virus Slayer program pre-installed
- Tablet holder
- Country-specific adapter
- Wifi connection (Not provided)

Activity Diagram



Set-up

10 minutes



Program

5 minutes



Clean up

5 minutes

Notes to the presenter

SAFETY: Some participants can get excited during the activity and may not pay attention to their surroundings. Make sure that there is enough space for the players to move around and clear the ground of low objects that players could trip over.

Before doing this activity: Start the Virus Slayer program on the windows tablet and adjust to the appropriate height for picture taking. Turn the virus on and charge the batteries if needed. Set 9 antibody pegs near the virus on a table. Make sure there is a wifi connection between the virus and your science center’s network.

Tips:

- The virus structure serves as a model. Let participants know that it does not represent the actual size of a virus or how antibodies attach and neutralize a virus, but serves more as an example of the process.
- The virus structure is an artistic interpretation of what some viruses look like under microscopes (such as electron microscopes) and the color was selected for aesthetic purposes.

- It may be useful to help the player in the first region to get comfortable with the code (no sound, positive sound, growl). Then let them use the code to figure out how to solve the next two regions on their own. Players will need to use their deductive skills and the game code to solve the virus quickly. You can add a timer to add a speed component to the activity and record who was able to solve the virus the fastest.



- If the antibody pegs are loose you may hear residual sounds if something brushes up against the peg while rotating the virus. If that happens, have the player solve the game while keeping the virus on the table, feet-side down. The player only needs to spin the virus to the next region to complete the game. Keep the activity table clear of objects so the virus sits on a flat surface and the pegs are not obstructed when the virus is spun around.
- Keep liquids away from the virus structure and accessories to avoid damaging the electrical components.
- The Virus Slayer program uses large amounts of battery power so keep the tablet plugged in and charging while running the activity to prevent the tablet from unexpectedly shutting down.
- Troubleshoot: If the program or virus structure malfunctions:
 - Close the program or switch off the virus and restart.
 - Check the status of the batteries and connect the Virus Slayer to the tablet to charge.

Cleanup: Disconnect the virus structure from the tablet and remove any antibody pegs still plugged into the ports. Carefully store the antibody pegs and the virus structure. Shut down the Virus Slayer program and then the tablet and recharge the batteries if needed.

Related educational resources

The World Biotech Tour website (www.worldbiotechtour.org/activities) contains additional resources to introduce visitors to biotechnology and the tools researchers use:

- Media include– *Virus Slayer : The Science* supplemental document (PDF)

Credits and rights

The Virus Slayer is a signature activity developed by the Association of Science-Technology Centers with help from Movia Robotics, Design Innovation, and TK McKenna from the Connecticut Science Center.

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Images courtesy of Movia Robotics, Design Innovation, and Carlin Hsueh. 2015-2016



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