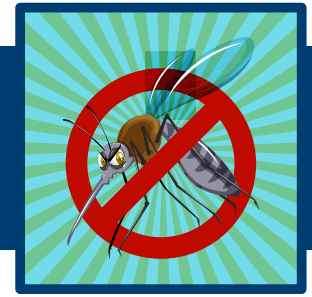


Teacher Directions

UNIT: CHIKUNGUNYA

LESSON 1: SILLY NAME, SERIOUS VIRUS

Activity 1A: *Of Mice or Men... and More*



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Educational Objectives

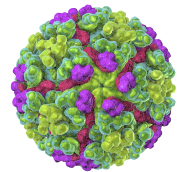
› Predict potential outcomes of **CHIKV infection** in different species.

Educational Objectives

1. Compare the response of macrophages to CHIKV infections in human and murine species
2. Evaluate the macrophage response to CHIKV infection outcomes in human and murine species.

Activity 1A Rationale

Students will model and compare the immune responses of human and murine macrophages to CHIKV infection. They will compare how differences in viral replication and inflammatory signaling contribute to the outcomes of infection. In humans, systemic inflammation may lead to chronic arthritis. Students will analyze data from an unknown sample (Species X) and make an evidence-based prediction about whether the outcome of CHIKV infection in Species X is more likely to be acute or chronic.



CHIKV Virus

Education Standards

TEKS: Processing: (MS) 1.F, 1.G (HS) 1.A, 1.F, 1.G, 2.B, 3.A, 3.B, 3.C, 4.A, 4.B, 4.C

Content: (MS) 7.13.A, 5.13.A (HS) B.5.D, B.7.D, B.12.A, E.8.D

ELPS: C.1.B, C.1.E, C.2.H, C.2.G, C.3.D, C.3.E, C.3.G, C.4.D, C.4.F, C.4.H, C.4.K, C.5.F

NGSS:

Student Handouts:

Final Transformation of Chikungunya Virus

CHIKV: Student Directions

CHIKV: Processing Out

MIDDLE & HIGH SCHOOL LEVEL

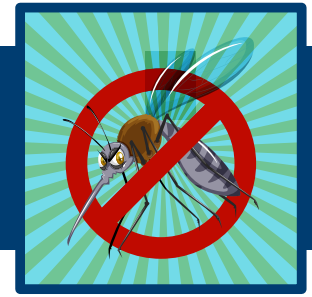
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Teacher Directions

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Activity 1A: Of Mice or Men... and More



Simulation Activity:

 **Suggested time: ~20 min**

Students will simulate the different responses of human and murine macrophages to CHIKV infection using color-coded cups, “virus”, and “macrophages”.

- › Select one color to represent the inflammatory response of humans. Blue is used in this activity.
 - This color will only receive only pro-inflammatory signals.
- › Select another color to represent anti-inflammatory signals. Red is used in this activity.
 - Mice will have both pro- and anti-inflammatory signals (Blue and Red).
- › Students observe differences in viral replication and the corresponding immune system response and record their findings.

Setup:

1. Materials:

- › Small, clear plastic cups: 1 per student
- › Blue/red stickers or Sharpies to label cups
- › Virus particles:
 - Nerd clusters gummies (preferred).
 - ◆ Substitutes: large round beads or dry kidney beans.
- › Pro-inflammatory and anti-inflammatory response particles:
 - Recommend skittles:
 - ◆ Green skittles: pro-inflammatory
 - ◆ Purple or Blue skittles: anti-inflammatory
 - » Substitutes: other colored candy, pony beads, split peas & lentils, etc.
- › Colored pencils/markers
- › Sandwich baggies:
 - Prepare mice macrophage bags: 25% pro-inflammatory (Green skittles) and 75% anti-inflammatory macrophages (Purple or Blue skittles). 1 bag per mice cup.
 - Prepare human macrophage bags: 100% pro-inflammatory (Green skittles)
 - **NOTE:** the total number per bag is flexible, determined by the teacher.



Photo Credit: [Nerds Candy](#)

MIDDLE & HIGH SCHOOL LEVEL

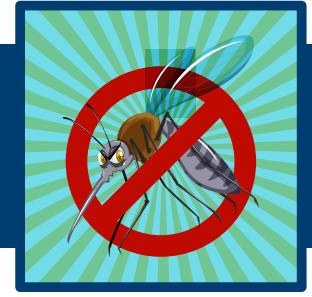
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Teacher Directions

UNIT: CHIKUNGUNYA

LESSON 1: SILLY NAME, SERIOUS VIRUS

Activity 1A: *Of Mice or Men... and More*



› Handouts:

- Student Directions
- CHIKV article
- Guided Questions
- Processing Out

2. Label cups with blue Sharpie dot/sticker (human) or red Sharpie dot/sticker (murine). As much as possible, there should be an equal number of blue and red cups.
3. **Do not tell students what each color represents.**

Directions for Simulation:

Part A

1. Place pre-labeled clear plastic cups on each student's desk. Distribute as equally as possible.
 - › Blue represents Human
 - › Red represents Mice
2. Students pair up, one student with a blue cup and one with a red cup.
3. After students pair up, teacher "infects" cups without answering any student questions:
 - a. Add 1 virus (Nerd cluster) to each cup. Students record what they see.
 - b. Go around the room again, this time adding 1 virus (Nerd cluster) only to the Blue cup. The red cup does not receive a virus. Students record what they see.
 - c. The last round: add 1 virus to the Blue cup and none to the red cup. For every blue cup, add 3 viruses (Nerd clusters) and for every red cup, add 1 virus.

Part B

1. Teacher now distributes immune responses:
 - a. Blue cup only received pro-inflammatory macrophages (Green Skittles).
 - b. Red cup receives both pro- and anti-inflammatory macrophages (25% Green and 75% Purple or Blue Skittles)
2. Demonstrate viral replication during an infection:
 - a. 5 additional viruses (Nerds) into blue cups, 1 additional virus into red cups
3. Using graphic organizer, students draw what they see in their cup and their partner's cup and make observations.

Teacher Directions

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4. Monitor students as they discuss and record their observations.
5. Facilitate class share-outs.

Processing Out

1. Distribute Processing Out worksheet.
2. Identify for students what each variable means:
 - a. Blue cup: Human
 - b. Red cup: Mice
 - c. Nerd Cluster: Chikungunya virus
 - d. Green skittles: pro-inflammatory response (macrophages)
 - e. Purple or Blue skittles: anti-inflammatory response (macrophages)
3. Students use this information to complete their key.
4. Referring to their observations, students are to make a claim, provided evidence, and support their reasoning to compare the immune response of mice and humans to CHIKV.