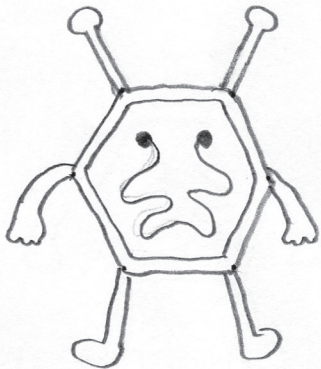


# VIRAL CRIMES AND MISDEMEANORS

PLEASE NOTE: This activity is not intended to be an accurate catalog of what individual viruses do inside cells. EVERY virus has ways of countering the interferon (IFN) response by the cell. They all use motor protein transport in some way. Many viruses suppress the MHC-1 pathway that puts flags on the surface of the cell. Many viruses shred cellular mRNAs.



## CRIME:

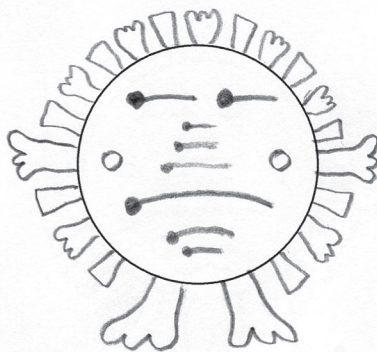
### 1) HI-JACKING

Adenovirus uses cellular transport motor proteins to get its capsid to the nucleus. (Many viruses do this.)

## MISDEMEANOR:

### 2) TAMPERING WITH METABOLISM

Adenovirus encourages the cell to be more active than it should. It causes the cell to stay in its reproduction cycle instead of resting. This can lead to out-of-control cell division (malignancy).



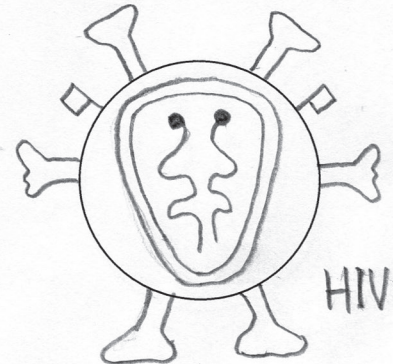
## CRIMES:

### 1) DISABLING SECURITY SYSTEM

Influenza's NS1 protein (in its capsid) disarms the cell's RIG-1 sensor, which senses viral dsRNA and RNA(-).

### 2) CAP-SNATCHING (i.e. stealing)

Influenza has "scissor and stapler" enzyme tools that can cut the caps off cellular mRNAs and put them onto their own RNAs. (The caps are necessary for ribosomes to read mRNAs.)



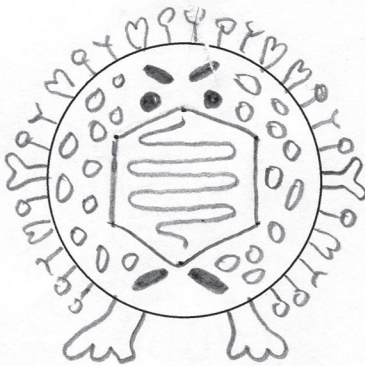
## CRIMES:

### 1) IDENTITY THEFT

Cellular MHC identity flags can be found in the envelope of HIV.

### 2) HARMING LAW ENFORCERS

HIV targets some of the "police" cells of the body. T cells are one of the main players in the cell's defense against foreign invaders like viruses and bacteria. HIV invades the very cells that are supposed to fight against it.



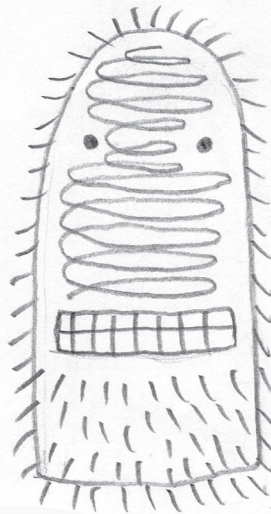
## CRIMES:

### 1) KIDNAPPING

Herpes detains the MHC-1 flags inside the ER so they can't rise to the surface and display pieces of viral proteins to immune cells.

### 2) DESTRUCTION OF PROPERTY

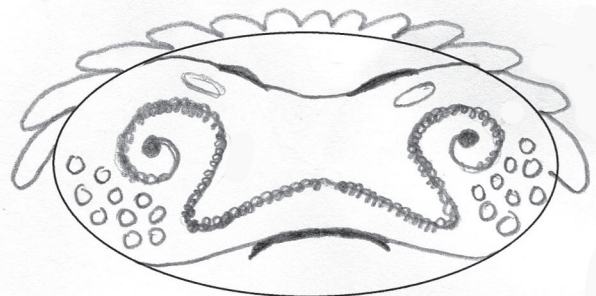
a) Herpes uses "vhs" to shred cellular mRNAs.  
b) Herpes also "breaks" cellular proteins that are part of the defense system we call "complement." The viral proteins attach to complement proteins, changing their shape, which destroys their function.



## MISDEMEANOR:

### 1) RE-PURPOSING SENSORS

Rabies does not destroy the TLR-3 receptor but pulls it down from the surface to a location deep inside the cell where the virus is establishing its viral factories. These sites are called **Negri bodies**, named after their discoverer over 100 years ago. TLR-3 becomes a construction material for these "factories."



## CRIMES:

### 1) FORGERY

Smallpox makes proteins that look almost identical to cellular proteins. They even make "fake" interferons that are enough like the real ones to confuse the cell and reduce the number of real interferons made.

### 2) MAIL TAMPERING

Smallpox has proteins that destroy many of the cell's chemical messages, called interleukins and chemokines.

## MISDEMEANOR:

### 1) NOT USING A SPELL CHECKER

One of polio's strategies is to make lots of mistakes when copying capsid protein coding. This means the capsid protein shapes are constantly changing, making it hard for immune cells to recognize them. (Virologists call this "Capsid Mediated Immune Evasion.")

