# FACT SHEET

## Recombinant Vaccinia Viral Vectors

The following provides information on the use and containment of recombinant viral vectors. Investigators should use these guidelines as part of their risk assessment when planning experiments with these vectors and preparing applications to the Institutional Biosafety Committee (IBC). Note the listed containment levels are the minimum that should be employed with these vectors: some experiments, such as the expression of toxins or oncogenes, may require higher levels of containment. The appropriateness of the containment should be considered as part of the investigator's risk assessment and will be reviewed by the IBC.

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| **NIH Risk Group** | RG2<br>The poxviruses are the largest known DNA viruses and are distinguished from other viruses by their ability to replicate entirely in the cytoplasm of infected cells. Vaccinia is an enveloped double-stranded DNA virus that is highly stable and can cause severe infections in immunocompromised persons, persons with certain underlying skin conditions, or pregnant women. |
| **Biocontainement Level** | The biocontainment level of the vector is based on CDC criteria for the parental virus strain.<br><br>BSL-1<br>Vectors derived from highly attenuated strains including TROVAC (fowlpox), MVA (Ankara strain) and ALVAC (canarypox) strains that do not replicate in human cells, and NYVAC (derived from the Copenhagen strain) that replicates poorly in human cells: if these strains are used in work areas where NO other orthopoxviruses are manipulated.<br><br>BSL-2<br><br>Non-attenuated vaccinia strains, such as NYCBOH (the strain used in the vaccinia vaccine), Western Reserve (WR), Copenhagen, Temple of Heaven, Lister or Cowpox. |
| **Infectious to Humans/Animals** | Yes |
| **Route of Transmission** | Vaccinia virus may be transmitted via surface contact with contaminated object(s) and subsequently spread to mucus membranes (eyes, nose, and mouth) and/or to open sores on skin. |
| **Laboratory Hazards** | Accidental needlestick is a mode of transmission within research laboratories. Accidental ingestion of viral contaminated materials and inhalation are other routes of transmission. If working with infectious animal models, then bite wounds could transmit vaccinia virus infection |
| **Disease** | Infection of the skin can cause a localized lesion that then scabs over and heals in about 10-14 days |
| **Treatment/Prophylaxis** | Vaccination is not recommended for persons who work only with replication-deficient poxvirus strains (e.g., MVA, NYVAC, TROVAC, and ALVAC). |

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| | The CDC recommends vaccination every 10 years for laboratory workers in the United States who have any contact with replication-competent vaccinia viruses and recombinant viruses developed from replication-competent vaccinia viruses. However, individuals who are pregnant; breastfeeding; have skin conditions such as eczema or atopic dermatitis; those with heart disease; or those with altered immune systems, are at increased risk from the vaccine, and should not be vaccinated and should not work with the virus.<br><br>The vaccination can be accompanied by fever, rash, lymphadenopathy, fatigue, myalgia and headaches. Serious complications such as ocular vaccinia, myopericarditis, eczema vaccinatum (a papular, vesicular and pustular rash that is very infectious), progressive vaccinia (progressive necrosis at the vaccination site), postvaccinial CNS disease (headache, lethargy, seizures and coma), fetus malformations and abortion (very rare) sometimes occur after vaccination. Complications are more serious in immunosuppressed individuals and the smallpox vaccine usually causes one death for every million doses.<br><br>https://www.cdc.gov/mmwr/volumes/65/wr/mm6510a2.htm |
| **Pathogenesis** | Can infect a variety of non-dividing cells. Stays episomal (does not integrate) |
| **Replication Competent** | Possible |
| **RCV Testing** | NA |
| **Disinfection** | Effective disinfectants require a minimum of 20 minutes contact time. Use one of the following:<br>• RECOMMENDED: Sodium hypochlorite (0.5%: use 1:10 dilution of fresh bleach)<br>• 70% Ethanol or Isopropanol |
| **Animals** | ABSL-2: Animals must be injected in a Biological Safety Cabinet. Animals will be maintained at ABSL-2 for the duration of the study. All bedding, waste and animals infected with vaccinia shall be treated as biohazardous. After all animals are removed from their primary enclosure immediately autoclave or treat with chemical disinfectant. After disinfection, dump the cage contents and begin cleaning the cage for re-use. All waste must be decontaminated by autoclaving or chemical disinfection prior to disposal. Animal carcasses must be placed in autoclave bags and be designated for infectious waste disposal. All necropsies must be performed in a designated room using animal BSL-2 practices and procedures.<br><br>Animal cages must be labeled with a biohazard sign. |

Sources:
https://ehs.stanford.edu/reference
https://www.dartmouth.edu/ehs/biological/viral_vectors.html

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