



Cornell University
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Research Integrity and Assurance

Institutional Biosafety Committee

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Cornell University Institutional Biosafety Committee Policy and Procedures on Use of Vaccinia Virus in Research Applications

Policy Statement:

In order to provide a safe workplace, the Cornell University Institutional Biosafety Committee (IBC) has developed a policy for individuals working with non-highly attenuated vaccinia viruses. This policy provides background information about vaccinia virus and affected personnel. Additionally, administrative, medical counseling and vaccination, and biosafety procedures define specific requirements for working with vaccinia virus. The practices and procedures outlined in this document are in accordance with those described in the CDC/NIH *Biosafety in Microbiological and Biomedical Laboratories* (BMBL), 5th edition (<http://www.cdc.gov/biosafety/publications/bmb15/index.htm>). This policy is predicated on shared responsibility among principal investigators (PI), research staff, department chairs and directors, and the IBC.

Vaccinia Virus Strains:

There are multiple strains of the virus that have varying degrees of virulence, and varying levels of risk for laboratory personnel. Pathogenic and non-highly attenuated strains include Western Reserve (WR), Temple of Heaven, Copenhagen, Lister, and NYCBOH. Activities with strains that are pathogenic or non-highly attenuated, and recombinant vaccinia viruses derived from these strains, **are subject** to the requirements of this policy.

Per CDC recommendations activities with highly attenuated, host restricted or poorly replicating strains including modified vaccinia Ankara (MVA), NYVAC, ALVAC, and TROVAC **are not subject** to this policy and medical counseling and vaccination are **not** recommended.

Who is Affected:

Personnel with Direct Contact: Personnel who engage in at-risk activities with standard and recombinant strains including, but not restricted to, inoculating and growing virus cell culture, harvesting virus from cell culture, sonication and centrifugation, using sharps while manipulating vaccinia virus, infecting animals as well as husbandry and care of infected animals. These personnel will be required to engage in medical counseling and screening from Occupational Medicine at Cornell Health prior to initiating work with vaccinia virus. Recommendations for vaccination will be made after medical counseling and screening.

Personnel with Indirect Contact: Personnel who do not directly handle vaccinia virus or infected animals, but may work in the same laboratory or animal room that houses vaccinia infected animals. These personnel will engage in medical counseling and screening on a voluntary basis. Recommendations for vaccination will be made after medical counseling and screening.

Medical Personnel: Cornell Health Occupational Medicine providers who may contact potentially contaminated materials (e.g., wound/vaccination site, dressings), but practice appropriate infection control measures, are at lower risk and not subject to counseling requirements and vaccination recommendations.

Other Personnel: Custodians, facilities services, and visitors, for example, who may have to enter the workspace where vaccinia virus is manipulated, will not require medical counseling and vaccination. Work space where vaccinia is manipulated should be decontaminated prior to entry, and activities with vaccinia should be suspended when non-lab personnel are in the room. If decontamination and suspension of work cannot be accomplished (e.g., in an animal room), non-lab personnel will be provided with appropriate PPE and receive information about the risks associated with entering these spaces (e.g., toolbox talk).

Administrative Procedures:

1. Principal investigators will describe their proposed activities with vaccinia virus in their MUA or in an amendment to an approved MUA. The PI will organize their research activities to reduce the risk of exposure, paying special attention to control measures for all unvaccinated individuals (e.g., additional engineering controls or PPE, avoidance of high risk procedures, reassignment of duties, or having PI or vaccinated personnel perform high risk procedures).
2. The principal investigator/supervisor will develop an exposure/infection control plan with standard operating procedures specific for laboratory manipulations of vaccinia virus. The IBC will determine if the proposed control measures adequately protect the health and safety of all personnel engaged in virus activities. Procedures will be approved by the IBC before implementation.
3. In addition to receiving IBC approval, the principal investigator will seek approval from the IACUC, if conducting animal work.
4. Personnel will review applicable vaccinia virus information and receive agent and project specific training by the principal investigator/supervisor, EHS Biosafety, and CARE, if animals will be used.
5. The principal investigator and EHS Biosafety will work with the IACUC and CARE to establish adequate control measures to minimize risks for animal care support personnel (e.g., animal handlers, veterinary technicians, veterinarians) who will handle infected animals.
6. Vaccinated and unvaccinated personnel, who have made informed choices, will work with the principal investigator/supervisor and the department chair/director to resolve discrepancies regarding assignment of duties and work recommendations. If necessary, Human Resources staff within the affected unit or College can assist with resolutions.

Medical Counseling and Vaccination Procedures:

1. The principal investigator/supervisor will identify all personnel who are affected by this policy (direct and indirect contact) by completing a *Counseling and Vaccine Request Form*. This form will be forwarded to Occupational Medicine, Cornell Health.
2. Personnel with direct contact will contact Occupational Medicine (255-6960) within two weeks of the date on the *Counseling and Vaccine Request Form* to set up an appointment for mandatory medical counseling and screening. Personnel with indirect contact will be recommended to contact Occupational Medicine to set up an appointment for voluntary medical counseling and screening.
3. Occupational Medicine will counsel personnel on the risks of working with the virus, consequences of exposure, and the benefits and risks of the vaccinia vaccine. Occupational Medicine will perform a health history review with the individual to determine the presence of contraindications to the virus and the vaccine. Individuals with certain conditions (e.g., eczema, pregnancy, altered immunocompetence, cardiac problems) are considered medically contraindicated and will not be vaccinated.
4. Consistent with CDC recommendations, Occupational Medicine will offer the vaccine, if medically appropriate, to each individual who has been counseled. The vaccine, ACAM2000, is a live, vaccinia virus vaccine that was licensed for use by the FDA in 2007. ACAM2000 replaced the Dryvax vaccine. Re-vaccination every 10 years is recommended for personnel who continue to have direct contact with vaccinia virus.
5. Personnel who wish to receive the vaccine and for whom the vaccine is medically appropriate will complete a *Vaccinia Vaccination Consent/Declination Form* prior to receiving the vaccine.
6. An individual who receives the vaccine will follow up with Occupational Medicine to monitor the vaccination site and vaccine “take”.
7. Personnel who decline vaccination will actively opt out and not receive the vaccine, and those with underlying health conditions (medical contraindications) will not receive the vaccine. Occupational Medicine may provide recommendations to all unvaccinated personnel to not work with the virus or infected animals, or to avoid certain high risk procedures (e.g., use of needles during animal inoculations, manipulation of large volumes/highly concentrated virus preparations).
8. Personnel who decline or are unable to receive the vaccine will complete a *Vaccinia Vaccination Consent/Declination Form* with Occupational Medicine, attesting that they are aware of the risks of working with the virus and have made an informed, personal decision.
9. Occupational Medicine will notify the principal investigator/supervisor, the department chair/director, and the IBC about each individual’s counseling and vaccination status, as well as any work recommendations. No confidential medical information will be communicated without the individual’s consent.

10. Unvaccinated personnel will complete an annual “check-in” with Occupational Medicine to assess any changes in health conditions or job changes that may impact the degree of occupational exposure. If personal health conditions or job duties change during the year, personnel will contact Occupational Medicine.
11. Occupational Medicine will issue medical alert cards to all personnel who have direct contact with vaccinia virus or infected animals. Personnel will be instructed to present these cards to a health care provider after an exposure or incident involving the virus or infected animals or upon development of signs or symptoms suggestive of vaccinia infection.

Biosafety Procedures:

1. Biosafety level 2 (http://www.cdc.gov/biosafety/publications/bmbl5/BMML5_sect_IV.pdf), and animal biosafety level 2 (http://www.cdc.gov/biosafety/publications/bmbl5/BMML5_sect_V.pdf) practices and procedures are the minimum conditions under which activities may take place. Depending on the proposed activities, the IBC may increase containment to biosafety level 3.
2. Personnel will sign and label (name of agent, biohazard symbol) areas and items where vaccinia virus is used, stored, or may be present. Limit access to these areas and items only to approved personnel directly involved with virus-related activities.
3. Personnel will conduct manipulations of the virus, animal inoculations, and husbandry activities with infected animals inside a certified biosafety cabinet or similar HEPA-filtered containment device. Activities with live virus or infected animals outside of a containment device are prohibited.
4. Other engineering controls and procedures will be incorporated, as appropriate. For example: use of sealed rotors or safety cups during centrifugation; loading and unloading of tubes and rotors inside a biosafety cabinet; use of a cup sonicator or performing sonication inside a biosafety cabinet; protecting vacuum lines with HEPA filters.
5. Infected animals will be housed in ventilated micro-isolator cages or static micro-isolator cages with filter tops. Personnel will label cages with a biohazard cage card.
6. Personnel will eliminate or minimize the use of sharps in laboratory manipulations, and the principal investigator will incorporate engineered sharps devices when possible. Safe needle handling and other sharps practices will be implemented (e.g., no recapping or other manipulations, direct disposal in sharps container).
7. Personnel will use a freshly prepared 1% sodium hypochlorite solution (1:5 dilution of household bleach) to decontaminate surfaces, equipment, and infectious liquids. Follow up with 70% ethanol to remove bleach residue.
8. Personnel will wear appropriate PPE at all times when manipulating virus or infected animals, including:

- a. A buttoned up lab coat with cuffed sleeves or solid front gown with cuffed sleeves
 - b. Double disposable gloves
 - c. Eye and mucous membrane protection (e.g., face mask and goggles, face shield)
9. Personnel will wear disposable PPE or the principal investigator/supervisor will provide for institutional laundering of lab coats. Disposable sleeves will be worn with reusable lab coat.
 10. Puncture resistant gloves will be worn, when possible and practical, during animal inoculations.
 11. Personnel will inspect hands and skin and cover cuts, scratches, and abrasions with dressings prior to donning personal protective equipment.
 12. Personnel will incorporate hand hygiene measures (i.e., thorough and frequent hand washing with soap and water) after glove removal.
 13. The IBC will review and approve any exceptions to the above procedures before implementation.

Emergency Response Procedures to Vaccinia Virus Exposure:

1. Immediate first aid interventions are required after any exposure event as they may help prevent or minimize the consequences of infection.
2. If the exposure is via needlestick, animal bite, or other break in the skin, stop activities and wash the exposure site well with soap and running water for 10 minutes. Cover the wound with a bandage.
3. If the exposure involves eye or mucous membranes (e.g., splash to mouth), stop activities and irrigate the site thoroughly at an eye wash for at least 10 minutes.
4. If the exposure is via inhalation of aerosolized materials outside of a biosafety cabinet, stop activities and leave the area immediately and remove personal protective equipment.
5. Contact with intact skin or protective clothing is low risk. Remove contaminated clothing and wash skin with soap and water.
6. Report all exposures immediately to the principal investigator/supervisor and EHS Biosafety (255-8200). Contact Occupational Medicine (255-6960) and arrange for medical evaluation and treatment, if necessary.

7. Inadvertent exposures to vaccinia virus may result in skin or eye lesions. Cover skin lesions with a bandage and seek medical evaluation immediately. If evaluation is obtained at a facility other than Cornell Health, contact Occupational Medicine as soon as possible.

Roles and Responsibilities:

Principal Investigator:

- Identify affected personnel (see above) and notify Occupational Medicine Cornell Health
- Verify that personnel engage in medical counseling procedures prior to initiating activities
- Verify that personnel implement all safety practices described within this document
- Provide agent and project-specific training for affected personnel
- Work with EHS Biosafety to establish adequate control measures to protect the health and safety of research personnel

Affected Personnel:

- Receive medical counseling and be offered vaccinia vaccination prior to initiating activities
- Implement all safety practices described within this document
- Report to principal investigator/supervisor and EHS Biosafety any incidents or potential exposures with vaccinia virus or animals infected with the vaccinia virus
- Report any signs and symptoms of vaccinia infection to their supervisor and EHS Biosafety

Institutional Biosafety Committee:

- Review and approve activities and locations described in the Memorandum of Understanding (MUA) for appropriate biosafety practices and containment, set biosafety level, and assess training and experience of personnel
- Notify the principal investigator/supervisor of the results of the Institutional Biosafety Committee's review
- Report, in conjunction with the Office of Research Integrity and Assurance, any significant problems or violations to appropriate agencies

Institutional Animal Care and Use Committee:

- Review and approve activities and location described in the animal use protocol for appropriate safety practices and containment

Center for Animal Resources and Education (CARE):

- Identify affected personnel (see above) and notify Occupational Medicine Cornell Health
- Verify that personnel engage in medical counseling procedures prior to initiating activities
- Verify that personnel implement all safety practices described within this document
- Provide agent and project-specific training for affected personnel
- Work with the principal investigator, research staff, and EHS Biosafety to establish adequate control measures to protect the health and safety of personnel handling infected animals
- Provide animal and biosafety training, as appropriate

Occupational Medicine, Cornell Health:

- Provide medical counseling and vaccinia vaccination services for affected personnel
- Provide follow-up evaluation, care, and local physician consultation for personnel with potential exposures to vaccinia virus or animals infected with the vaccinia virus
- Report incidents of vaccinia infection to the Tompkins County Health Department and the New York State Department of Health

EHS Biosafety:

- Review the areas where vaccinia virus is manipulated and animals are housed, and provide technical advice on safety procedures
- Provide biosafety training, as appropriate
- Conduct post-incident/exposure investigations and report findings to the IBC, and other agencies as appropriate

Background Information:

Vaccinia virus is a research tool used in a variety of biomedical applications because of its ability to infect a wide variety of cell types, deliver different types of antigens, and express proteins. The double stranded DNA virus is a member of the Orthopox family of viruses, has a broad host range, and like other members of this family (e.g., smallpox, monkeypox) is a human pathogen. Poxviruses can replicate in the cytoplasm of mammalian cells without host replication machinery found in the nucleus. Vaccinia virus vectors can accept up to 25 kb of foreign DNA. Genes are stably inserted into the viral genome, which provides efficient replication and expression, and proper post translational modification.

Researchers who engage in activities with non-highly attenuated strains of the virus are at increased risk for laboratory acquired infections, serious complications, and transmission to close personal contacts. From 1986-2009 there were 17 documented case reports of laboratory acquired infections, involving needlestick or other sharps injuries, direct contact, and ocular exposure. Non-sharps exposures involved inconsistent biosafety practices and lack of personal protective equipment (PPE). Infections can include localized skin lesions at the site of exposure, including spread to other sites, as well as ocular infections.

The risks of infection are much more serious for individuals who are immune-compromised or have eczema and other atopic skin conditions. Because of these risks, the IBC and the Advisory Committee on Immunization Practices (ACIP) of the CDC recommend that all medically eligible individuals who work with the virus be immunized every 10 years with an FDA (Food and Drug Administration)- licensed vaccine, ACAM2000. It is important to note that vaccination does not provide complete protection against accidental exposures, and although the vaccine is safe, vaccination has been associated with a low frequency of adverse side effects. Nonetheless, the CDC initiated an educational campaign in 2009 and continues to recommend vaccination for researchers engaged in activities with non-highly attenuated strains.

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Vaccinia Counseling and Vaccine Request Form

This form is used to initiate medical counseling (mandatory and voluntary) and request vaccinia vaccination in preparation for activities that involve vaccinia virus. The principal investigator/supervisor must identify all individuals who may have direct or indirect contact with vaccinia.

Principal Investigator/Supervisor _____ Date _____

Signature _____ Net ID _____

Phone _____

MUA # _____ IACUC # _____

| <u>Name</u> | <u>Net ID</u> | <u>Position/Duties</u> | <u>Phone</u> |
|-------------|---------------|------------------------|--------------|
|-------------|---------------|------------------------|--------------|

Return this form to Occupational Medicine, Cornell Health

Vaccinia Vaccination Consent/Declination Form

I acknowledge that I have been informed of the following (initial each item):

- _____ Risks of working with vaccinia virus, including consequences of accidental exposure to myself and/or to household, personal, or workplace contacts
- _____ Advisory Committee for Immunization Practices (ACIP) recommendation of vaccinia vaccination for individuals who come in direct contact with pathogenic and non-highly attenuated vaccinia virus and their recombinants
- _____ Availability of vaccinia vaccination, at no cost to me, from Cornell Health Occupational Medicine
- _____ Vaccinia vaccination benefits and risks, including vaccination contraindications (e.g. pregnancy, immunocompromising conditions, eczema and other skin conditions, or cardiac conditions)
- _____ Importance of screening for medical conditions, both for myself and for my household and personal contacts, to prevent the development of serious consequences from working with vaccinia virus or from receiving the vaccinia vaccination.

I acknowledge that (initial each item):

- _____ I have read and do understand the ACAM2000 Medication Guide (vaccinia vaccination information sheet)
- _____ I have had an opportunity to ask questions about the vaccine and that my questions were answered to my satisfaction
- _____ I have had an opportunity to discuss my vaccinia-related health concerns with Cornell Health, Occupational Medicine staff
- _____ I have either sought the advice of my personal health care provider or have declined to do so at my own election and risk
- _____ I have considered my own health status as well as the health status of my household and personal contacts
- _____ I have answered questions about my health status to the best of my ability

VACCINATION CONSENT

_____ I authorize and request Cornell Health, Occupational Medicine to administer ACAM2000 (vaccinia vaccination) to me.

VACCINATION DECLINATION

_____ I decline the ACAM2000 vaccine at this time for **medical reasons**. If in the future I continue to have occupational exposure to vaccinia virus AND there is no longer a medical contraindication for myself or for my household or personal contacts, I can receive the vaccination at no cost to me.

_____ I decline the ACAM2000 vaccine at this time for **personal reasons**. If in the future I continue to have occupational exposure to vaccinia virus, I can receive the vaccination at no cost to me.

_____ I decline the ACAM2000 vaccine at this time because I received a vaccinia vaccination within the past ten years. (provide date) ____

IF YOU DECLINE VACCINATION YOU MUST READ AND INITIAL THE FOLLOW SECTION

_____ I understand that my occupational exposure to vaccinia virus places me at risk of acquiring a vaccinia infection. By declining to take the vaccine, I continue to be at risk of acquiring a vaccinia infection, and I am making an informed, personal decision to accept this risk.

Name _____ Signature _____ Date _____

Date of Birth _____ Net ID _____ Faculty Staff Student Other _____

Vaccination date _____ Vaccination site _____ Vaccine lot # _____

Vaccine administered by _____