Biological Agent Reference Sheet (BARS)

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BIOLOGICAL AGENT REFERENCE SHEET

Modified Vaccinia Virus Ankara (MVA)

CHARACTERISTICS	
Background	Modified Vaccinia virus Ankara (MVA) (family *Poxviridae*, genus *Orthopoxvirus*) was originally developed as an attenuated vaccinia virus strain for smallpox vaccination. It was generated from ancestor virus Chorioallantois Vaccinia virus Ankara (CVA; Turkish vaccine institute in Ankara) in 1968 by serial passage. Isolate F6, derived by 572 serial passages in chicken embryo fibroblasts, resulted in six major deletions. As a result, MVA is replication-deficient in most mammalian cells and does not produce many virulence factors. It has a large packaging capacity for heterologous DNA and is considered a vaccine virus of choice in clinical research.
Morphology	MVA is enveloped with a highly asymmetric structure (ellipsoidal, brick shaped, or barrel shaped) measuring approximately 360 × 270 × 250 nm, with a single, linear dsDNA genome of 178 kb.
Growth Conditions	BHK-21 [C-13] fibroblasts isolated from the kidney of an uninfected golden hamster are commonly used. The cells are incubated at 37°C with 5% CO_2 in air atmosphere.

HEALTH HAZARDS	
Host Range	In embryonic chicken tissues: The liver is the major target organ, macrophages and hematopoietic cells are the primary target cells, and chorioallantoic membrane is the major site of replication. However, increasing doses of MVA do not result in increased lesion severity or embryonic death, and MVA-based vaccines are promising for protection of parrots against avian bornavirus. In mammalian species: MVA is replication-deficient in most mammalian cells, but some mammalian cell lines support limited MVA replication (e.g., human embryonic kidney (HEK) 293 cells, HeLa cells, human Caco-2 cells, Chinese hamster ovary (CHO) cells, and BHK-21 cells).
Special Precautions	1) MVA can productively infect human Caco-2 cells after multiple serial passages. 2) Recombination can occur in vitro between MVA vectored vaccine and wild type cowpox virus (CPXV) in cell lines that are semi-permissive to MVA. 3) Nonreplicating MVA enters target cells where recombinant constructs are translated, so risks associated with recombinant constructs must be evaluated on a case-by-case basis. 4) Strains should be evaluated for homogeneity by PCR, sequencing, or infection studies to ensure there are no variants present that can replicate in otherwise resistant mammalian cells.
Modes of Exposure	Exposure may occur by contact with mucous membranes, ingestion, inhalation of viral particles, and injection.
Signs and Symptoms	In rare cases, exposure to MVA may cause serious allergic reaction including difficulty breathing, dizziness, or swelling of the face and neck.
Infectious Dose	MVA is not infectious.

MEDICAL PRECAUTIONS / TREATMENT	
Prophylaxis	MVA is not infectious, so prophylaxis is not required.
Vaccines	Vaccination is not required for individuals working in laboratories with only replication-deficient strains of vaccinia virus.
Diagnosis &	MVA is not infectious.
Treatment	
Surveillance	None
Emory Requirements	None

LABORATORY HAZARDS	
Sources	MVA exposure in the laboratory may occur by needlesticks, splashes, etc.

SUPPLEMENTAL REFERENCES	
CDC	https://www.cdc.gov/vaccinesafety/vaccines/Smallpox-Vaccine.html
CDC	Biosafety in Microbiological and Biomedical Laboratories, 6th Edition
Viruses	Okeke MI, Okoli AS, Diaz D, et al. Viruses. 2017 Nov; 9(11): 318
BMC Infect Dis.	Eggers M, Eickmann M, Kowalski K, Zorn J, Reimer K. BMC Infect Dis. 2015 Sep 17;15:375

CONTAINMENT	
BSL2/ABSL2/ ABSL1	BSL2 practices should be followed. Inoculated animals shed MVA during the first few hours and should remain at ABSL-2 for 72h, then moved to ABSL1.

SPILL PROCEDURES	
Small	Notify others in the area and allow 30 minutes for aerosols to settle. Don appropriate PPE. Cover the spill with paper towels and apply disinfectant effective against MVA, working from the perimeter towards the center. Allow 30 minutes of contact time before disposal and cleanup of spill materials.
Large	Contact Emory's Biosafety Officer (404-357-1821) or The Spill Response Team (404-727-2888).

EXPOSURE PROCEDURES		
Mucous membrane	Flush eyes, mouth, or nose for 15 minutes at an eyewash station.	
Other Exposure	Wash area with soap and water for 15 minutes.	
Seek Medical Attention	7:30 am - 4:00 pm (OHS): 404-686-8578	After Hours: OIM NP On Call 404-686-5500, PIC# 50464
	Needle Stick: EUH (404-686-8587) EUHM (404-686-2352)	ENPRC: Maureen Thompson Office (404-727-8012) Cell (404-275-0963)
Reporting	Report incident to supervisor and complete an employee incident report in PeopleSoft.	

VIABILITY	
Disinfection	1) 1:10 dilution of bleach (5.25% sodium hypochlorite) for 30 minutes or overnight. 2) quaternary ammonium compounds (QACs) 3) povidone-iodine hand wash and hand rub products
Inactivation	Inactivated by heat (55 °C for 1 h) and disinfectants.
Survival Outside Host	Poxviruses have resistance to drying and may remain viable over several months depending on temperature.

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
Minimum PPE Requirements	Wear gloves, closed toed shoes, a lab coat, and appropriate face and eye protection.
Additional Precautions	Use respiratory protection if work will be performed outside a biosafety cabinet.

PERMIT REQUIREMENTS	
USDA/State	Importing MVA requires a VS 16-6A import permit. You should confirm import requirements with the USDA and your state's department of agriculture.