Smallpox and Mpox Vaccine

BIOLOGICAL PAGE

Alberta Health Services
Communicable Disease Control

Section 7	Biological Product Information	**Standard # 07.282**	
Created and approved by	Provincial Immunization Program Standards and Quality		
Approval date	June 10, 2022	**Revised**	January 31, 2025

	IMVAMUNE
Manufacturer	Bavarian Nordic A/S
Classification	Live-attenuated: non-replicating

Indications for Provincially Funded Vaccine	**Pre-Exposure**
	The following individuals are eligible for pre-exposure Imvamune:
	• Men who have sex with men (MSM), and who meet at least one of the following criteria:
	  ○ Have more than one sexual partner
	  ○ Are in a relationship where at least one of the partners has other sexual partners
	  ○ Have had a confirmed sexually transmitted infection acquired in the last year
	  ○ Have engaged in sexual contact in sex-on-premises venues
	• Sexual partners of any of the above
	• Sex workers regardless of gender, sex assigned at birth, or sexual orientation
	• Staff or volunteers in sex-on-premises venues where workers may have contact with fomites potentially contaminated with mpox
	• Individuals who engage in sex tourism (regardless of gender, sex assigned at birth, or sexual orientation)
	• Individuals who anticipate experiencing any of the above scenarios
	• Research laboratory employees working directly with replicating orthopoxviruses and who are at high risk of occupational exposure
	• Health care workers in advance of deployment to support the mpox clade 1 outbreak in countries where there is a level 2 travel health notice for mpox.
	Note:
	• MSM are defined as any man or Two-Spirit identifying individual who has sex with another person who identifies as a man, including but not limited to: individuals who self-identify as trans-gender, cis-gender, Two-Spirit, gender-queer, intersex, and non-binary.
	• Healthcare workers and clinical diagnostic laboratory workers who are in contact with patients or their clinical diagnostic specimens but who work in environments with training and control measures in place to mitigate risk of unprotected exposures or infections in healthcare settings are not recommended for pre-exposure immunization at this time.
	• The mpox vaccine is not routinely recommended for travellers. Currently only travellers who meet the high-risk eligibility criteria, or who are health care workers who will be deployed as noted above should receive pre-exposure mpox vaccine.
	Post-Exposure Prophylaxis
	• Contacts who have had a **high risk exposure** with a probable or confirmed case of monkeypox (mpox), or within a setting where transmission is happening, if they have not received both doses of pre-exposure vaccine.

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	○ Contacts who have had a **high risk exposure**: individuals with direct physical contact (skin/mucosa contact) with a probable or confirmed mpox case while the case is infectious, their body fluids, secretions, skin lesions, contaminated objects or surfaces (for example, clothing, bedding) without appropriate personal protective equipment (PPE). ○ This includes individuals who share a residence, sexual partners, and healthcare workers who provide care without appropriate PPE.
Schedule	**Pre-exposure**
	• Dose 1: day 0 • Dose 2: 28 days after dose 1 • Individuals who receive the second dose beyond the minimum authorized interval (28 days) do not require restarting the series or receiving additional doses • Research laboratory employees currently eligible for pre-exposure immunization are recommended to receive the second dose at the authorized interval (28 days between doses). **Booster Dose:** • 1 Dose: 2 years after the second pre-exposure dose. **Note:** Only research laboratory employees working directly with replicating orthopoxviruses and who are at high risk of occupational exposure are recommended to receive a booster dose.
	Post-exposure
	• Dose 1: as soon as possible following exposure • Dose 2: at least 28 days after first dose. **Note:** • Individuals with previous or active mpox infection should not be offered Imvamune. ○ Ask about symptoms such as new onset of rash, fever, swollen lymph nodes, fatigue, headache, myalgia and back pain before the immunization. If the contact has developed symptoms since the initial assessment, they should be treated as a probable case and the immunization should not proceed. • Imvamune given within 4 days of exposure may prevent disease. If given 5-14 days following exposure, vaccine may reduce the symptoms of illness, but may not prevent the disease. Therefore, a post-exposure dose should be given ideally within 4 days of the last exposure, and up to 14 days after the last exposure. ○ After 28 days, a second dose should be offered if mpox infection did not develop, regardless of ongoing exposure status. • Immunocompetent individuals who have received two doses of Imvamune do not need to receive additional doses after an exposure. However, an additional dose at least 28 days after the second dose can be offered to individuals who are moderately to severely immunocompromised, after an exposure as they may have had a lower or less durable immune response. See list below. • Individuals who have previously received smallpox immunization, such as a previous generation live replicating vaccine, and are recommended to receive Imvamune based on risk factors for mpox, should receive a 2-dose series with a minimum interval of 28 days. • Individuals with the following conditions are considered moderately to severely immunocompromised: ○ Immunocompromised due to solid tumour or hematologic malignancies or treatments for these conditions ○ Solid-organ transplant and taking immunosuppressive therapy ○ Hematopoietic stem cell transplant within 2 years of transplantation or taking immunosuppression therapy

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	○ Immunocompromised due to chimeric antigen receptor (CAR) T-cell therapy targeting lymphocytes ○ Moderate to severe primary immunodeficiency with associated humoral and/or cell-mediated immunodeficiency or immune dysregulation ○ Human immunodeficiency virus (HIV) with acquired immunodeficiency syndrome (AIDS)-defining illness or tuberculosis (TB) diagnosis in last 12 months before starting vaccine series, or severe immune compromise with CD4<200 cells/uL or CD4%<15%, or without HIV viral suppression ○ Recent treatment with the following categories of immunosuppressive therapies: anti-B cell therapies (monoclonal antibodies targeting CD19, CD20 and CD22), high-dose systemic corticosteroids, alkylating agents, antimetabolites, or tumor necrosis factor (TNF) inhibitors and other biologic agents that are significantly immunosuppressive ○ Chronic kidney disease on dialysis.
Preferred Use	N/A
Dose	0.5 mL
Route	Subcutaneous injection
Contraindications/ Precautions	**Contraindications:** • Known hypersensitivity to any component of Imvamune. ○ One non-medicinal ingredient in the vaccine that has been associated with allergic reactions in other products is Trometamol (Tris-hydroxymethyl-aminomethane or Tris) a component found in contrast media, oral and parenteral medications. • A known egg allergy is **not** a contraindication to Imvamune vaccine. • Anaphylactic reaction to a previous dose of Imvamune. **Precautions:** • Immunization with Imvamune must be postponed in individuals with acute febrile conditions if used for pre-exposure prophylaxis.
Myopericarditis	• First and second generation (replicating) smallpox vaccines have been associated with myopericarditis. • With the third generation vaccine, Imvamune (non-replicating), there is a theoretical risk of myopericarditis following immunization. ○ In clinical trials, no confirmed case of myocarditis, pericarditis, endocarditis or any other type of cardiac inflammatory disease was recorded. ○ Post-market safety surveillance data on Imvamune is now available, and shows the vaccine is well tolerated with no signal indicating increased risk of myocarditis or anaphylaxis following immunization, and no new or unexpected safety concerns were identified. • For individuals with a history of myocarditis/pericarditis linked to a previous dose of live replicating first or second generation smallpox vaccine and/or Imvamune, the benefit of pre-exposure or post-exposure immunoprophylaxis to protect against infection versus the risk of recurrent myocarditis/pericarditis should be discussed.
Individuals with Immuno-compromising Conditions	• Individuals with immunocompromising conditions may be at risk for more severe outcomes if infected with mpox depending on the nature and degree of the immunosuppression. • Live vaccines are usually contraindicated for individuals who are immunocompromised. However, Imvamune may be used safely in this group as it is considered a non-replicating vaccine. The safety profile of Imvamune was similar in both immunocompetent and immunocompromised individuals. • The use of Imvamune in individuals who are immunocompromised is supported by clinical trials which include individuals who are HIV infected (CD4 greater or equal to 100 cells/μL)

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	and hematopoietic stem cell transplant (HSCT) recipients (studied 2 years post HSCT). Safety of Imvamune in these populations was comparable to healthy controls. • There were limited data overall on vaccine efficacy, immunogenicity or safety in individuals who are immunocompromised. • Individuals who are immunocompromised may have lower immune responses to Imvamune compared to individuals who are immunocompetent. • Imvamune can be offered to individuals who are immunocompromised due to disease or treatment if informed consent includes discussion about the limited evidence on the use of Imvamune in this population.
Individuals with Atopic Dermatitis	• Imvamune may be safely administered to individuals with atopic dermatitis • Individuals with atopic dermatitis were a risk group with severe outcomes for earlier generations of smallpox vaccines • From the limited clinical testing of Imvamune, solicited adverse events were more frequent in this group, including transient worsening of atopic dermatitis. The difference was mostly due to events of mild to moderate severity • Immune responses were comparable between individuals with and without atopic dermatitis.
Children from Birth up to and Including 17 Years of Age	• This population may be at higher risk of severe outcomes from mpox infection and may benefit from immunization. • There is limited safety and efficacy information for use of Imvamune in children. • Indirect evidence of clinical testing of the MVA vector as a viral vector vaccine platform for other vaccines in development (including RSV, TB and Ebola, often at a considerably higher dose than used in Imvamune) indicates that Imvamune components are well tolerated in individuals under 18 years of age. • The Bavarian Nordic A/S live-attenuated, non-replicating mpox vaccine (UK product name Imvanex) has been administered safely to children in the United Kingdom for post-exposure prophylaxis, including at least one infant. • Imvamune can be offered to a child either pre-exposure or post-exposure if they meet the eligibility criteria and informed consent includes discussion about the limited evidence on the use of Imvamune in this population.
Possible Reactions	**Common:** • Pain, erythema, itching, swelling, and induration at the injection site • Fatigue, headache, myalgia, nausea • Injection site nodule, bruising, skin discolouration, warmth at injection site • Fever, chills • Pain in extremity, arthralgia, decreased appetite. **Uncommon:** • Irritation, exfoliation, inflammation, paraesthesia, and hemorrhage at the injection site • Underarm swelling, lymphadenopathy, axillary pain • Malaise, flushing, dizziness • Musculoskeletal stiffness, chest pain, back pain, neck pain, throat pain • Nasopharyngitis, pharyngeal pain, rhinitis, cough • Rash, pruritus, dermatitis, skin discolouration, • Vomiting, diarrhea, dry mouth, cough • Sleep disorder • Paresthesia • Increased Troponin I and hepatic enzymes • Decreased white blood cell count and mean platelet volume. **Rare:** • Rash, anesthesia, dryness, movement impairment, vesicles at the injection site • Migraine

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	• Peripheral sensory neuropathy • Muscle spasms, musculoskeletal pain, muscular weakness • Urticaria, angioedema, peripheral edema • Hyperhidrosis, night sweats • Subcutaneous nodule • Abdominal pain • Tachycardia • Sinusitis • Conjunctivitis • Asthenia • Ecchymosis • Increased white blood cell count • Vertigo • Anaphylaxis. Unexpected or unusual side effects can occur. Refer to product monograph for more detailed information.

Pregnancy	May use during pregnancy.
	• Imvamune should be offered in pregnancy either pre-exposure or post-exposure if the individual meets the eligibility criteria and informed consent includes discussion about the limited evidence on the use of Imvamune in this population.
	  ○ Data available on the use of Imvamune in pregnancy is limited. However, there are no reported safety issues.
	  ○ Animal reproductive studies did not reveal any evidence of impaired fertility or harm to the fetus.
	  ○ Persons who are pregnant may particularly benefit from post-exposure immunization as they are at risk for severe outcomes from disease.
	  ○ Live vaccines are usually contraindicated for persons who are pregnant. However, Imvamune may be used safely in this group as it is considered a non-replicating vaccine.

Lactation	May use for individuals who are breast/chest feeding.
	• Individuals who are breast/chest feeding should be offered Imvamune vaccine either pre-exposure or post-exposure if they meet the eligibility criteria and the lack of evidence on the use of Imvamune in this population has been discussed.
	  ○ Persons who are lactating are not at higher risk of negative outcomes due to mpox infection.
	  ○ Safety during lactation has not been established as there are limited Imvamune data in this population.
	  ○ It is not known if vaccine components/antigens or antibodies are excreted in human milk; however, this is unlikely as Imvamune is a non-replicating vaccine.
	  ○ At this time, there is no reason to believe that immunization would have any adverse impact on the person who is lactating or the child.

Composition	• Imvamune is a live, attenuated, and non-replicating vaccine produced from the orthopoxvirus strain Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN). • MVA-BN has a restricted host-range and fails to replicate in human cells due to multiple genomic deletions and other mutations that block viral assembly and egress in the cells. Each 0.5 mL dose contains: **Active Ingredients:** • titer of at least 0.5 x 10^8 infectious units (Inf.U) of MVA-BN **Non-medicinal ingredients:** • Tris buffer

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	• sodium chloride 4.1 mg • trometamol 0.61 mg • water for injection • hydrochloric acid • trace amounts of host cell DNA and protein, benzonase, gentamicin and ciprofloxacin. • contains no preservatives and no adjuvants. **Note:** The orthopoxvirus strain used in Imvamune is grown in chicken embryo fibroblast cells.
Blood/Blood Products	Does not contain blood/blood products.

Bovine/Porcine Products	• Bovine and porcine derived materials are used indirectly during the production of MVA-BN.
	• The manufacturing of the following media and reagents involves the use of porcine or bovine derived materials:
	  ○ Benzonase (Casein hydrolysate of bovine origin is used in the production process of Benzonase)
	  ○ Trypsin-EDTA (Porcine trypsin, Bovine lactose).

Latex	Does not contain latex-Bromobutyl rubber stopper.
Interchangeability	N/A
Administration with Other Products	• Imvamune can be given on the same day, at the same time or at any time before or after other inactivated and live vaccines. • This vaccine can be administered any time before or after tuberculin skin testing. • Interaction with concomitant administration of immunoglobulins has not been established. ○ No minimum spacing is required between administration of immunoglobulins or blood products and Imvamune.
Appearance	The product should appear as a milky coloured homogenous suspension after thawing.

Storage	• When possible, store between -90°C to -70°C.
	  ○ Shelf life when stored at this temperature is 9 years from the date of manufacture.
	  ○ After prior long-term storage at -90°C to -70°C, vaccine can be stored at -25°C to -15°C for up to 91 days, not exceeding the approved shelf life at -90°C to -70°C
	• Shelf life when stored between -60°C to -40°C is 5 years from date of manufacture.
	• Shelf life when stored between -25°C to -15°C is 3 years from date of manufacture
	• Can be stored at +2°C to +8°C for up to 2 months.
	• Transport Imvamune in the frozen (-25°C to -15°C) or thawing state.
	• Refrigerate vaccine that is received in the thawing state at +2 to +8°C.
	• Thaw vaccine before use.
	  ○ Thaw time at room temperature is 10 minutes.
	• Swirl gently for 30 seconds. Do not shake.
	• Do not refreeze.
	• Protect from light.
	• For the most recent updates to storage conditions and shelf life for vaccine distributed in Canada, see: IMVAMUNE Vaccine: Updated Storage Conditions and Shelf Life.
	• See Product Monograph for more details.

Vaccine Code	SMAMONV
Antigen Code	SMA-1
Licensed for	Active immunization against smallpox, mpox and related orthopoxvirus infection and disease in adults 18 years of age and older determined to be at high risk of exposure. **Note:**

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	• Imvamune is approved by Health Canada under the provisions of the Extraordinary Use New Drug regulations.
Off-License Use	• Post-exposure prophylaxis for children from birth up to and including 17 years of age determined to be at high risk of exposure. • Pre-exposure use for individuals less than 18 years of age.
Notes	• 2022 June 7: Implemented in Alberta. • 2022 July 28: Updated to include indications for pre-exposure use. • 2022 August 10: Updated storage and handling section to ensure most recent information is available. • 2022 September 21: Updated to include information about immunity following infection. • 2022 October 11: Updated to expand eligibility for pre-exposure immunization and roll out second doses for pre-exposure immunization. • 2022 December 1: Updated with revised disease name (mpox) from the World Health organization, updated co-administration recommendation and clarification that pre-exposure use in individuals less than 18 years of age is off-license. • 2023 March 1: Updated to expand eligibility for pre-exposure immunization (laboratory research settings). • 2023 June 30: Storage and handling section updated as per product monograph updates from March 10, 2023 and correspondence from the Public Health Agency of Canada • 2024 August 20: Updated to align with national recommendations in the context of an ongoing immunization program. • 2025 January 31: Pre-exposure eligibility updated to include health care workers deployed to support mpox outbreaks.
Related Resources	Mpox (Monkeypox) Vaccine Information Sheet

References

Alberta Health. (2025, January 31). Smallpox and Mpox Vaccine. In *Alberta Immunization Policy: Biological Products*. Government of Alberta.

Bavarian Nordic. (2023, August 3). IMVAMUNE Smallpox and mpox Vaccine. Modified Vaccinia Ankara-Bavarian Nordic. Health Canada databse. https://pdf.hres.ca/dpd_pm/00071931.PDF

BC Centre for Disease Control (2023, June). Smallpox and Mpox Vaccine (Live attenuated, non-replicating) IMVAMUNE In *Communicable Disease Control Manual: Chapter 2: Immunization. Part 4 Biological Products.* BC Centre for Disease Control, Population and Public Health Program.

Government of the United Kingdom. (2022, September 26). Smallpox and monkeypox *In Green Book: Chapter 29*. UK Health Security Agency.

National Advisory Committee on Immunization. (2024, May 24). *Interim guidance on the use of Imvamune in the context of a routine immunization program: An advisory committee statement.* Public Health Agency of Canada.

National Advisory Committee on Immunization. (2022, August 3). *NACI Rapid Response: Interim guidance on the use of Imvamune in the context of monkeypox outbreaks in Canada: An advisory committee statement.* Public Health Agency of Canada.

National Advisory Committee on Immunization (2022, September). *NACI Rapid Response: Updated interim guidance on Imvamune in the context of ongoing monkeypox outbreaks: An advisory committee statement.* Public Health Agency of Canada.

Public Health Agency of Canada. (2024, November 25). Smallpox and mpox (monkeypox) vaccines. *In Canadian Immunization Guide: Part 4: Immunizing agents*. Government of Canada.

Public Health Agency of Canada. (2023, May 19). Imvamune: Storage temperatures, shelf life, shipment and supportive temperature excursion information. Government of Canada.

UK Health Security Agency. (2022, August 26). Recommendations for the use of pre-and post-exposure vaccination during a monkeypox incident. Department of Health and Social Care.

U.S. Centre for Disease Control and Prevention (2022 June 3). Use of JYNNEOS (Smallpox and Monkeypox Vaccine, Live, Nonreplicating) for Preexposure Vaccination of Persons at Risk for Occupational Exposure to Orthopoxviruses: Recommendations of the Advisory Committee on Immunization Practices. *In Morbidity and Mortality Weekly Report*.

U.S. Centers for Disease Control and Prevention (2024, June 13). Mpox Vaccination *In Healthcare Professionals: Vaccine Considerations: Vaccination.* Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases.