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## INDIVIDUALS AT HIGH RISK FOR VACCINE PREVENTABLE DISEASE

All considerations and recommendations are for pre-exposure situations (i.e., before individuals who are members of one or more of these groups are knowingly exposed to a vaccine-preventable disease).

[Table 1 Vaccines Recommended for Immunosuppressed Clients](#) provides health care providers with an overview of vaccines to consider when assessing an individual with a health condition that is known to suppress the immune system.

There are a variety of other health conditions that place an individual at increased risk for certain vaccine preventable diseases. Refer to [Table 2 Vaccines Recommended for Individuals with Other Health Conditions](#) for an overview of high risk health conditions and recommended vaccines.

There are a few groups of individuals (e.g., health and child care workers, new Canadians) who require special consideration of their immunization status and who are eligible for certain vaccines. [Table 3 Vaccines Recommended for Select Populations](#) outlines the immunization needs of members of select populations.

When assessing a high risk individual's eligibility for certain vaccines, it is important to assess overall immunization status and current state of health. Unless contraindicated (i.e., live vaccines for immune-suppressed individual), ensure routine vaccines are included in the client's immunization plan.

When a client presents with an identified health condition or is identified as being a member of a select population:

- Ascertain the details of client's specified health condition (if applicable).
- Assess the client's immunization and communicable disease history.
- Refer to recommendations relating to the client's medical condition or population in this section.
- Ensure routine immunizations are up to date. There is no indication to re-administer a primary immunization series except for HSCT recipients.
- Assess the individual's eligibility for additional recommended vaccines.
- Assess for any contraindications to any recommended vaccines.
- If recommended, consult the client's medical specialist prior to administration of live vaccines (i.e., varicella and MMR).
- For more information on specific vaccines, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).



**TABLE 1: VACCINES RECOMMENDED FOR IMMUNOSUPPRESSED CLIENTS**

	VACCINES							
	Special Indications						Routine	
	Meningo ①	Pneumo ②	Hib	Hep A	Hep B	Influenza ③	Inactivated	Live
<b>IMMUNE-SUPPRESSING CONDITIONS</b>								
Asplenia (anatomic or functional), including sickle cell disease	x	x	x			x	x	④
Congenital immunodeficiency (e.g., Complement, properdin, or factor D deficiency)	x	x	x			x	x	C ⑤
Hematopoietic Stem Cell Transplant (HSCT) recipient	x	x	x	x	x	x	x	④
HIV + adult		x	x	x	x	x	x	④
Immunosuppressive therapy		x	x			x	x	C ⑤
Islet cell transplant candidate or recipient	x	x	x			x	x	④
Kidney disease (chronic) (pre-dialysis and dialysis clients)		x			x	x	x	④
Liver disease (chronic)		x		x	x	x	x	x
Hepatitis B (chronic)		x		x		x	x	x
Hepatitis C (chronic)		x		x	x	x	x	x
Malignant neoplasm		x	x			x	x	C ⑤
Solid organ (liver, heart, lung, kidney) transplant candidate or recipient	x	x	x	liver	liver kidney	x	x	④

- ① Meningo = Meningococcal conjugate vaccines
- ② Pneumo = Pneumococcal conjugate and/or polysaccharide vaccine
- ③ Yearly influenza immunization is indicated for all immunosuppressed individuals ≥ 6 months of age.
- ④ Special considerations exist.
- ⑤ C = Contraindicated

This table is intended as a guideline only. For more information, refer to the appropriate health condition in this Section or [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

**TABLE 2: VACCINES RECOMMENDED FOR INDIVIDUALS WITH OTHER HEALTH CONDITIONS**

	VACCINES ❶							
	Special Indications						Routine	
	Meningo ❷	Pneumo ❸	Hib	Hep A	Hep B	Influenza	Inactivated	Live
CONDITIONS								
Infants at high risk for hepatitis B					X		X	X
Bleeding disorders (e.g., hemophilia)				X	X		X	X
Chronic heart or lung disease		X				X	X	X
CSF leak (chronic)		X					X	X
Cochlear implant candidate or recipient	X	X	X				X	X
Cystic fibrosis		X				X	X	X
Diabetes		X				X	X	X
Neurologic Disorders						X	X	X
Pregnancy						X	X	C ❸
Prematurity						X	X	X

**TABLE 3: VACCINES RECOMMENDED FOR SELECT POPULATIONS**

	VACCINES ❶							
	Special Indications						Routine	
	Meningo ❷	Pneumo ❸	Hib	Hep A	Hep B	Influenza	Inactivated	Live
POPULATIONS								
Health and Childcare Workers						X	X	X
Inmates of Provincial Correctional facilities				X	X	X	X	X
International travellers ❹							X	X
Men who have sexual contact with men				X	X		X	X
New Canadians							X	X
Unknown or uncertain immunization status							X	X

❶ Vaccines that are recommended and provided free are included in this table. Individuals may be eligible for other vaccines if other co-existing health conditions exist.

❷ Meningo = Meningococcal conjugate vaccines

❸ Pneumo = Pneumococcal conjugate and/or polysaccharide vaccine

❹ Additional vaccines may be recommended for international travel. Consultation with a travel health professional is recommended.

❸C = Contraindicated

Tables are intended as a guideline only. For specific schedule information regarding individual vaccines, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).



## 1.0 IMMUNOCOMPROMISED INDIVIDUALS

Immunocompromised individuals are unable to mount an adequate immune response. The cause of the altered immunocompetent state can be primary (inherited) or secondary (acquired) and it can be temporary or permanent.

A variety of conditions and treatments can affect the immune system of an individual, making them more vulnerable to a range of communicable diseases. These conditions include:

- Asplenia (functional or anatomic)
- Congenital immunodeficiencies involving any part of the immune system, including B-lymphocyte (humoral) immunity, T-lymphocyte (cell) mediated immunity, Complement System (Properdin, or factor D deficiencies), or phagocytic functions
- Hematopoietic stem cell transplantation (HSCT)
- Human Immunodeficiency Virus infection (HIV)
- Immunosuppressive therapy including corticosteroids, chemotherapy, radiation therapy, post-organ-transplant therapy, and certain anti-rheumatic drugs
- Islet cell transplant (candidate or recipient)
- Chronic kidney disease
- Chronic liver disease (including hepatitis B and C)
- Malignant neoplasms including leukemia and lymphoma
- Solid organ transplant (candidate or recipient)

Individuals with conditions that compromise the effectiveness of their immune system are at particular risk of infection with encapsulated bacteria such as *Streptococcus pneumoniae* (pneumococcal), *Neisseria meningitidis* (meningococcal), and *Haemophilus influenzae* type b (Hib).

In some immunocompromised individuals, even a less than optimal response to vaccine may provide important benefit as they may be at high risk of morbidity and mortality due to vaccine-preventable infection.

Only HSCT clients require re-immunization due to the hematopoietic ablative therapy preceding the transplant. All other immunocompromised individuals should be immunized according to past immunization history. The exception to this is asplenic clients > 5 years of age who should receive one dose of Hib vaccine regardless of their immunization history.



## 1.1 HOUSEHOLD CONTACTS OF IMMUNOCOMPROMISED INDIVIDUALS

Assess the immunization status of household contacts of immunocompromised individuals. Ensure routine immunizations are up-to-date.

There are no contraindications to immunization of a household or close contact of immunosuppressed individuals.

Ensure that vaccination opportunities are not missed for household contacts of individuals with conditions that compromise their immune system.

As the immune response in individuals with compromised immune systems may be suboptimal, the immunization of household contacts provides important protection against transmission of disease in the household.

Offer yearly influenza immunization to all household contacts of immunocompromised individuals, regardless of whether or not the individual at high risk has been immunized. Household and close contacts of immunocompromised individuals can be immunized with MMR and varicella vaccines as the vaccine viruses are rarely transmitted to contacts.

No special precautions need to be taken post MMR immunization, regardless of whether or not a post – vaccine rash occurs.

After varicella immunization, no special precautions need to be taken unless the vaccine recipient develops a post - varicella vaccination rash within 42 days of vaccine receipt. Vaccine recipients should keep the rash covered. If this is not possible, they should minimize contact with susceptible immunocompromised individuals for the duration of the rash. If contact inadvertently occurs, the risk of transmission is low and administration of Varlg is not indicated.

## 1.2 GENERAL PRINCIPLES FOR IMMUNIZATION OF THE IMMUNOCOMPROMISED

### **Maximize benefit while minimizing harm.**

- There is potential for serious illness and death in the under-immunization of immunocompromised people and every effort should be made to ensure adequate protection through immunization.

### **Make no assumptions about susceptibility or protection.**

- A history of childhood infection or previous vaccination may be irrelevant.

### **Vaccinate at the time when maximum immune response can be anticipated.**

- Vaccines may be less effective when administered during the period of altered immunocompetence. Individuals who are fully immunized may remain at risk for vaccine-preventable diseases.
- Vaccinate early when immunologic decline is predictable.
- Delay vaccination if the immunodeficiency is transient (if this can be done safely).
- Primary health care provider may decide to stop or reduce immunosuppressive therapy to permit better vaccine response (if this is appropriate).

### **Consider the vaccination environment broadly.**

- Vaccinate family and care givers when individuals need protection (i.e., against influenza).

### **Avoid live vaccines unless:**

- Data are available to support their use and
- The risk of natural infection is greater than the risk of vaccination.

### **Administer routine boosters as indicated.**

- The degree and duration of vaccine-induced immunity are often reduced in immune compromised individuals.

### **Consider the use of passive immunizing agents.**

- **These include:**
  - Immune globulin (Ig)
  - Intravenous immune globulin (IVIg)
  - The several “pathogen-specific” Ig preparations that are available (i.e., varicella zoster Ig, tetanus Ig).



### 1.3 IMMUNIZATION WITH INACTIVATED VACCINES

For the immunocompromised population, there are no contraindications to immunization using inactivated vaccines.

Immunocompromised individuals may not mount an optimal immune response to vaccines. Specific vaccine formulations (e.g., hepatitis B vaccine for individuals with chronic renal disease) and / or specific immunization schedules may be recommended.

### 1.4 IMMUNIZATION WITH LIVE VACCINES

The decision to immunize an immunocompromised individual with a live vaccine can only be made following consultation with specialists knowledgeable in both the immunosuppressive disease and the vaccine.

The inappropriate use of live vaccines can cause serious adverse events in some immunocompromised individuals as a result of the uncontrolled replication of the virus or bacterium.

Consult the client's medical specialist and obtain a written referral regarding the appropriateness of live vaccine administration to any individual whose immune system is compromised as the result of disease or therapy.

Utilize the [Referral Form For Varicella Vaccination](#) and [Referral Form For MMR Vaccination](#) to communicate with and obtain recommendation from client's specialist regarding immunization with varicella and MMR vaccines.

Many individuals with immunosuppressing conditions are immune to varicella as a result of earlier immunization or disease. Assess all immune suppressed clients  $\geq 12$  months of age for varicella susceptibility prior to immunization. A varicella susceptible individual is defined as an individual:

- with a history of varicella disease  $< 12$  months of age
- with no history of chickenpox disease at  $\geq 12$  months of age, no history of herpes zoster, and no history of varicella immunization
- $\geq 13$  years of age who has no history of varicella immunization, no or uncertain history of varicella disease or herpes zoster, **and** has negative VZV IgG serology.

Recommendations for MMR and varicella vaccines for immunocompromised individuals are not the same. Refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#) for specific recommendations.



**Considerations for immunization with MMR and varicella vaccine for the following clients with immunosuppressing conditions:**

**Asplenia / Hyposplenia** (congenital, surgical, or functional):

- MMR and varicella vaccines are recommended.

**Hematopoietic stem cell transplant (HSCT):**

- MMR and varicella vaccines may be considered if the client is  $\geq 2$  years post transplant AND there is no graft versus host disease and no immunosuppressive treatment.

**High doses of oral corticosteroid therapy of more than 14 days duration** (more than 2 mg/kg or >20 mg of prednisone daily):

- MMR and varicella vaccines may be considered if the client is able to discontinue therapy for one month prior to immunization.
- It is not necessary to obtain a written referral for immunization of clients who are receiving physiologic replacement of corticosteroids (<2mg/kg of prednisone per day) or who are receiving oral corticosteroid therapy for 14 days or less.

**HIV infection:**

- MMR vaccine may be considered if no evidence of significant immune system compromise is present.
- Varicella vaccine may be considered for individuals  $\geq 12$  months of age with asymptomatic or mildly symptomatic HIV infection (CDC class N1 or A1) and with age – specific CD4 percentages of  $\geq 25\%$ .

**Immunosuppressive therapy** (e.g., chemotherapy, radiation therapy, and certain anti-rheumatic drugs):

- Live vaccines are contraindicated during therapy but may be considered if only low doses of immunosuppressive drugs are required and there is significant risk of wild-type infection.
- MMR and varicella vaccines may be considered if  $\geq 3$  months has elapsed since immunosuppressive therapy was discontinued.

**Isolated immunodeficiencies** (i.e., humoral (IG), neutrophil, or complement deficiency):

- MMR and varicella vaccines are recommended.

**Considerations for immunization with MMR and varicella vaccine for the following clients with immunosuppressing conditions (cont'd):**

**Leukemia, lymphoma or generalized malignancy:**

- MMR and varicella vaccines are contraindicated until  $\geq 3$  months has elapsed since the client was cured and immunosuppressive therapy was discontinued.
- Acute lymphocytic leukemia (ALL) – varicella vaccine is recommended if the client's disease has been in remission for  $\geq 12$  months, the client's total lymphocyte count is  $\geq 1.2 \times 10^9/L$ , the client is not receiving radiation therapy, and maintenance chemotherapy can be withheld for at least 1 week before to 1 week after immunization.

**Solid organ transplant candidate or recipient:**

- MMR and varicella vaccines are recommended for solid organ transplant **candidates**.
- MMR and varicella vaccines are contraindicated for solid organ transplant **recipients**. MMR vaccine may be considered for seronegative females before pregnancy  $\geq 2$  years post transplantation if the individual is taking minimal immunosuppressive therapy.

**Chronic kidney disease and dialysis clients:**

- MMR and varicella vaccines are recommended.

Live oral attenuated typhoid vaccine is contraindicated for all immunocompromised persons, regardless of benefits.

A family history of congenital immunodeficiency may not be evident in infants  $< 12$  months of age but may be documented as an overwhelming infection following natural infection or receipt of a live vaccine with or without death, including in older siblings or siblings born earlier.

- Assess family history of these types of events prior to administering a live vaccine to an infant  $< 12$  months of age (i.e., MMR vaccine for an infant travelling to a measles endemic region). If such a history is present, live vaccines are contraindicated.



1.4.1 REFERRAL FORM FOR VARICELLA VACCINATION

VARICELLA VACCINATION OF IMMUNOCOMPROMISED CLIENTS REQUIRES A MEDICAL SPECIALIST'S APPROVAL

Date: \_\_\_\_\_ (yyyy/mm/dd) Re: \_\_\_\_\_ (Patient's surname) (Given name)

\_\_\_\_\_  
Patient's DOB (yyyy/mm/dd) (Patient's PHN)

In British Columbia, publicly funded varicella vaccine is available for the following varicella susceptible **immunocompromised** persons: (Check appropriate box for your patient)

<p>Children and adults with:</p> <p><input type="checkbox"/> Acute lymphocytic leukemia in remission for at least 12 months (<b>use Varilrix only</b>) (Total lymphocyte count must be <math>\geq 1.2 \times 10^9</math> /L and client <b>not</b> receiving radiation therapy at the time of immunization. If clients are still receiving maintenance chemotherapy, it should be withheld for at least 1 week before to 1 week after immunization). Give 2 doses 1 – 3 months apart.</p> <p><input type="checkbox"/> Asymptomatic HIV, CD4 <math>\geq 25\%</math> for age. Give 2 doses 3 months apart.</p> <p>Isolated: (follow age appropriate dosage schedule)</p> <p><input type="checkbox"/> Humoral (IG) deficiency diseases</p> <p><input type="checkbox"/> Neutrophil deficiency disorders</p> <p><input type="checkbox"/> Complement deficiency diseases</p> <p><input type="checkbox"/> Asplenia / Hyposplenia (congenital, surgical removal or functional)</p> <p><input type="checkbox"/> Other</p>	<p><input type="checkbox"/> Child and Adult candidates for solid organ transplant. Administer last dose of vaccine 6 weeks before transplantation, providing the client is not receiving immunosuppressive treatment.</p> <p><input type="checkbox"/> <math>\geq 2</math> years after HSCT transplant (providing there is minimal immunosuppression and no graft vs. host disease). No need to test for VZV IgG prior to immunization.</p> <p><input type="checkbox"/> <math>\geq 3</math> months after being cured of a malignant disease and the end of immunosuppressive treatment.</p> <p><input type="checkbox"/> Chronic kidney disease/dialysis</p> <p><input type="checkbox"/> <math>\geq 1</math> month after completion of high doses (<math>&gt;2\text{mg/kg}</math> or <math>&gt;20</math> mg daily) oral corticosteroid therapy more than 14 days duration</p>
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- A varicella susceptible person is
  - An individual with a history of chickenpox disease at < 12 months of age; a child 12 months to 12 years of age with no history of varicella immunization, no varicella disease at  $\geq 12$  months of age, or no herpes zoster, or
  - a person  $\geq 13$  years of age who has no history of varicella immunization, no or uncertain history of varicella disease or herpes zoster, **and** has negative VZV IgG serology. Test VZV IgG as necessary, and report test result.

**To be completed by Medical Specialist:** To Public Health Nurse:

1) VZV IgG test result \_\_\_\_\_ Date of test: \_\_\_\_\_.

2) I have verified that as of the following date of \_\_\_\_\_ this patient has no medical contraindications to the receipt of live attenuated varicella vaccine. I understand that persons 13 years of age and older require a second dose given one to three months after the first dose, and verify that this patient's condition is sufficiently stable to permit receipt of both doses, if age appropriate.

Medical Specialist's Signature: \_\_\_\_\_ Clinic: \_\_\_\_\_

Medical Specialist's Phone # \_\_\_\_\_ Fax # \_\_\_\_\_

**To be completed by Public Health Nurse and faxed back to Medical Specialist:**

Varicella Vaccination(s) (2 doses if  $\geq 13$  years of age or if indicated):

Date: \_\_\_\_\_ Lot #: \_\_\_\_\_ Site \_\_\_\_\_ Initials: \_\_\_\_\_

Date: \_\_\_\_\_ Lot #: \_\_\_\_\_ Site \_\_\_\_\_ Initials: \_\_\_\_\_

Public Health Nurse's Name: \_\_\_\_\_

Public Health Nurse's Phone #: \_\_\_\_\_



1.4.2 REFERRAL FORM FOR MMR VACCINATION

**MMR VACCINATION OF IMMUNOCOMPROMISED CLIENTS WITH A LIVE VACCINE REQUIRES A MEDICAL SPECIALIST'S APPROVAL**

Date: \_\_\_\_\_  
(yyyy/mm/dd)

Re: \_\_\_\_\_  
(Patient's surname) (Given name)

\_\_\_\_\_  
Patient's DOB (yyyy/mm/dd)

\_\_\_\_\_  
(Patient's PHN)

**MMR vaccine is available for the following immunocompromised ❶ persons:  
(Check appropriate box for your patient)**

- HSCT recipient (provided there is no GVHD, no suppressive Rx): **2 doses 6 – 12 mos apart ❷**
  - Chronic Kidney Disease/Dialysis: **2 doses minimum 4 weeks apart ❸**
  - HIV/AIDS (if no significant compromise): **2 doses minimum 4 weeks apart ❸**
  - Solid Organ Transplant Candidate: **2 doses minimum 4 weeks apart ❸**
  - Asplenia / Hyposplenia (congenital, surgical removal or functional): **2 doses minimum 4 weeks apart ❸**
  - Isolated: **(2 doses minimum 4 weeks apart) ❸**
    - Humoral (Ig) deficiency diseases
    - Neutrophil deficiency diseases
    - Complement deficiency diseases
  - ≥ 3 months after being cured of a malignant disease and the end of immunosuppressive treatment: **2 doses minimum 4 weeks apart ❸**
  - ≥ 1 month after completion of high doses (>2mg/kg or >20 mg daily) oral corticosteroid therapy: **2 doses minimum 4 weeks apart ❸**
- Other: \_\_\_\_\_

❶ Separate the administration of MMR and Varicella vaccine by at least 4 weeks ❷ Only HSCT clients require re-immunization (2 doses) due to the hematopoietic ablative therapy preceding the transplant. ❸ Immunize according to past immunization history (e.g., if 1 dose previously received, give 1 more dose).

**To be completed by Medical Specialist:** To Public Health Nurse:

*I have verified that as of the following date of (yyyy/mm/dd) \_\_\_\_\_, this patient has no medical contraindications to the receipt of live attenuated MMR vaccine. I understand that individuals may require up to two doses, and verify that this patient's condition is sufficiently stable to permit receipt of two doses.*

Medical Specialist's Signature: \_\_\_\_\_ Clinic: \_\_\_\_\_

Medical Specialist's Phone # \_\_\_\_\_ Fax # \_\_\_\_\_

**To be completed by Public Health Nurse and faxed back to Medical Specialist:**

MMR Vaccine (2 doses, if indicated):

Date: \_\_\_\_\_ Lot #: \_\_\_\_\_ Site \_\_\_\_\_ Initials: \_\_\_\_\_

Date: \_\_\_\_\_ Lot #: \_\_\_\_\_ Site \_\_\_\_\_ Initials: \_\_\_\_\_

Public Health Nurse's Name: \_\_\_\_\_

Public Health Nurse's Phone #: \_\_\_\_\_



## 1.5 SPECIFIC CONDITIONS

### 1.5.1 ANATOMIC OR FUNCTIONAL ASPLENIA

<b>Recommended vaccines<sup>❶</sup> for those with anatomic or functional asplenia</b>	
All routine immunizations	Immunize according to routine schedule.
Hib vaccine	All individuals > 5 years of age require one dose regardless of immunization history <sup>❷</sup>
Meningococcal vaccine	<ul style="list-style-type: none"> <li>• Meningococcal C conjugate for those <math>\geq 2</math> months to <math>\leq 10</math> years of age.</li> <li>• Meningococcal quadrivalent conjugate vaccine for those <math>\geq 2</math> years of age. Reinforcement dose(s) recommended<sup>❸</sup></li> </ul>
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine.
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
MMR vaccine	Consult client's medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> <sup>❹</sup>
Varicella vaccine	Consult client's medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a> <sup>❹</sup>

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

❷ With the exception of Hib vaccine, where one dose is recommended regardless of immunization history, asplenic individuals do not require re-immunization.

❸ If individual was previously vaccinated at  $\geq 7$  years of age: give 5 years after previous dose. If individual was previously vaccinated at 2 – 6 years of age: give 3 years after previous dose. Re-immunize every 5 years as long as medical condition exists.

❹ If client had splenectomy following a traumatic injury many years previously and no longer has a medical specialist, obtain referral for immunization with MMR and varicella vaccines from client's family physician or the Medical Health Officer.

Give vaccine(s) at least 14 days prior to elective splenectomy, or, if not possible, 14 or more days post-splenectomy. If there is concern that the patient may not present later for immunization, give vaccine(s) before discharge.

Unimmunized individuals who have had a splenectomy in the past or who have functional hyposplenism should be immunized as soon as their condition is identified.



Asplenia or hyposplenism may be congenital, surgical, or functional. A number of conditions may lead to functional asplenia (e.g., sickle cell anemia, thalassemia major, essential thrombocytopenia, celiac disease, inflammatory bowel disease, and rheumatoid arthritis). Individuals with any of these conditions need further investigation to determine whether their pre-existing condition is compromising their spleen function.

The spleen plays an important role in the body's immune system, including:

- Filtering antigen - antibody complexes and bacteria
- Site for immunoglobulin M (IgM) production, antigen presentation to T cells and memory B cell differentiation
- Production site for a peptide that promotes phagocytosis.

The individual with decreased or no spleen function is at increased risk for infection from a variety of pathogens, particularly those caused by encapsulated polysaccharide bacteria (e.g., pneumococcal, meningococcal, and Hib bacteria).

Children who have sickle cell disease or have had a splenectomy are at increased risk for fulminant pneumococcal sepsis associated with high mortality.

### 1.5.2 CONGENITAL IMMUNODEFICIENCY STATES

Recommended vaccines <sup>①</sup> for those with congenital immunodeficiency states	
All routine <u>inactivated</u> vaccines	Immunize according to routine schedule for inactivated vaccines.
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine. Requires once only revaccination with polysaccharide vaccine.
Meningococcal vaccine	<ul style="list-style-type: none"> <li>• Meningococcal C conjugate for those <math>\geq 2</math> months to <math>\leq 10</math> years of age.</li> <li>• Meningococcal quadrivalent conjugate vaccine for those <math>\geq 2</math> years of age. Reinforcement dose(s) recommended.<sup>③</sup></li> </ul>
Hib vaccine	Unimmunized individuals > 5 years of age require one dose.
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
MMR vaccine <sup>②</sup>	Consult client's medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> .
Varicella vaccine <sup>②</sup>	Consult client's medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a> .

① For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

② Live vaccines:

- may be considered for those individuals with antibody defects if they are not receiving regular Ig replacement therapy.
- may be considered for individuals with phagocytic defects.
- may be considered for individuals with complement deficiency.
- are contraindicated for individuals with T cell, natural killer and mixed cell-mediated antibody defects.
- Live **bacterial** vaccines (e.g., oral typhoid vaccine) are contraindicated.

③ If individual was previously vaccinated at  $\geq 7$  years of age: give 5 years after previous dose. If individual was previously vaccinated at 2 – 6 years of age: give 3 years after previous dose. Re-immunize every 5 years as long as medical condition exists.

Examples of congenital immunodeficiency include disorders of B-lymphocyte (humoral immunity), T-lymphocyte (cell-mediated immunity), complement system (including Properdin or factor D deficiencies), or phagocytic functions.

Inactivated and component vaccines can be safely administered to individuals with all of these conditions, keeping in mind that many of the vaccine recipients will not develop an adequate immune response. Consider use of IVIg or pathogen-specific Ig if individual is exposed to vaccine-preventable disease.



### 1.5.3 HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT)

Recommended vaccines <sup>①</sup> for HSCT recipients <sup>②</sup>	
Diphtheria, tetanus, acellular pertussis, polio, Hib vaccine	Individuals < 7 years of age.
Tetanus, diphtheria, acellular pertussis, and polio vaccines	<ul style="list-style-type: none"> <li>Individuals <math>\geq 7</math> to &lt; 18 years of age: 3 doses Tdap and 3 doses IPV.</li> <li>Individuals <math>\geq 18</math> years of age: 1 dose Tdap and 1 dose IPV followed by 2 doses of Td/IPV.</li> </ul>
Hib vaccine	All ages require 3 doses.
Hepatitis A vaccine	All individuals $\geq 6$ months of age.
Hepatitis B vaccine	All ages. Each dose should be double $\mu\text{g}$ for age.
Pneumococcal vaccine	Conjugate and / or polysaccharide depending on age.
Meningococcal vaccine	<ul style="list-style-type: none"> <li>Meningococcal C conjugate for those <math>\geq 2</math> months to <math>\leq 10</math> years of age.</li> <li>Meningococcal quadrivalent conjugate vaccine for those <math>\geq 2</math> years of age. Reinforcement dose(s) recommended.<sup>③</sup></li> </ul>
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
MMR vaccine	<ul style="list-style-type: none"> <li>Wait 24 months post HSCT before administering.</li> <li>Only administer with specialist approval. Use <a href="#">Referral Form for MMR Vaccination</a>.</li> <li>Contraindicated if chronic GVHD is present or if taking immunosuppressive therapy for chronic GVHD.</li> </ul>
Varicella vaccine	<ul style="list-style-type: none"> <li>Wait 24 months post HSCT before administering. Only administer with specialist approval. Use <a href="#">Referral Form for Varicella Vaccination</a>.</li> <li>Contraindicated if chronic GVHD or if taking immunosuppressive therapy for GVHD.</li> </ul>

<sup>①</sup>For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

<sup>②</sup>Use [Table 4 Worksheet for Adult HSCT recipients](#) or [Table 5 Worksheet for Child HSCT recipients](#) for scheduling guidance and as a paper record of Immunizations

<sup>③</sup> If individual was previously vaccinated at  $\geq 7$  years of age: give 5 years after previous dose. If individual was previously vaccinated at 2 – 6 years of age: give 3 years after previous dose. Re-immunize every 5 years as long as medical condition exists.

Hematopoietic stem cell transplantation (HSCT) results in immunosuppression from:  
Hematopoietic ablative therapy preceding transplant

- Medications used to prevent or treat graft – versus – host disease (GVHD)
- In some cases, the disease process necessitating the transplantation.

HSCT generally involves the ablation of the bone marrow followed by reimplantation of the person's own stem cells (autologous HSCT) or stem cells from a donor (allogeneic HSCT).

Recipients of allogeneic grafts from donors who are not closely matched siblings are at substantially greater risk for GVHD, suboptimal graft function, and delayed capability for immune system memory.

Depending on the pre-ablation immune status of the client in autologous HSCT or on the immune status of the donor in allogeneic HSCT, there may be some immunity to vaccine-preventable diseases following transplantation. However, antibody levels to vaccine preventable diseases decline 1-4 years after HSCT if the recipient is not re-immunized, regardless of whether the transplant was autologous or allogeneic.

The Hematopoietic Stem Cell Transplant (HSCT) program of British Columbia will supply the client with a letter authorizing and outlining the vaccines required; and the recommended schedule. These vaccines may be administered by the client's doctor or by public health, according to Health Authority policy.

Public health should administer the vaccinations according to the client's letter, unless the schedule or vaccine is not licensed for use in the given age group. Maintain minimum intervals between vaccine doses and follow vaccine specific guidelines outlined in the [Communicable Disease Control Manual, Chapter 2, Section VII, Biological Products](#).

If the client undergoes the procedure out-of-province and /or does not receive a letter outlining the vaccines required, refer to [Table 4 Worksheet for Immunization of Adult Hematopoietic Stem Cell Transplant \(HSCT\) Recipients \(Those ≥18 Years of Age\)](#) and [Table 5 Worksheet for Immunization of Child Hematopoietic Stem Cell Transplant \(HSCT\) Recipients \(Those <18 Years of Age\)](#).

Individuals post-HSCT receive all indicated vaccines, regardless of immunization history prior to HSCT and whether it was an allogeneic or autologous HSCT.

Immunization with inactivated vaccines is generally started 12 months post HSCT, except influenza which can be administered 6 months post HSCT.

Do not administer live vaccines until 24 months post HSCT and then only if there is no ongoing immune suppressive treatment or graft-versus-host disease (GVHD). **Note:** BCG is contraindicated at all times.



**Table 4: Worksheet for Immunization of Adult Hematopoietic Stem Cell Transplant (HSCT) Recipients (those ≥ 18 years of age)**

Client name: \_\_\_\_\_ Date of birth: \_\_\_\_\_  
 (Given Name) (Surname) (yyyy/mm/dd)  
 allogeneic recipient Personal Health Number: \_\_\_\_\_  
 autologous recipient Date of transplant: \_\_\_\_\_  
 (yyyy/mm/dd)

1 <sup>st</sup> set of vaccines (12 months after HSCT)	1 month after 1 <sup>st</sup> set of vaccines	2 months after 1 <sup>st</sup> set of vaccines	7 months after 1 <sup>st</sup> set of vaccines	12 mos. after 1 <sup>st</sup> set of vaccines (24 mos. after HSCT)
Date Given	Date Given	Date Given	Date Given	Date Given
Tdap(ADACEL®)		Td/IPV		Td/IPV
IPV				
Act-HIB®		Act-HIB®		Act-HIB®
	Hepatitis A		Hepatitis A	
	Hepatitis B ①	Hepatitis B ①	Hepatitis B ①②	
Pneumococcal Polysaccharide③			Pneumococcal Polysaccharide③	
Menactra™ (Meningococcal quadrivalent conjugate - Groups A, C, Y, W-135)				
				MMR ④⑤⑦ Varicella⑤⑥⑦ ⑧
Influenza (≥ 6 months after HSCT and yearly)				

① Administer double µg dose for age.

② One month after third dose of hepatitis B vaccine, perform serology for anti-HBs. If testing indicates inadequate protection, provide an additional 3 doses of hepatitis B vaccine. Retest anti-HBs one month after the second series of hepatitis B vaccine.

③ Two doses of pneumococcal polysaccharide vaccine are indicated due to the possibility of a blunted immune response.

④ MMR with specialist written approval. Give a second MMR dose 6-12 months after the first dose.

⑤ Wait at least **24 months** after ablative therapy before administering live vaccines and then **only** if there is no ongoing immune suppressive treatment or chronic graft-versus-host disease (GVHD) Separate the administration of MMR and Varilrix® by at least 4 weeks

⑥ Give two doses, one month apart. Obtain medical specialist written approval. Use **Varilrix®**.

⑦ Use either [Referral Form for MMR Vaccination](#) or [Referral Form for Varicella Vaccination](#).

⑧ One month after receipt of second **Varilrix** dose test for VZV antibody. Send sample to BCCDC Laboratory Services and specify that client is immunocompromised. If antibody is not detectable, the client should be offered Varig on subsequent exposures to wild-type varicella.



**Table 5: Worksheet for Immunization of Child Hematopoietic Stem Cell Transplant (HSCT) Recipients (those < 18 years of age)**

Client name: \_\_\_\_\_ Date of birth: \_\_\_\_\_  
 (Given Name) (Surname) (yyyy/mm/dd)

allogeneic recipient

Personal Health Number: \_\_\_\_\_

autologous recipient

Date of transplant: \_\_\_\_\_ (yyyy/mm/dd)

1 <sup>st</sup> set of vaccines (12 months after HSCT)	1 month after 1 <sup>st</sup> set of vaccines	2 months after 1 <sup>st</sup> set of vaccines	7 months after 1 <sup>st</sup> set of vaccines	12 mos. after 1 <sup>st</sup> set of vaccines (24 mos. after HSCT)
Date Given	Date Given	Date Given	Date Given	Date Given
<b>PEDIACEL ① OR ADACEL ②</b>	<b>PEDIACEL ① OR ADACEL ②</b>	<b>PEDIACEL ①</b>		<b>PEDIACEL ① OR ADACEL ②</b>
<b>Act-HIB®</b> (only those ≥ 7 years of age who are receiving ADACEL™)		<b>Act-HIB®</b> (only those receiving ADACEL™)		<b>Act-HIB®</b> (only those receiving ADACEL™)
<b>IPV</b> (only those ≥ 7 years of age who are receiving ADACEL™)		<b>IPV</b> (only those receiving ADACEL™)		<b>IPV</b> (only those receiving ADACEL™)
	<b>Hepatitis A</b> (≥ 6 months of age only)		<b>Hepatitis A</b>	
	<b>Hepatitis B ⑤</b>	<b>Hepatitis B ⑤</b>	<b>Hepatitis B ⑤ ⑥</b>	
<b>Prenar® ③ OR Pneumococcal polysaccharide ④</b>		<b>Prenar® ③</b>	<b>Pneumococcal polysaccharide ④</b> (if not received previously)	<b>Pneumococcal polysaccharide ④</b>
	<b>Meningococcal C conjugate (MCC) ⑦</b>	<b>Menactra™ (Meningococcal quadrivalent conjugate- Groups A, C, Y, W-135) ⑦</b>		
<b>Influenza</b> (≥ 6 months after HSCT and yearly)				<b>MMR ⑧ ⑨</b> <b>Varicella ⑨ ⑩</b>

① Those < 7 years of age. INFANRIX hexa™ should not be used due to timing consideration and hepatitis B dose recommendations.

② Those ≥ 7 years of age.

③ For those < 59 months of age. Once child is 2 years of age, they should receive 2 doses of pneumococcal polysaccharide vaccine, with first dose given at least 8 weeks after the last dose of pneumococcal conjugate vaccine.

④ Those ≥ 2 years of age (2 doses in total).

⑤ Administer double µg dose for age.

⑥ One month after third dose of hepatitis B vaccine, perform serology for anti-HBs. If testing indicates inadequate protection, provide an additional 3 doses of hepatitis B vaccine. Retest anti-HBs one month after the second series of hepatitis B vaccine.

⑦ Children < 2 yrs old: give MCC 1<sup>st</sup>, followed by Menactra™ after 2<sup>nd</sup> birthday. Children 2 yrs to 10 years of age (inclusive): give Menactra™ first, followed by MCC vaccine one month later.

⑧ MMR with specialist written approval. Give a second dose of MMR 6 – 12 months after the first dose.

⑨ Wait at least **24 months** after ablative therapy before administering live vaccines and then **only** if there is no ongoing immune suppressive treatment or graft-versus-host disease (GVHD). Separate administration of MMR and Varilrix by at least 4 weeks.

⑩ One month after receipt of **Varilrix** dose(s) test for VZV antibody. Send sample to BCCDC Laboratory Services and specify that client is immunocompromised. If antibody is not detectable, the client should be offered Varig on subsequent exposures to wild-type varicella.



### 1.5.4 ILLNESS THAT PROGRESSIVELY WEAKENS THE IMMUNE SYSTEM [E.G., HUMAN IMMUNODEFICIENCY VIRUS (HIV)]

Recommended vaccines <sup>❶</sup> for those with illness that progressively weakens the immune system	
All routine <u>inactivated</u> vaccines	Immunize according to routine schedule for inactivated vaccines.
Hib vaccine	All unimmunized individuals $\geq 5$ years of age require one dose.
Hepatitis A vaccine	For HIV positive individuals, provide 3 doses of vaccine at 0, 1, and 6 months.
Hepatitis B vaccine	Requires double $\mu\text{g}$ dose for age.
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine.
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
MMR vaccine <sup>❷</sup>	Consult specialist and obtain written referral prior to immunization. Use <a href="#">Referral Form for MMR Vaccination</a> .
Varicella vaccine <sup>❷ ❸</sup>	Consult specialist and obtain written referral prior to immunization. Use <a href="#">Referral Form for Varicella Vaccination</a> .

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

❷ MMR and varicella must be separated by a minimum of 4 weeks

❸ Varicella vaccine may be given to children and adults with asymptomatic HIV infection, providing they have a CD4 count  $\geq 25\%$  for age and following a referral from the child's medical specialist.

There are no contraindications to the use of inactivated vaccines at any time.

As the client's illness progresses, the immune system weakens and the effectiveness of immunization decreases while the risk associated with administering live vaccines increases.

MMR, oral cholera, and yellow fever vaccines may be given to an HIV positive client if the client's immune system is not significantly compromised and the risk of disease outweighs the risk of vaccination. Consult client's medical specialist prior to immunizing.

Oral typhoid and BCG vaccines are contraindicated in the HIV client regardless of the degree of immunosuppression.



Consider passive immunoprophylaxis or chemoprophylaxis after exposure to vaccine-preventable diseases even if the person previously has received the recommended vaccines.

The ability of HIV infected individuals to respond to vaccine antigens is related to the degree of immunosuppression at the time of immunization and may be inadequate. These persons could be susceptible to vaccine-preventable diseases, even after appropriate immunization, unless a recent serological test demonstrates adequate antibody concentrations.



### 1.5.5 IMMUNOSUPPRESSIVE THERAPY

<b>Recommended vaccines<sup>①</sup> for those on Immunosuppressive Therapy</b>	
All routine <u>inactivated</u> vaccines	Immunize according to routine schedule for inactivated vaccines.
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine.
Hib vaccine	Unimmunized individuals > 5 years of age require one dose.
Influenza vaccine	Immunize yearly (all those $\geq$ 6 months of age).
MMR vaccine	<b>Contraindicated</b> (unless significant risk of wild type infection exists and client is receiving only low doses of immunosuppressive medications). Consult client's medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> .
Varicella vaccine	<b>Contraindicated</b> (unless significant risk of wild type infection exists and client is receiving only low doses of immunosuppressive medications). Consult client's medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a>

① For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Long-term immunosuppressive therapy includes:

- Long-term corticosteroids
- Cancer chemotherapy
- Radiation therapy
- Cyclosporine / azathioprine
- Cyclophosphamide / infliximab

Immunosuppressive therapy may be used for treatment of cancer, organ transplantation and an increasing range of chronic infections and inflammatory conditions (i.e., inflammatory bowel disease, psoriasis, systemic lupus erythematosus, rheumatoid arthritis, and collagen vascular disease).

Long term immunosuppressive therapies alone or in combination have their greatest impact on cell-mediated immunity, although T cell-dependent antibody production can also be reduced.



Administer all appropriate vaccines/boosters to individuals undergoing such therapy at least 10-14 days before the initiation of therapy. If this cannot be done safely, delay vaccination until at least 3 months after immunosuppressive therapy has been stopped. The exception to this is influenza immunization, which is recommended for all immunosuppressed individuals.

If immunosuppressive therapy cannot be stopped, inactivated vaccines should be given when therapy is at the lowest possible level.

Individuals immunized before chemotherapy or radiation therapy are thought to retain immune memory after treatment and re-immunization is not necessary. The exception is a recipient of Hematopoietic stem cell transplant.

Live vaccines are contraindicated during immunosuppressive therapy. An analysis of risk vs benefit may be necessary if only low doses of therapy are needed and there is significant risk of wild-type infection. In this case, consult with the individual's specialist before immunization.

Refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#) for specific varicella vaccine recommendations for children with acute lymphocytic leukemia.

#### ***1.5.5.1 Corticosteroid Therapy***

Only high dose systemic steroids interfere with vaccine induced immune responses (i.e., consider persons receiving more than 2 mg/kg or 20mg daily of prednisone for more than 14 days duration to be immune-suppressed).

Topical, inhaled and locally injected steroids do not have an impact on vaccines unless there is clinical or laboratory evidence of immunosuppression from such therapy.

A period of at least one month should elapse between high dose corticosteroid therapy administered for more than 2 weeks and administration of both inactivated vaccine (to ensure immunogenicity) and live vaccine (to reduce the risk of dissemination).

Children with adrenogenital syndrome and those receiving physiologic replacement doses (< 2mg/kg of prednisone per day) of glucocorticoids should receive all routine immunizations on schedule.



### 1.5.6 CHRONIC KIDNEY DISEASE AND DIALYSIS CLIENTS

<b>Recommended vaccines<sup>❶</sup> for those with chronic kidney disease/undergoing dialysis</b>	
All routine vaccines	Immunize according to routine schedule. <b>Exception:</b> live vaccines when significant immunosuppression is present pre or post transplantation (Refer to <a href="#">Candidate or recipient of solid organ transplant</a> ).
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine.
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
Hepatitis B vaccine	If vaccine is indicated, always use renal formulation. Refer to <a href="#">Hepatitis B vaccine program for chronic kidney disease clients</a> .
MMR vaccine	Consult with client's medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> .
Varicella vaccine	Consult with client's medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a> .

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

Bacterial and viral infections are a major cause of morbidity and mortality in individuals with chronic kidney disease or who are undergoing chronic dialysis.

Several issues put these individuals at increased risk of vaccine-preventable diseases:

- Vascular access catheters
- Long-term peritoneal dialysis catheters
- Immunosuppression prior to transplantation
- Immune system compromise due to uremic state
- Lower seroconversion rates to vaccines
- Lower peak antibody titers following immunization
- More rapid decline of antibody levels following immunization.

Formulate immunization strategies early in the course of progressive kidney disease, particularly if transplantation and / or long term immunosuppressive therapy are being considered.

Pay particular attention to ensuring there is adequate protection against hepatitis B, influenza, pneumococcal, and varicella diseases.



#### Hepatitis B:

- Hepatitis B immunization may be more effective in individuals before the initiation of dialysis therapy.
- Seroconversion rates following hepatitis B immunization in the hemodialysis population are poor when compared with the general population.
- Protective antibody titers are defined as 10 IU/L or greater.
- In immunocompetent individuals, effective immunity after hepatitis B immunization is sustained even when anti-HBs levels drop to below 10 IU/L. In dialysis patients, protection against hepatitis B infection is lost when titers drop below this level. Subsequent exposure to hepatitis B virus may then lead to acute disease, and possibly a subsequent carrier state.
- Test annually for the presence of anti-HBs. Administer booster dose of hepatitis B vaccine as necessary. See [Table 6 Hepatitis B Vaccination Guidelines for Patients with Chronic Kidney Disease](#).
- Persons who do not respond to the vaccine should be tested for the presence of HBsAg.
  - If HBsAg positive, test sexual contacts and immunize if indicated.
  - If HBsAg negative, counsel the client that they are at risk for hepatitis B infection and need to obtain HBIG post-exposure prophylaxis for any known or likely parenteral exposure to HBsAg positive blood.

#### Influenza:

- Patients on dialysis are at greater risk for influenza mortality.

#### MMR:

- Viral diseases are a major cause of morbidity and mortality in clients who have renal disease or who are undergoing chronic dialysis.

#### Pneumococcal:

- Mortality rates after pneumonia in dialysis patients are up to 14-16 times higher than in the general population.
- Dialysis patients are also at increased risk of cardiovascular events after pneumonia.

#### Varicella:

- Varicella disease is a significant risk factor for immunosuppressed kidney transplant recipients. Complications of varicella infection in transplant recipients include disseminated disease, allograft rejection, and death.

Refer to [Table 6 Hepatitis B Vaccination Guidelines for Patients with Chronic Kidney Disease](#) and [Table 7 Algorithm for Hepatitis B Vaccine for Clients with Chronic Kidney Disease](#) for assistance with decision making regarding hepatitis B immunization based on serology results.

Immunization should occur within the client's dialysis facility whenever possible.

**Table 6: Hepatitis B Vaccine Program for Chronic Kidney Disease Clients**

Chronic hemodialysis clients are at high risk for HBV infection because the process of hemodialysis requires vascular access for prolonged periods. In an environment where multiple clients receive dialysis concurrently, repeated opportunities exist for person-to-person transmission of infectious agents, directly or indirectly via contaminated devices, equipment and supplies, environmental surfaces or hands of personnel. Furthermore, hemodialysis clients are immunosuppressed, which increases their susceptibility to infection.

**ELIGIBILITY**

All predialysis, hemodialysis and peritoneal dialysis clients in hospital, community, home or self-care settings are eligible for this program. Vaccine administration should occur at the dialysis facility; however, in small communities the local health unit may arrange it.

**PRE-DIALYSIS AND DIALYSIS CLIENTS ① ②**

Age	RECOMBIVAX HB™			Engerix®-B		
	Dose	Volume	Schedule	Dose	Volume	Schedule
≥ 20 years	40 mcg ③	1.0 ml	0, 1 and 6 months	40 mcg	2.0 ml	0, 1, 2 and 6 months
7 – 19 years	10 mcg ④	1.0 ml	0, 1 and 6 months	20mcg	1.0 ml	0, 1, 2 and 12 months
Birth – 6 years	5 mcg ⑤	0.5 ml	0, 1 and 6 months	20 mcg ⑤	1.0 ml	0, 1, 2 and 12 months

**Post-vaccination serology:** measure anti-HBs 1 month after completion of a primary series. If anti-HBs is < 10 IU/L, the client is a non-responder. Provide a second vaccine series and assess anti-HBs. If anti-HBs is <10 IU/L, the client, as a non-responder to 2 vaccine series, is susceptible to hepatitis B. **There is no benefit to further vaccination. If an exposure to blood or body fluids occurs, the client will require post-exposure prophylaxis.**

- ① All doses of hepatitis B vaccine should be administered in the deltoid by the **IM** route, or for infants <12 months of age, in the vastus lateralis.
- ② Pre-dialysis clients and dialysis clients receive the same dose volume of hepatitis B vaccine because there is no discrete level of renal function that correlates well with vaccine immunogenicity.
- ③ Special formulation for adult dialysis clients.
- ④ Use adult formulation (10mcg/1.0ml).
- ⑤ Use thimerosal-free RecombivaxHB® or pediatric Engerix®-B formulation. Dosage for this age group is based on NACI guidelines.

**NOTE:** If a client has received Engerix®-B vaccine as dose 1, the client will require a **4 dose series** regardless of which vaccine is used to complete the series. If a client has received RecombivaxHB® vaccine as dose 1, the client will only require a **3 dose series** regardless of which vaccine is used to complete the series.

For ongoing management, refer to [Table 7: Hepatitis B Vaccination Guidelines for Patients With Chronic Kidney Disease](#)



**Table 7: Hepatitis B Vaccination Guidelines for Patients with Chronic Kidney Disease<sup>①</sup>**

	HBsAG	Anti_HBs (IU/L)	Total Anti-HBc	Clinic Scenario	Interpretation <sup>①</sup>	Vaccination Protocol
(1)	Negative	< 10	Negative	No prior immunization or incomplete immunization	Susceptible to Hepatitis B	Immunize with primary (3 dose) series. Test 1 month after last dose.
(2)	Negative	≥10	Negative	Results after primary series	Immunity to Hepatitis B	Monitor annually
(3)	Negative	< 10	Negative	Results after primary series	Inadequate response to primary series	Provide second vaccine series. Test anti-HBs 1 month after last dose. If anti-HBs remains < 10, no further immunization. Document as a non-responder. <sup>②</sup>
(4)	Negative	≥10	Negative	Results of annual testing	Immunity to Hepatitis B	Monitor annually
(5)	Negative	1 to < 10	Negative	Results of annual testing	Possibly susceptible to Hepatitis due to falling titres	Give a second vaccine series as in (3) above if client has not had second series. If second series has been given previously, provide a booster dose.
(6)	Negative	< 1	Negative	Results of annual testing	Susceptible to Hepatitis B	Document as a non-responder. <sup>②</sup>
<p>Following initial vaccine or second vaccine series and a protective response (anti-HBs ≥ 10), continue annual testing. Results of annual testing may indicate a need for 1 booster dose, or completion of a second series of vaccine if not received previously. Provide no more than two complete vaccine series. A booster dose may be provided annually as long as the client continues to mount an antibody response (1 to &lt; 10).</p>						

<sup>①</sup> For interpretation of test results that include a positive HBsAg and/or a positive anti-HBc, refer to the Communicable Disease Control manual, Chapter 1, Hepatitis B.

<sup>②</sup> Test HBsAg annually in non-responders. A non-responder exposed to blood or body fluids and at risk for Hepatitis B infection should be given 2 doses of HBIG, 1 month apart.



### 1.5.7 CHRONIC LIVER DISEASE

<b>Recommended vaccines<sup>①</sup> for those with chronic liver disease</b>	
All routine vaccines	Immunize according to routine schedule.
Hepatitis A vaccine	Provided free for individuals who are previously unimmunized, are anti-HAV IgG negative, and -are anti-HCV positive; or -are chronically infected with hepatitis B; or -have other chronic liver disease.
Hepatitis B vaccine	Provided free for individuals who do not have past or current evidence of hepatitis B infection and -are anti-HCV positive <sup>②</sup> ; or -have other chronic liver disease (require a double µg dose for age).
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.
Influenza vaccine	Immunize yearly (all those ≥ 6 months of age).

<sup>①</sup>For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

<sup>②</sup>There is no indication to administer a double µg dose for age of hepatitis B vaccine to individuals with hepatitis C, unless the individual has physician - diagnosed advanced liver disease or cirrhosis. Health care providers may consider post-vaccination serology (i.e., anti-HBs one to six months after vaccine series completion) to assess vaccine effectiveness and determine the need for a booster dose.

Chronic hepatitis C (HCV) infection develops in 70% - 80% of those infected. Chronic HCV may progress to cirrhosis, end-stage liver disease, and hepatocellular carcinoma.

Individuals with chronic liver disease, including hepatitis C infection, may not be at increased risk of infection with hepatitis A or B viruses but are at increased risk for fulminant hepatitis A or more severe acute hepatitis B infection should infection occur.

Immunization should be done early in the course of disease as the immune response may be suboptimal in advanced liver disease.

Individuals with chronic liver disease (e.g., cirrhosis) and alcoholism are at increased risk of developing pneumococcal infection and severe pneumococcal disease and its complications. Individuals with chronic liver disease experience some degree of immunosuppression. They are at increased risk of influenza-related complications.



### 1.5.8 MALIGNANT NEOPLASM (INCLUDING LEUKEMIA AND LYMPHOMA)

Recommended vaccines <sup>❶</sup> for those with a malignant neoplasm	
All routine inactivated vaccines	Immunize according to routine schedule for inactivated vaccines.
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine.
Hib vaccine	Unimmunized individuals > 5 years of age require one dose.
Influenza vaccine	Immunize yearly (all those > 6 months of age).
MMR vaccine	Contraindicated (unless significant risk of wild type infection exists and client is receiving only low doses of immunosuppressive medications). Consult client's medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> .
Varicella vaccine	Contraindicated (unless significant risk of wild type infection exists and client is receiving only low doses of immunosuppressive medications). Consult client's medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a> .

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Individuals with a malignant neoplasm are at increased risk of vaccine-preventable diseases as a result of both their underlying condition and their treatment (e.g., chemotherapy, radiation therapy). There is a broad spectrum in the potential immunologic impact of cancer depending on cancer type and treatment used.

For most cancers, the main period of immune suppression is during or immediately following chemotherapy and/or radiation therapy when neutropenia and mucosal injury may be present. Refer to [Section 1.5.5 Immunosuppressive therapy](#) for immunization recommendations for the individual who is currently undergoing treatment.

Specific malignancies, particularly Hodgkin's and to a lesser degree, non-Hodgkin's lymphomas are associated with significant deficits in cell-mediated immunity, which can persist even after cure. Other malignancies such as multiple myeloma and B-cell chronic lymphocytic leukemia are associated with deficiencies in humoral immunity and susceptibility, particularly to infection with encapsulated bacteria.



### 1.5.9 CANDIDATE FOR OR RECIPIENT OF SOLID ORGAN OR ISLET CELL TRANSPLANT

<b>Recommended vaccines<sup>❶</sup> for candidate or recipient of solid organ or islet cell transplant</b>	
All routine <u>inactivated</u> vaccines	Immunize according to routine schedule. <b>Exception:</b> Children expected to be transplanted before 18 months of age ( <a href="#">See Table 8 BC Children’s Hospital Multi-organ Transplant Clinic Accelerated Immunization Schedule For Children Expected To Be Transplanted Before 18 Months Of Age</a> ).
Td or Tdap vaccine	Complete routine schedule for adults (first dose only as Tdap).
IPV vaccine	Complete routine schedule.
Hib vaccine	Complete routine schedule for children. Unimmunized individuals $\geq 5$ years of age require one dose.
Pneumococcal vaccine	Conjugate and / or polysaccharide vaccine depending on age. Requires once only revaccination with polysaccharide vaccine if taking immunosuppressive medication post transplant.
Meningococcal vaccine	One dose of quadrivalent conjugate meningococcal vaccine for all those $\geq 2$ years of age. Reinforcement dose(s) recommended. <sup>❷</sup>
Hepatitis B vaccine	Immunize liver and kidney transplant candidates and recipients. Each dose should be double $\mu\text{g}$ . See below for post-immunization testing guidelines. <sup>❸</sup>
Hepatitis A vaccine	Immunize liver transplant candidates and recipients.
Influenza vaccine	Immunize yearly (all those $\geq 6$ months of age).
MMR vaccine	Recommended before transplantation according to routine schedule. Consult with client’s medical specialist. Use <a href="#">Referral Form for MMR Vaccination</a> . <b>**Contraindicated after transplantation**</b>
Varicella vaccine	Recommended before transplantation for susceptible individuals according to routine schedule. Consult with client’s medical specialist. Use <a href="#">Referral Form for Varicella Vaccination</a> . <b>**Contraindicated after transplantation**</b>

<sup>❶</sup>For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

<sup>❷</sup> If individual was previously vaccinated at  $\geq 7$  years of age: give 5 years after previous dose. If individual was previously vaccinated at 2 – 6 years of age: give 3 years after previous dose. Re-immunize every 5 years as long as medical condition exists.

<sup>❸</sup>Hepatitis B post immunization testing:

- For those previously immunized, check anti-HBs and provide a second series if  $<10\text{IU/L}$ .
- For those unimmunized, one month after the third dose of hepatitis B vaccine, perform serology for anti-HBs. If testing indicates inadequate protection, provide an additional 3 doses of hepatitis B vaccine. Retest anti-HBs one month after the second series of hepatitis B vaccine. (Note: series is three doses at 0, 1, and 6 months).



BC Children's Hospital has developed immunization schedules and worksheets for infants who will be requiring a solid organ transplant either before or after they are 18 months old. See [Table 8 BC Children's Hospital Multi-organ Transplant Clinic Accelerated Immunization Schedule For Children Expected To Be Transplanted Before 18 Months Of Age](#) and [Table 9 BC Children's Hospital Multi-organ Transplant Clinic Routine Immunization Schedule for Children Expected to be Transplanted After 18 months of age](#).

See [Table 10 Work Sheet for Immunization of Adult Solid Organ Transplant Candidates and Recipients](#) for adult solid organ transplant candidates and recipients.

Ideally, a recipient of solid organ or islet cell transplantation should receive all vaccines before transplantation occurs. However, many children undergo transplantation before completion of their immunization schedule.

Solid organ and islet cell recipients usually receive lifelong immunosuppressive therapy. Live vaccines are contraindicated following transplantation except in certain circumstances.

Live vaccines administered before the transplant must be completed at least 6 weeks before transplantation.

Immunization should begin or resume at least 6 – 12 months after transplantation.

Assess previous immunizations and offer vaccines to complete routine schedule.

Re-immunization is NOT indicated for these clients.



**Table 8: BC Children's Hospital Multi-organ Transplant Clinic Accelerated Immunization Schedule For Children Expected To Be Transplanted Before 18 Months Of Age**

Age	Immunization	Date Given YYYY/MM/DD	Serology	Comments
2 months	<ul style="list-style-type: none"> <li>• DTap-IPV-Hib</li> <li>• Hep B</li> <li>• Prevnar®</li> <li>• NeisVac-C (a MCC vaccine)</li> </ul>			<p>Infanrix hexa™ is not appropriate due to hepatitis B dose recommendation.</p> <p>Use double µg dose of hepatitis B vaccine.</p>
3 months	<ul style="list-style-type: none"> <li>• DTap-IPV-Hib</li> <li>• Hep B</li> <li>• Prevnar®</li> </ul>			
4 months	<ul style="list-style-type: none"> <li>• DTap-IPV-Hib</li> <li>• Prevnar®</li> <li>• NeisVac-C</li> </ul>			
6 months	<ul style="list-style-type: none"> <li>• MMR</li> <li>• Varicella</li> <li>• Hep B</li> <li>• Hep A (if liver tx)</li> </ul>		Anti-HBs one month after Hep B initial series	<p>Minimum age of 6 months based on expert opinion from BC Children's Hospital.</p> <p>MMR and Varicella are live vaccines: last dose must be given 6 weeks prior to transplantation.</p>
7 months	<ul style="list-style-type: none"> <li>• Hep B</li> </ul>			Full Hep B series (double µg dose) if anti-HBs (-) when tested one month after initial series
12 months	<ul style="list-style-type: none"> <li>• Prevnar®</li> <li>• Hep A (if liver tx)</li> <li>• DTap-IPV-Hib</li> <li>• MMR</li> <li>• NeisVac-C</li> <li>• Varicella</li> </ul>			MMR & Varicella –see above.
13 months	<ul style="list-style-type: none"> <li>• MMR ①</li> </ul>			MMR – see above for timing
15 months	<ul style="list-style-type: none"> <li>• Hib</li> </ul>			
24 months	<ul style="list-style-type: none"> <li>• Pneumococcal polysaccharide</li> <li>• Menactra™ (meningococcal quadrivalent conjugate)</li> </ul>			
6 months post-transplant	<ul style="list-style-type: none"> <li>• Hep B (3 doses)</li> </ul>		Anti-HBs before and one month after initial series	If Hep B vaccine not previously given, and anti-HBs (-), give initial series, using double µg dose. Repeat (double µg dose) series if inadequate response to initial series. Re-test anti-HBs one month after second series.
4 to 6 years	<ul style="list-style-type: none"> <li>• QuadraceI™ (DTaP-IPV)</li> <li>• Menactra™</li> </ul>			Offer second dose of Menactra™ 3 years after first dose.
Grade 6	<ul style="list-style-type: none"> <li>• HPV</li> </ul>			
Grade 9	<ul style="list-style-type: none"> <li>• Adacel™ (Tdap)</li> <li>• HPV</li> </ul>			HPV only offered from 08/09 through 2010/11 school years
Annually	<ul style="list-style-type: none"> <li>• Influenza</li> </ul>			Recommended for patient and all family members.

① If first MMR given when child is < 12 months of age, give 2<sup>nd</sup> dose at 12 months of age, and a 3<sup>rd</sup> dose one month later.



**Table 9: BC Children's Hospital Multi-organ Transplant Clinic Routine Immunization Schedule for Children Expected to be Transplanted After 18 months of age**

Age	Immunization	Date Given yyyy/mm/dd	Serology	Comments
2 months	<ul style="list-style-type: none"> <li>DTap-IPV-Hib</li> <li>Hep B</li> <li>Prevnar®</li> <li>NeisVac-C (a MCC vaccine)</li> </ul>			<p>Infanrix hexa™ is not appropriate due to hepatitis B dose recommendation.</p> <p>Use double µg dose of hepatitis B vaccine for the series.</p>
4 months	<ul style="list-style-type: none"> <li>DTap-IPV-Hib</li> <li>Hep B</li> <li>Prevnar®</li> </ul>			
6 months	<ul style="list-style-type: none"> <li>DTap-IPV-Hib</li> <li>Hep B</li> <li>Prevnar®</li> <li>Hep A (if liver tx)</li> </ul>		Anti-HBs one month after 3 <sup>rd</sup> dose of Hep B	
12 months	<ul style="list-style-type: none"> <li>MMR</li> <li>Varicella</li> <li>Hep A (if liver tx)</li> <li>Hep B</li> <li>NeisVac-C</li> <li>Prevnar®</li> </ul>			<p>MMR and Varicella are live vaccines: last dose must be given 6 weeks prior to transplantation.</p> <p>Full Hep B series (double µg dose) <b>if</b> anti-HBs (-) at least 4 weeks after 3<sup>rd</sup> dose of initial series</p>
18 months	<ul style="list-style-type: none"> <li>DTap-IPV-Hib</li> <li>MMR</li> </ul>			MMR – see above for timing
24 months	<ul style="list-style-type: none"> <li>Pneumococcal polysaccharide</li> <li>Menactra™ (Meningococcal quadrivalent conjugate)</li> </ul>			
4 to 6 years	<ul style="list-style-type: none"> <li>Quadracel™ (DTaP-IPV)</li> <li>Menactra™</li> </ul>			Offer second dose of Menactra™ 3 years after first dose.
At time of pre-transplant assessment or in grade 6	<ul style="list-style-type: none"> <li>Hep B series (double µg dose) if not previously given and child is anti-HBs (-)</li> <li>Meningococcal C conjugate (if not previously given)</li> <li>HPV (in grade 6)</li> </ul>		Anti-HBs before and 4 weeks after initial series	Give another 3 dose series (double µg dose) if anti-HBs (-) at least 4 weeks after initial series.
Grade 9	<ul style="list-style-type: none"> <li>Adacel™ (Tdap)</li> <li>HPV</li> </ul>			HPV only offered from 08/09 through 2010/11 school years
Annually	<ul style="list-style-type: none"> <li>Influenza</li> </ul>			Recommended for patient and all family members.



**Table 10: Work Sheet for Immunization of Adult Solid Organ Transplant Candidates and Recipients**

Client's name: \_\_\_\_\_  
(given) (surname)

Date of Birth: \_\_\_\_\_  
(yyyy/mm/dd)

Date of transplant: \_\_\_\_\_  
(yyyy/mm/dd)

Type of transplant: \_\_\_\_\_

Personal Health Number: \_\_\_\_\_

Vaccine	Date given (yyyy/mm/dd)	Date given (yyyy/mm/dd)	Date given (yyyy/mm/dd)	Date given (yyyy/mm/dd)	Date given (yyyy/mm/dd)
<b>Td or Tdap</b>					
<b>IPV</b>					
<b>Act-HIB<sup>®</sup></b>					
<b>Hepatitis B (for liver and kidney transplants only)</b>					
<b>Hepatitis A (for liver transplants only)</b>					
<b>Pneumococcal Polysaccharide</b>					
<b>Menactra<sup>™</sup> (Meningococcal quadrivalent conjugate)</b>					
<b>Influenza</b>					
<b>Varicella Live Vaccine Candidates only</b>					
<b>MMR Live Vaccine Candidates only</b>					



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## 2.0 OTHER CONDITIONS

### 2.1 INFANTS AT HIGH RISK FOR HEPATITIS B

Infants born to mothers who are positive for HBsAg during pregnancy have a 90-95% risk of developing Hepatitis B infection and becoming chronic carriers of the disease.

All pregnant women should be screened for the presence of HBsAg during every pregnancy. If found to be positive, protocols are in place to ensure the infant is immunized with hepatitis B vaccine and HBIg as soon as possible after delivery.

Included are:

- Perinatal protocols for hepatitis B
- Prophylaxis record for infants at high risk of hepatitis B
- High risk neonatal hepatitis B programme (referral and information letter for physicians)

#### 2.1.1 Perinatal Protocols for Hepatitis B

BCCDC Laboratory Services, private, and hospital laboratories provide prenatal screening for Hepatitis B. Approximately 40,000 specimens are submitted yearly, with <1% testing positive for HBsAg. All positive specimens are tested for HBeAg, a marker of infectivity.

Results of positive tests are forwarded to the requesting physician, the Blood Bank of the expected hospital of delivery, and the Health Unit office in the client's area of residency. Results are identified as **Prenatal Assessment**, and the expected date of delivery is included, if available.

At birth, the infant is given HBIg and the first dose of hepatitis B vaccine. This information is recorded on the discharge notice sent to the Health Unit.

Infants identified as at risk of hepatitis B (mother is high risk for hepatitis B, but negative {possible window period} or unknown for HBsAg) will also be given HBIg and the first dose of vaccine in hospital, and the information will be recorded on the discharge notice. The [Prophylaxis Record for Infants at High Risk of Hepatitis B](#) is faxed to the Health Unit office in the parent's area of residency.

Enter HBIg and hepatitis B vaccine administered in hospital in the infant's electronic or paper record.

Immunize infant with complete series of Infanrix hexa™ vaccine as per routine schedule.

Ensure post vaccination testing (i.e., HbsAg and anti-Hbs) is completed, one month after (and no longer than six months after) vaccine series completion.





**2.1.3 High Risk Neonatal Hepatitis B Immunization Programme**

**PATIENT'S NAME:** \_\_\_\_\_

**ADDRESS:** \_\_\_\_\_

**DOB:** \_\_\_\_\_

**PHN:** \_\_\_\_\_

**EDC:** \_\_\_\_\_

Dear Doctor:

Your patient has tested **HBsAg Positive** on <<Posdate>>. Her baby will require a dose of Hepatitis B Immune Globulin (HBIG) and the first dose of hepatitis B vaccine at birth. This will be arranged through the hospital at which your patient is delivering. Completion of the series of hepatitis B vaccine using Infanrix hexa™ vaccine at 2, 4, and 6 months of age should be co-ordinated between the family physician and your patient's local public health unit.

Your patient will require appropriate counseling and medical follow-up related to this test result. In management of this patient it would be important to determine whether this result reflects an acute or a chronic hepatitis B infection. **Inform the patient that they are HBsAg positive and ask them to inform the delivery staff so that the HBIG and vaccine will be given to their child even if they deliver in another facility.**

As hepatitis B is a reportable infection, the Medical Health Officer has been notified.

**If the Hospital for delivery has changed it is the physician's responsibility to send a copy of this letter to the new hospital.**

**To: <<hosp>> Hospital Blood Bank:** Please order the HBIG from the Blood Products Distribution Department at the Canadian Blood Services. Please order hepatitis B vaccine from your local health unit.

**To: <<hosp>> Hospital Case Room:** Following the baby's birth, please fill-in the following information and fax a copy of this letter to the <<public health>> **with the mother/infant discharge notice.**

**DATE OF BABY'S BIRTH:** \_\_\_\_\_  
YYYY / MM / DD

**BABY'S LAST NAME:** \_\_\_\_\_

**HEPATITIS B IMMUNE GLOBULIN-DATE GIVEN:** \_\_\_\_\_  
YYYY / MM / DD      LOT#

**HEPATITIS B VACCINE – DATE GIVEN:** \_\_\_\_\_  
YYYY / MM / DD      LOT



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General Information:

Babies born to HBsAg positive mothers have a high risk of becoming chronic carriers of hepatitis B virus. When HBIg and hepatitis B vaccine is provided, the risk of hepatitis B infection in the infant is low. HBIg should be given immediately after birth, along with 1 dose of hepatitis B vaccine. Give hepatitis B vaccine and HBIg at the same time using separate syringes and separate limbs. Hepatitis B vaccine is also given to the infant at 2, 4, and 6 months of age as a component of Infanrix hexa™ vaccine. All infants who receive hepatitis B vaccine at birth will receive 4 doses of hepatitis B vaccine.

For further information consult the Canadian Immunization Guide, 7<sup>th</sup> Edition 2006, Health Canada. This is available on the web at: [http://www.phac-aspc.gc.ca/publicat/cig-gci/pdf/cig-gci-2006\\_e.pdf](http://www.phac-aspc.gc.ca/publicat/cig-gci/pdf/cig-gci-2006_e.pdf). The BC Communicable Disease Control Guidelines for hepatitis B are available at [bccdc.ca](http://bccdc.ca).

Transmission of hepatitis B virus may be through sexual contacts and household members. Hepatitis B vaccine is supplied to susceptible contacts of an individual with acute or chronic hepatitis B infection. Hepatitis A vaccine is also recommended for chronic hepatitis B infected individuals. Both vaccines are available at no cost through Public Health.

For laboratory inquiries call 1-877-747-2522. For BCCDC Epidemiology Services call 604-707-2517.

Yours sincerely,

Mel Kraiden, MD, FRCPC  
Director, BC Hepatitis Services  
Associate Director, BCCDC Laboratory Services

Jane Buxton, MBBS, FRCPC  
Physician Epidemiologist  
BCCDC Epidemiology Services

cc: Medical Health Officer  
Public Health

**NOTE TO PHYSICIAN /MEDICAL HEALTH OFFICER:**

Please initiate follow-up of the baby for completion of the hepatitis B vaccine series. Also, please ensure that post-vaccination testing for HBsAg and anti-HBs is performed one month after (and no longer than six months after) completion of the vaccine series, to monitor the success of prophylaxis. It is important to ensure the infant is protected from continual exposure to hepatitis B virus and despite complete and timely post-exposure prophylaxis the infant may become infected. As the "Protocol for Viral Hepatitis Testing" is in effect (MSC and BCMA – Protocol Steering Committee), in order to obtain both tests, they should be ordered individually. If on follow-up testing the baby tests HBsAg positive OR anti-HBs less than 10 IU/L, please contact your local public health unit for additional follow up information.



**2.2 INDIVIDUALS WITH BLEEDING DISORDERS**

<b>Recommended vaccines<sup>❶</sup> for those with bleeding disorders</b>	
All routine vaccines	Immunize according to routine schedule. Administer vaccine via recommended route (e.g., SC or IM).
Hepatitis A vaccine	Provided free for individuals with hemophilia A or B receiving plasma-derived clotting factors and testing negative for anti HAV-IgG.
Hepatitis B vaccine	Provided free for hemophiliacs and others receiving repeated infusions of blood or blood products.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Individuals who are receiving low doses of acetylsalicylic acid therapy or long term anticoagulation with either coumadin or heparin are not considered to be at higher risk of adverse events following immunization.

Although currently available plasma-derived products are all tested for viral contamination prior to administration, consider all individuals with a bleeding disorder to be at higher risk of contracting hepatitis A and B.

Immunize on schedule, including SC and IM injections. When the efficacy is known to be the same for a vaccine whether it is administered SC or IM, administer the vaccine using the SC route.

If there is concern that the injection may stimulate bleeding, schedule it shortly after the administration of anti-hemophilia therapy.

Apply direct pressure to the injection site for 5 minutes following immunization.



### 2.3 INDIVIDUALS WITH CHRONIC HEART OR LUNG DISEASE

Recommended vaccines❶ for those with chronic heart or lung disease	
All routine vaccines	Immunize according to routine schedule.
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.
Influenza vaccine	Immunize yearly (all those $\geq$ 6 months of age).

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

Individuals with chronic heart or lung disease are at higher risk of influenza related complications, including pneumococcal infection and potentially the exacerbation of their underlying disease. People at high risk of influenza related complications are more likely to require hospitalization.

### 2.4 CHRONIC CEREBROSPINAL FLUID (CSF) LEAK

Recommended vaccines❶ for individuals with Chronic CSF leak	
All routine vaccines	Immunize according to routine schedule.
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Individuals with a CSF leak (usually from a congenital malformation, skull fracture or neurologic procedure) are at increased risk for pneumococcal infection.

### 2.5 COCHLEAR IMPLANT

Recommended vaccines❶ for Cochlear Implant candidate or recipient	
All routine vaccines	Immunize according to routine schedule.
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.
Hib vaccine	Unimmunized individuals > 5 years of age require one dose.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Children with cochlear implants are at increased risk of developing bacterial meningitis, most commonly caused by *streptococcus pneumoniae* (pneumococcus). There is no evidence that children with cochlear implants are more likely to get meningococcal meningitis than children without cochlear implants.



Some children who are candidates for cochlear implants may have factors that increase their risk of meningitis even before they receive a cochlear implant.

## 2.6 CYSTIC FIBROSIS

<b>Recommended vaccines<sup>❶</sup> for individuals with Cystic fibrosis</b>	
All routine vaccines	Immunize according to routine schedule.
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.
Influenza vaccine	Immunize yearly (all those $\geq$ 6 months of age).

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Abnormal mucous is produced in the lungs of individuals with cystic fibrosis; it interferes with their breathing and they are more prone to serious lower respiratory tract and lung infections.

## 2.7 DIABETES MELLITUS

<b>Recommended vaccines<sup>❶</sup> for individuals with Diabetes</b>	
All routine vaccines	Immunize according to routine schedule.
Pneumococcal vaccine	Polysaccharide and / or conjugate vaccine depending on age.
Influenza vaccine	Immunize yearly (all those $\geq$ 6 months of age).

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Individuals with diabetes mellitus are at high risk of influenza related complications, including pneumonia. In addition, individuals with longstanding diabetes mellitus often have complications such as cardiovascular, renal, and other end-organ dysfunction. For these reasons, pneumococcal and annual influenza immunizations are recommended.



## 2.8 INDIVIDUALS WITH NEUROLOGIC DISORDERS

For the purposes of immunization, people with neurologic disorders may be divided into two categories: those with a pre-existing neurologic condition and those who developed symptoms of a new neurologic condition following immunization.

### 2.8.1 Pre-existing neurologic conditions

Recommended vaccines <sup>❶</sup> for those with pre-existing neurologic conditions	
All routine vaccines	Immunize according to routine schedule.
Influenza vaccine	Yearly immunization of those adults and children $\geq$ 6 months of age whose neurologic condition compromises clearance of respiratory secretions.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Disorders that usually begin in infancy (e.g., cerebral palsy, spina bifida, seizure disorder, neuromuscular diseases, and inborn errors of metabolism) may have symptoms identified before administration of the routine infant vaccines.

Other disorders often appear later in childhood or adulthood (e.g., autism spectrum disorders, acute demyelinating encephalomyelitis, transverse myelitis, multiple sclerosis, and Guillain-Barré syndrome) and may appear coincidentally before or after administration of vaccines. There has been no causal relationship identified between any routine immunizations and autism spectrum disorders or demyelinating disorders such as multiple sclerosis.

Neurologic conditions whose onset clearly precedes immunization are not contraindications to subsequent immunization.



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### 2.8.2 Those who develop symptoms of a new neurologic condition at any time after immunization

Neurologic events that occur in the 8 weeks following immunization are said to be temporally associated with immunization. This temporal association alone is not evidence that the vaccine caused the neurologic condition.

Children who experience hypotonic-hyporesponsive events or prolonged crying after receiving vaccine(s) may receive the next dose of vaccine according to schedule.

Individuals who develop encephalopathy or encephalitis within 7 days following immunization should be investigated. Continue to immunize according to routine schedule those individuals whose condition is found to have a different etiology and those who recover fully by the next scheduled immunization.

Individuals with encephalopathy that persists and who have no alternative etiology should be referred to a specialist for further consultation. Continue with routine immunization schedule if their condition is stable and found not to relate to immunization.

#### **Guillain-Barre´ syndrome (GBS)**

Individuals who developed GBS within 8 weeks of a previous dose of tetanus toxoid or influenza vaccine should not be re-immunized with that product.

Individuals who have developed GBS outside this interval or who have a different etiology confirmed may receive subsequent doses of tetanus and/ or influenza vaccines.

A history of GBS is a relative contraindication to Menactra™ vaccine. Assess the current and ongoing risk of meningococcal disease for individuals who have had an episode of GBS in the past and for whom Menactra™ is indicated. Conduct a risk-benefit analysis and consider immunization if the risk of exposure is very high and the benefit clearly outweighs the risk of a recurrent episode of GBS.

For individuals aged  $\geq 2$  years with a history of GBS, a polysaccharide vaccine is preferred for short-term protection as no association with GBS has been described for any meningococcal polysaccharide vaccine, despite extensive use for more than 30 years. For extended protection against serogroup C invasive meningococcal disease (IMD), a monovalent conjugate C product is preferred. For extended protection against serogroups A, Y and W135, the risk of recurrence of GBS should be balanced against the risk of IMD and the patient appropriately informed.



## 2.9 WOMEN WHO ARE PREGNANT OR PLANNING A PREGNANCY

Recommended vaccines <sup>①</sup> during pregnancy	
Tetanus / Diphtheria toxoid(Td)	According to routine schedule.
Hepatitis B vaccine	If ongoing risk present.
Hepatitis A vaccine	<ul style="list-style-type: none"> <li>• If travelling to a hepatitis A endemic area (not provided free).</li> <li>• Close contact of hepatitis A.</li> </ul>
Pneumococcal vaccine	As indicated for high risk clients.
Influenza vaccine	If in 3 <sup>rd</sup> trimester during the influenza season or if a member of a high risk group.
Meningococcal vaccine	In an outbreak situation.
MMR vaccine <sup>②</sup>	<b>Contraindicated during pregnancy.</b>
Varicella vaccine <sup>③</sup>	<b>Contraindicated during pregnancy.</b>

① For more information regarding specific vaccines during pregnancy refer to <http://www.phac-aspc.gc.ca/publicat/cig-gci/p03-04-eng.php> or [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

### ② MMR vaccine

- Rubella infection during pregnancy may cause congenital rubella syndrome (CRS), which can cause miscarriage, stillbirth, and fetal malformations. The highest risk of damage to the fetus following maternal infection occurs during the first trimester.
- MMR vaccine is recommended post-partum or preconception for susceptible women. Advise women who are immunized to avoid pregnancy for one month following immunization.
- When Rh immune globulin (RhIg) and MMR vaccine are given concurrently postpartum, check rubella antibody status at 2 months postpartum and re-vaccinate if the result is negative. No testing is required after the second dose.

### ③ Varicella vaccine

- Counsel susceptible women of childbearing age to avoid pregnancy for one month following immunization.
- Offer varicella vaccine to susceptible postpartum women. When RhIg is given postpartum, wait 2 months before administration of varicella vaccine.

Pregnancy is a time when a healthy woman may have more contact with the medical system than at any other time. It is therefore an opportune time to assess her immunization status and administer any appropriate vaccines that will provide protection for both her and the neonate.

Although pregnancy is an immunologically altered state, there are no data to support an inadequate response to vaccines.



There are no data to indicate that any of the currently approved vaccines are teratogenic or embryotoxic, or have resulted in specific adverse pregnancy outcomes.

There are data to support the benefits of antenatal vaccines on the prevention of disease in the neonate. It is well documented that transplacental transfer of maternal antibodies (particularly IgG) occurs during pregnancy, mainly during the final trimester. Maternal IgG has a half life of about 3-4 weeks in the newborn, waning during the first 6-12 months of life. Routine infant immunization schedules take into account the potential effect of circulating antibody in the infant.

Inactivated viral and bacterial vaccines, including toxoids, are considered safe during pregnancy and should be administered when indicated. When vaccines are administered in pregnancy there does not appear to be any evidence of increased risk of adverse events following immunization.

Live attenuated vaccines pose a theoretical risk to the fetus. There are occasions when administration of a non-routine live vaccine during pregnancy may be considered (e.g., pregnant traveler to a yellow fever endemic region). If a live vaccine is given inadvertently during pregnancy, termination of the pregnancy is not recommended.

Immunize women who will be in their third trimester of pregnancy during the influenza season (typically spanning November to April). Serious maternal morbidity (namely hospitalization) during seasonal influenza supports a recommendation for the immunization of healthy pregnant women, since rates of influenza-associated hospitalization increase with increasing length of gestation after the first trimester.

All pregnant women should be evaluated for immunity to rubella and varicella, and in every pregnancy be tested for the presence of HBsAg.

There are no known risks to the fetus if a woman is given Ig preparations during pregnancy.

## 2.10 INFANTS BORN PREMATURELY

Recommended vaccines <sup>❶</sup> for infants born prematurely	
All routine vaccines	Immunize according to routine schedule.
Influenza immunization	Immunize if infant is <b>6-23</b> months during influenza season. Immunization of household contacts is especially important if infant is < 6 months of age.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).

Premature infants whose clinical condition is satisfactory should be immunized with age-appropriate doses of vaccine at the same chronological age and according to the same schedule as full term infants, regardless of birth weight. Antibody response to immunization is generally a function of chronological age rather than maturity and vaccine efficacy is high in premature infants.

As most of the transfer of maternal IgG antibody occurs during the third trimester of pregnancy, infants born prematurely have lower maternal antibody titers and shorter duration of maternal antibody protection.

The severity of vaccine preventable illnesses may be greater in preterm and low birth weight infants. Preterm birth is associated with increased risk of complications and death from pertussis in infancy. All infants and children < 2 years of age are considered to be at high risk of significant morbidity and mortality from influenza. This includes infants born prematurely and is especially significant for those infants with chronic complications of preterm birth.

Preterm and low birth weight infants tolerate immunizations well. Low rates of adverse events are similar to those of full-term infants.

Premature and very low birth weight infants (i.e., 1500gm) still hospitalized at time of immunization may experience a transient increase or recurrence of apnea and bradycardia following immunization. This resolves within 48 hours and does not alter the overall clinical progress of the child. It is recommended that hospitalized premature infants have continuous cardiac and respiratory monitoring for 48 hours after their first immunization.

Respiratory Syncytial Virus (RSV) monoclonal antibody (Palivizumab) is indicated for certain premature infants. Palivizumab is not publicly funded. Advise clients to contact their physician regarding eligibility and administration of Palivizumab. Refer to <http://www.phac-aspc.gc.ca/publicat/cig-gci/p05-01-eng.php#ge> for more information.



### 3.0 SELECT POPULATIONS

#### 3.1 HEALTH AND CHILDCARE WORKERS

Recommended vaccines❶ for health and childcare workers	
All routine vaccines	<ul style="list-style-type: none"> <li>Tetanus-diphtheria (Td), varicella, MMR</li> <li>Meningococcal C conjugate for those born on or after January 1, 1988</li> </ul>
Polio vaccine	<ul style="list-style-type: none"> <li>Primary immunization is recommended for all health care workers (HCW).</li> <li>Administer a single booster dose 10 years after primary series</li> <li>Those who have not completed a full primary series should have the series completed, regardless of the interval since the last dose.</li> <li>Provided free.</li> </ul>
Hepatitis B vaccine	<ul style="list-style-type: none"> <li>Recommended and provided free by employers for:               <ul style="list-style-type: none"> <li>HCWs who may be exposed to blood or body fluids, or who may be at increased risk of sharps injury, bites, or penetrating injuries.</li> </ul> </li> <li>Not recommended for child care workers except in exceptional circumstances where direct contact with infected blood or body fluids is a likely and ongoing risk.</li> <li>BC Ministry of Health provides free vaccine to <b>students</b> of health care professions. Refer to <a href="#">BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products</a></li> </ul>
Influenza vaccine	<ul style="list-style-type: none"> <li>Immunize yearly.</li> <li>Provided free.</li> </ul>

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).



Health care workers (HCWs) include persons who provide health care to patients or work in institutions that provide patient care (e.g., physicians, nurses, emergency medical personnel, dental professionals, laboratory technicians; medical, dental, nursing and laboratory technician students; hospital volunteers; and administrative and support staff in health-care institutions).

HCWs are at risk of exposure to communicable diseases because of their contact with patients or material from patients with infections, both diagnosed and undiagnosed.

Maintenance of immunity against vaccine-preventable diseases is an integral part of a health care facility's occupational health program. Optimal usage of immunizing agents in hospital staff will not only safeguard the health of staff members but may, in some instances, also protect patients from becoming infected by hospital employees.

Childcare workers have unique and intense exposures to young children on a daily basis. Persons in the childcare field who will be providing direct childcare should have written proof of vaccinations previously received. Maintenance of an up-to-date immunization status is vital to protect the health of both childcare workers and the children in their care.

The priority for all health and childcare workers should be to ensure that all routine immunizations, including booster doses, are completed and booster doses are provided as needed on an ongoing basis.

### **Guidelines for Health and Childcare Worker Immunization Programs**

It is the responsibility of the employer to:

- Assess the immunization status of each worker at the time of initial employment.
- Obtain full vaccination history, including documentation of the doses received and dates of administration.
- Offer immunization at the earliest opportunity to persons who cannot provide acceptable information or evidence of adequate immunity.
- Maintain records of all immunizations and serologic tests. The employee should also keep these records.
- Institute an immunization recall system.



## Hepatitis B Vaccine

Individuals are considered immune if they have completed a series of hepatitis B vaccine and one documented laboratory test that shows they have developed sufficient antibodies.

Childcare workers are **not** considered to be at increased risk of hepatitis B; immunization is not indicated for them except in exceptional circumstances where direct contact with infected blood or body fluids is a likely and ongoing risk.

## Measles, Mumps, Rubella Vaccine

Although there is differing information available regarding the need for each of the antigens contained in MMR vaccine (based on birth year, previous illness and previous immunization), the only vaccine available and provided free in BC is the combination product, MMR. There are no data indicating an increase in adverse events related to additional doses of MMR vaccine.

Administer the appropriate number of doses (i.e., one or two) of MMR vaccine to any individual requiring protection against any of the antigens.

- **Measles Protection:**

Screen all new employees born on or after January 1, 1957 for proof of two live measles vaccinations, laboratory evidence of immunity, or a history of laboratory confirmed measles disease. Persons born before 1957 have probably been infected naturally and can be considered immune.

**Note:** the 1956 cut-off is different than the NACI-recommended cut-off year of 1970 due to a difference in the observed sero-prevalence of measles immunity in BC residents according to birth year.

- **Rubella Protection:**

Assess all employees for one dose of rubella containing vaccine or laboratory evidence of immunity to rubella.

- **Mumps Protection:**

Assess all individuals born on or after January 1, 1957 for proof of prior history of laboratory confirmed mumps disease, or one dose of live mumps-containing vaccine if they were born between 1957 and 1969 (inclusive), or two doses of live mumps-containing vaccine if they were born on or after January 1, 1970.

Individuals born before 1957 are considered immune to mumps.



### **Influenza Vaccine**

Influenza vaccination of HCWs has been shown to reduce the mortality and morbidity of patients under their care in long-term settings and to reduce worker illness during the influenza season.

### **Varicella Vaccine**

Assess varicella susceptibility before immunization. A varicella susceptible individual is defined as an individual:

- with a history of varicella disease at <12 months of age
- with no history of varicella disease at > 12 months of age, no history of herpes zoster, and no history of varicella immunization.

For persons  $\geq 13$  years of age with negative or unknown history of prior varicella infection, have serology done for VZV IgG to determine susceptibility.

### **Hepatitis A Vaccine**

Prevention of hepatitis A transmission within a hospital or childcare facility should be based on the use of good hygiene practices and patient/childcare techniques, especially proper hand washing and management of potentially infected materials.

### **BCG Vaccine**

Comprehensive application of infection control practices remains the primary strategy to protect health care workers from infection with *M. tuberculosis*.

In Canada, BCG vaccination is not routinely administered to HCWs. Only in exceptional circumstances, such as an outbreak of multiple drug-resistant disease should BCG be considered for exposed health care workers.

### **Meningococcal Vaccine**

Recommended, but not provided free to research, industrial, and clinical laboratory personnel who are routinely exposed to *N. meningitidis*.

### 3.2 INMATES OF PROVINCIAL CORRECTIONAL INSTITUTIONS

Recommended vaccines <sup>❶</sup> for inmates of correctional institutions	
All routine vaccines	Immunize according to routine schedule.
Hepatitis A vaccine	Immunize according to recommended schedule.
Hepatitis B vaccine	Immunize according to recommended schedule.
Influenza vaccine	Immunize yearly.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)

### 3.3 INTERNATIONAL TRAVELERS

Advise individuals considering international travel to make an appointment for a full consultation with a travel medicine professional.

Refer clients to the following websites for travel health information:

<http://travelclinic.vancouver.bc.ca/index.html>

<http://www.phac-aspc.gc.ca/publicat/cig-gci/p03-10-eng.php> (Canadian Immunization Guide 7th ed.)

<http://www.travelhealth.gc.ca/> (Travel Medicine Program section on the Public Health Agency of Canada web site)

<http://wwwn.cdc.gov/travel/default.aspx> (*Health Information for International Travel*, U.S. Centers for Disease Control and Prevention)

<http://www.who.int/ith/en/> (*International Travel and Health*, World Health Organization)

### 3.4 MALES WHO HAVE SEXUAL CONTACT WITH OTHER MALES

Recommended vaccines <sup>❶</sup> for males who have sexual contact with other males	
All routine vaccines	Immunize according to routine schedule.
Hepatitis A vaccine	Immunize according to recommended schedule.
Hepatitis B vaccine	Immunize according to recommended schedule.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#)



### 3.5 INDIVIDUALS NEW TO CANADA

<b>Recommended vaccines ❶❷ for individuals new to Canada</b>	
Diphtheria, tetanus, acellular pertussis, polio, hepatitis B, and Hib containing vaccine	<ul style="list-style-type: none"> <li>• Individuals &lt;7 years of age.</li> <li>• Immunize according to routine schedule.</li> </ul>
Tetanus, diphtheria, acellular pertussis vaccine (Tdap) IPV	<ul style="list-style-type: none"> <li>• Individuals 7 to 18 years of age.</li> <li>• Complete routine series according to routine schedule.</li> </ul>
Tetanus, diphtheria vaccine	<ul style="list-style-type: none"> <li>• Individuals ≥ 18 years of age.</li> <li>• One dose of Tdap followed by 2 doses of Td.</li> </ul>
IPV	<ul style="list-style-type: none"> <li>• Individuals ≥ 18 years who may have contact with other refugees / immigrants from areas of countries where wild polioviruses are circulating (e.g., countries in Indian subcontinent and West Africa).</li> </ul>
Hepatitis B vaccine	<ul style="list-style-type: none"> <li>• All individuals born on or after January 1, 1980.</li> <li>• All children &lt; 12 years of age who have immigrated to Canada from regions of high hepatitis B prevalence (e.g., Asia and Africa) are eligible for hepatitis B vaccine prior to entering Grade 6.</li> <li>• All children born on or after January 1, 2001.</li> <li>• Other individuals with specific health conditions or risk factors.</li> </ul>
Meningococcal vaccine	<ul style="list-style-type: none"> <li>• Individuals born on or after January 1, 1988 (1 dose).</li> <li>• Infants &lt; 12 months of age: one dose at presentation and one dose at 12 months of age (at least 2 months after first dose).</li> </ul>
MMR vaccine	<ul style="list-style-type: none"> <li>• All individuals born on or after January 1, 1957 and who are ≥ 12 months of age at time of presentation (2 doses one month apart).</li> </ul>
Pneumococcal vaccine	<ul style="list-style-type: none"> <li>• Conjugate vaccine: all individuals 2 months to 59 months of age.</li> <li>• Polysaccharide vaccine: all individuals ≥65 years of age and all individuals ≥ 2 years of age with certain health conditions.</li> </ul>
Varicella vaccine	<ul style="list-style-type: none"> <li>• All susceptible ❸ individuals ≥ 12 months of age (≥ 12 months to 12 years of age, one dose; ≥ 13 years of age, two doses 4 weeks apart).</li> </ul>



- ① For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section IIA Immunization Schedules](#) and [Section VII Biological Products](#)
- ② All immunization recommendations are for routine immunizations. Individuals may be eligible for additional vaccines based on health conditions or other risk factors. Live vaccines may be contraindicated (i.e., if client is HIV positive or has another immunosuppressing condition).
- ③ Assess varicella susceptibility before immunization. A varicella susceptible individual is defined as an individual:
  - with a history of varicella disease at <12 months of age
  - with no history of varicella disease at > 12 months of age, no history of herpes zoster, and no history of varicella immunization.

For persons  $\geq$  13 years of age with negative or unknown history of prior varicella infection, have serology done for VZV IgG to determine susceptibility.

Immunization of individuals who have newly arrived in Canada is challenging because:

- Immunization records may not exist
- Records that do exist may be difficult to interpret because of language barriers
- Immunization schedules and products may differ from those used in Canada.

Translation of foreign terms for immunization products can be found at <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/foreign-products-tables.pdf>

Although the potency of vaccines administered in other countries can be generally assumed to be adequate, immunization schedules vary and the age at immunization, number of doses, and intervals between doses should be reviewed in determining the need for additional doses of vaccines.

Immunizations received outside Canada can be considered valid if the written documentation indicates the vaccine types, dates of administration, number of doses, intervals between doses, and age of the client at time of immunization are comparable with the current Canadian recommendations.

Only written documentation of immunization should be considered valid evidence of prior immunization.

Immunization records for certain children, especially children from orphanages, may not be accurate (e.g., MMR may be recorded but the actual product administered may be missing one of the components).

Internationally adopted children typically differ from refugee children in terms of their access to medical care and treatment before arrival in Canada. Many refugee children may have resided in refugee processing camps for months before resettlement in Canada and may have had access to medical care and immunization in the camp.



Re-immunize any child immunized outside of Canada, if any question exists about whether vaccines were administered or were immunogenic.

In some situations, use of serologic testing may be useful in determining which vaccines are needed. If child experiences a significant local reaction after one dose of tetanus and diphtheria - containing vaccine, consider serologic testing for antibodies to diphtheria and tetanus toxoids.

The following vaccines are in limited use in the developing world and, therefore, individuals from such areas are unlikely to have received them:

- Hib conjugate
- Meningococcal conjugate
- Pneumococcal conjugate
- Hepatitis B vaccine
- Varicella vaccine
- Mumps and rubella vaccine (measles vaccine alone is often given).

Information on vaccination schedules in other countries can be found at <http://www.who.int/vaccines/GlobalSummary/Immunization/ScheduleSelect.cfm>

The epidemiology of different diseases varies in other countries:

- Compared with temperate climates, in the tropics a higher proportion of varicella disease occurs in adults, meaning that children, adolescents and young adults from those areas are more likely to be susceptible to varicella.
- Hepatitis A immunity is more common in individuals from hepatitis A endemic countries.
- Individuals born in developing countries are more likely to be hepatitis B carriers, necessitating the need for assessment and immunization of their sexual and household contacts.

Ask the following questions when assessing the immunization status of an individual who is new to Canada:

- What country has the individual(s) come from?
- Were they in an orphanage or refugee camp?
- When did they arrive in Canada?
- What immunizations were given prior to arrival and when?
- Were the immunizations comparable to Canadian recommendations, particularly:
  - Vaccine type
  - Dates of administration
  - Numbers of doses
  - Intervals between doses
  - Age of client at time of immunization?
- What diseases were endemic in the country of previous residence?



As part of the assessment, the following tests are particularly relevant in determining the need for some vaccines or contraindications to vaccination:

- Hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), and hepatitis B core antibody (anti-HBc): to identify current or chronic infection, past resolved infection, or evidence of immunization. Should any member of the family test positive for HBsAg, assess and immunize all susceptible sexual and household contacts.
- Hepatitis C antibody: If anti-HCV is positive in children <18 months (may be due to circulating maternal antibodies), order hepatitis C PCR. Offer hepatitis A and B vaccines to individuals with hepatitis C infection.
- Human immunodeficiency virus (HIV): If individual is from a country with high rates of HIV and HIV status is not known, testing should be encouraged. Routine HIV testing is done during the immigration medical examination for everyone  $\geq$  15 years of age and certain children (those who received blood products, those whose mother was known to be HIV positive). If anti-HIV is positive in children <18 months (may be due to circulating maternal antibodies), order HIV PCR.

In the context of a complete clinical assessment in which no signs or symptoms consistent with advanced HIV/AIDS are identified, immunization with live vaccines may proceed when HIV tests are not yet available. Live vaccines are contraindicated for individuals with advanced HIV infection. See [Section 1.0 Immunocompromised Individuals](#).

Families new to Canada may return to their country of origin to visit friends and relatives or may receive visitors from their country of origin. Encourage such families to visit a travel health professional for consultation and immunization with appropriate vaccines, particularly hepatitis A and B vaccines.

### **Tuberculin skin testing**

Refer to:

BC Communicable Disease Manual, Tuberculosis Control at [http://www.bccdc.ca/NR/rdonlyres/90E2CF31-8621-4082-81B9-BB67B8D1E4F3/0/TB\\_GF\\_manual\\_1999.pdf](http://www.bccdc.ca/NR/rdonlyres/90E2CF31-8621-4082-81B9-BB67B8D1E4F3/0/TB_GF_manual_1999.pdf)

Canadian Tuberculosis Standards, 6<sup>th</sup> ed. at [http://www.phac-aspc.gc.ca/tbpc-latb/pubs/pdf/tbstand07\\_e.pdf](http://www.phac-aspc.gc.ca/tbpc-latb/pubs/pdf/tbstand07_e.pdf)



### 3.6 UNKNOWN OR UNCERTAIN IMMUNIZATION STATUS / INADEQUATE IMMUNIZATION RECORDS

In every instance, an attempt should be made to obtain the child's immunization records from the previous health care provider. Written documentation of immunization is preferred. In some instances, telephoned information from the health care provider with the exact dates of vaccinations may be accepted. Parental verbal reports of prior immunization correlate poorly with actual immunity and should not be accepted as evidence of immunization.

Routine serologic testing of children and adults without records to determine immunity is not practical. Instead, the following approach is recommended:

- Start all children and adults lacking written documentation of immunization on a primary immunization schedule as appropriate for their age.
- If indicated, give MMR, polio, Hib conjugate, pneumococcal polysaccharide and conjugate, meningococcal conjugate, varicella, hepatitis B and A, and influenza vaccines, without concern about prior receipt of these vaccines. An increase in adverse events following repeated vaccination with these antigens has not been demonstrated.
- There is no increase in adverse events following immunization of an individual previously infected with the antigen.
- Assess individuals who experience a serious local adverse event after administration of vaccines containing diphtheria, tetanus and pertussis. Serologic testing for specific IgG antibodies against diphtheria and tetanus may demonstrate immune status and may guide the need for continued immunization. There are no established serologic correlates for protection against pertussis but protective concentrations of antibody to both diphtheria and tetanus toxins can serve to validate the immunization record.

❶ For specific vaccine schedule information, refer to [BC Communicable Disease Control Manual, Chapter 2, Section VII Biological Products](#).



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