

Immunization for Children Expecting Solid Organ Transplant after 18 Months of Age (Catch-up and Ongoing Schedule)

Revision Date: March 14, 2018

Rationale for update: Updated dosing and scheduling for hepatitis B vaccine for hyporesponsive individuals under 16 years of age.

This guide is meant to supplement existing recommendations for routine immunization as outlined in the current *Alberta Immunization Policy*. See [Principles of Immunization in Hematopoietic Stem Cell Transplant Recipients and Solid Organ Transplant Recipients](#).

Inactivated vaccines should be given at least 2 weeks before transplantation and live attenuated vaccines should be given at least 4 weeks prior to transplantation. Consult with an attending physician before providing live vaccines.¹

1. Routine Immunizations – Before Transplant

1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
DTaP-IPV-Hib or DTaP-IPV or dTAp-IPV or Hib	DTaP-IPV or dTAp-IPV	DTaP-IPV		DTaP-IPV or dTAp-IPV
Hepatitis A HAV*				Hepatitis A HAV*
HBV	HBV			HBV
HPV (9 to 17 years of age)	HPV (9 to 17 years of age)			HPV (9 to 17 years of age)
INFLUENZA (inactivated)				
MMR		MMR (If needed based on serology results)		
MenC-ACYW				
PNEU-C13		PNEUMO-P		
VZ*			VZ (If needed based on serology results)	

See detailed recommendations on following pages.

DTaP-IPV-Hib or DTaP-IPV or dTap-IPV or Hib				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
DTaP-IPV-Hib or DTaP-IPV or dTap-IPV or Hib	DTaP-IPV or dTap-IPV	DTaP-IPV		DTaP-IPV or dTap-IPV
<p>DTaP-, IPV- and Hib-containing vaccines - Minimum interval between the first three doses is four weeks.¹</p> <p>DTaP-IPV-Hib: Administer to those younger than seven years of age who need Hib vaccine as well.</p> <p>DTaP-IPV: Administer to those younger than seven years of age with an incomplete DTaP-IPV series but Hib is not indicated.</p> <p>dTap-IPV:</p> <ul style="list-style-type: none"> Reinforcing dose routinely at five years of age. DTaP-IPV-Hib should be used for this dose for children five years to younger than seven years of age. Seven years of age and older when diphtheria, tetanus, pertussis and polio immunization is indicated (primary series or reinforcing dose). If polio series is complete, dTap should be used. <p>Hib:</p> <ul style="list-style-type: none"> One dose of Hib only is indicated for children previously unimmunized between 15 months and four years of age inclusive.¹ One dose of Hib is recommended for all children five years of age and older regardless of previous Hib immunization (at least one year after any previous dose). <p>Note: If dTap-IPV booster has not already been administered, DTaP-IPV-Hib vaccine may be used for children 5 years of age but younger than 7 years of age.¹</p> <p>Immunity screening after immunization is not recommended.</p>				

Hepatitis A				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
Hepatitis A HAV*				Hepatitis A HAV*
<p>*Only for those considered at high risk (chronic liver disease; liver transplantation; individuals receiving repeated replacement of plasma-derived clotting factors; household or close contacts of children adopted from hepatitis A endemic countries; populations or communities at risk of hepatitis A outbreaks or in which hepatitis A is highly endemic; or those eligible post-exposure.¹</p> <p>Two doses: Second dose 6 – 12 months after the first dose.</p> <p>Note: Provincially funded vaccine is not available for travellers – refer to local travel clinics. Immunity screening after HAV immunization is not routinely recommended.¹</p>				

HBV				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
HBV	HBV			HBV
<p>HEPATITIS B</p> <ul style="list-style-type: none"> Follow the dosage and schedule for hypo-responsive individuals for Hepatitis B Vaccine. <p>Laboratory Recommendations Screen for anti-HBs within 1 – 6 months after the third dose. If antibody levels are suboptimal, repeat series once and retest anti-HBs within 1 – 6 months after the repeat series.</p> <ul style="list-style-type: none"> Periodic screening as recommended by the attending transplant physician taking into account the severity of the immunocompromised state and whether or not the risk of hepatitis B is still present.¹ <p>Ordering serology and interpretation of the results is the responsibility of the transplant physician.</p>				

HPV				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
HPV (9 to 17 years of age)	HPV (9 to 17 years of age)			HPV (9 to 17 years of age)
The vaccine series includes three doses administered at 0, 1 – 2 months and 6 months after the first dose. Girls and Boys 9 to 17-years of age. Immunity screening after immunization is not recommended.				

INFLUENZA				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
INFLUENZA (inactivated)				
INFLUENZA Administer age-appropriate dose(s) of inactivated influenza vaccine every fall. Influenza vaccine can be administered as early as three months post-transplant. Note: <ul style="list-style-type: none"> Solid organ transplant recipients: Live attenuated influenza vaccine (LAIV) is contraindicated. Immunity screening after immunization is not recommended.				

MMR				
1 st visit	2 nd visit (1 month after 1 st visit)	3 rd visit (1 month after 2 nd visit)	4 th visit (1 month after 3 rd visit)	5 th visit (6 month after 3 rd visit)
MMR		MMR (If needed based on serology results)		
MMR must be administered at least four weeks prior to transplant. ^{1,4} Note: MMR-Var may be used if children are younger than 13 years of age and susceptible to varicella. Laboratory Recommendations <ul style="list-style-type: none"> Routine immunity screening prior to transplant is not recommended because of waning immunity. Screen for measles, mumps, rubella, and varicella immunity (IgG) 6 weeks after the first dose of vaccine. If non-immune and a second dose can be administered, provide a second dose and repeat screening in 6 weeks.⁵ If serology indicates immunity, do not administer a second dose. Annual immunity screening for measles or rubella is not recommended. Ordering serology and interpretation of the results is the responsibility of the transplant physician.				

MenC-ACYW				
1st visit	2nd visit (1 month after 1 st visit)	3rd visit (1 month after 2 nd visit)	4th visit (1 month after 3 rd visit)	5th visit (6 month after 3 rd visit)
MenC-ACYW				
<p>MENINGOCOCCAL - Menveo™ vaccine should be used for children younger than 24 months of age¹.</p> <ul style="list-style-type: none"> Doses may be administered a minimum of four weeks apart if accelerated scheduling is needed.¹ Children who have previously received meningococcal conjugate C (MenC) vaccine only should receive one dose of meningococcal conjugate quadrivalent (MenC-ACYW) separated by at least 4 weeks from any previous dose of MenC vaccine dose. <p>Note: Children at high risk due to underlying medical conditions should receive two doses of MenC-ACYW at least eight weeks apart and booster doses every 3 – 5 years depending upon their age when immunization was initiated.¹ High-risk underlying medical conditions include functional or anatomic asplenia (including sickle cell disease); congenital complement, properdin, factor D or primary antibody deficiencies; acquired complement deficiency due to eculizumab (Soliris™) and HIV infection.¹</p> <p>Immunity screening after immunization is not recommended.</p>				

PNEU-C13 and PNEUMO-P				
1st visit	2nd visit (1 month after 1 st visit)	3rd visit (1 month after 2 nd visit)	4th visit (1 month after 3 rd visit)	5th visit (6 month after 3 rd visit)
PNEU-C13		PNEUMO-P		
<p>PNEU-C13</p> <ul style="list-style-type: none"> Age-appropriate number of doses (determined by number of previous doses and age) <p>PNEUMO-P</p> <ul style="list-style-type: none"> Must be 24 months of age or older AND there must be at least eight weeks between administration of PNEU-C13 and PNEUMO- P^{1,2} (may need to delay PNEUMO-P if more than one dose of PNEU-C13 is indicated). <p>Note: Children who have already received PNEUMO-P should receive PNEU-C13. PNEU-C13 should be administered at least eight weeks after PNEUMO-P.^{1,3}</p> <p>Immunity screening after immunization is not recommended.</p>				

VZ				
1st visit	2nd visit (1 month after 1 st visit)	3rd visit (1 month after 2 nd visit)	4th visit (1 month after 3 rd visit)	5th visit (6 month after 3 rd visit)
VZ*			VZ (if needed based on serology results)	
<p>VARICELLA (chickenpox)</p> <p>*Administer to susceptible children (evidence of immunity is history of two doses of vaccine after 12 months of age OR laboratory evidence of immunity). MMR-Var vaccine may be used for children younger than 13 years of age. The last dose of varicella vaccine should be administered at least four weeks prior to transplant.^{1,4}</p> <p>Laboratory Recommendations Routine screen pre-transplant includes varicella IgG testing.</p> <ul style="list-style-type: none"> Serology is recommended after the first dose of VZ vaccine and a second dose should not be administered if seroconversion is demonstrated. <p>Ordering serology and interpretation of the results is the responsibility of the transplant physician.</p>				

2. Non-routine Immunizations – Before and/or After Transplant

Note: Non-routine immunizations may be provided using the same schedule after transplant if not completed prior to transplant. Immunization may resume once immunosuppression has been reduced to maintenance levels, usually 6 to 12 months after transplant,^{1,2} and as determined appropriate by the individual's attending physician. **Live vaccines are contraindicated post-transplant¹.**

Vaccine	Series	Comments
Hepatitis A HAV*	Two doses: Second dose 6 – 12 months after the first dose.	*Only for those considered at high risk (chronic liver disease; liver transplantation; individuals receiving repeated replacement of plasma-derived clotting factors; household or close contacts of children adopted from hepatitis A endemic countries; populations or communities at risk of hepatitis A outbreaks or in which hepatitis A is highly endemic; or those eligible post-exposure. ¹ Note: Provincially funded vaccine is not available for travellers – refer to local travel clinics. Immunity screening after HAV immunization is not routinely recommended. ¹
Rabies RAB*	Pre-exposure: days 0, 7, 21 or 28 Post-exposure: One dose of RIG on day 0 and vaccine on days 0, 3, 7, 14 and 28.	* Pre-exposure: Should be administered (1.0mL intramuscularly) only to those considered high risk (volunteers working in animal shelters or animal clinics and spelunkers). Post-exposure: Rabies prophylaxis can be administered intramuscularly at any time before or after transplant if indicated. Laboratory Recommendations Pre-exposure: Immunity screening is recommended 7 – 14 days after the third dose and every two years thereafter if risk continues. ¹ Provide booster if indicated. Post-exposure: Immunity screening is recommended 7 – 14 days after the last dose. ¹ If no acceptable antibody response is detected, the individual may need to receive a second rabies vaccine series. Rabies Immune Globulin (RIG) should not be repeated at the initiation of this second course. ¹ Ordering serology and interpretation of the results is the responsibility of the transplant clinician.
Typhoid Fever TYVI* (inactivated)	1 dose	*Only for those considered at high risk and 24 months of age or older. Individuals at high risk include household or intimate contacts of a typhoid carrier. <ul style="list-style-type: none"> Booster every three years if at continued high risk.¹ Immunity screening after immunization is not recommended.

3. Routine Immunizations – Ongoing Recommendations after Transplant

Note: Immunization may resume once the individual is on baseline immunosuppression, usually 6 to 12 months after transplant,¹ and as determined appropriate by the individual's attending transplant physician. If immunizations were not completed prior to transplant, complete the series for inactivated vaccines as previously indicated. **Live vaccines, such as MMR, VZ and live attenuated influenza vaccine are contraindicated after transplant.**¹

Vaccine	Series	Comments
DTaP-IPV-Hib	Age five years (preschool booster)	<ul style="list-style-type: none"> Three years after the fourth dose (DTaP-IPV). When a fourth dose of DTaP-IPV-Hib/DTaP-IPV is administered at four years of age and older, the pre-school booster is not required.¹ However a dose of Hib would still be required at five years of age.¹ Immunity screening after immunization is not recommended.
dTap	Grade 9 (14 – 17 years of age)	Not indicated if a reinforcing dose of acellular pertussis-containing vaccine was received at 12 years of age or older. Immunity screening after immunization is not recommended.
Hepatitis A HAV*	Non-specific age	*Only for those considered at high risk (chronic liver disease; liver transplantation; individuals receiving repeated replacement of plasma-derived clotting factors; household or close contacts of children adopted from hepatitis A endemic countries; populations or communities at risk of hepatitis A outbreaks or in which hepatitis A is highly endemic; or those eligible post-exposure. ¹ Note: Provincially funded vaccine is not available for travellers – refer to local travel clinics. Immunity screening after HAV immunization is not routinely recommended. ¹
Hepatitis B HBV	Non-specific age	Laboratory Recommendations See Laboratory Recommendations in Routine Immunizations – Before Transplant
Human Papilloma-virus Vaccine HPV	Grade 6 Girls and Boys 9 to 17 years of age	The vaccine series includes three doses administered at 0, 1 – 2 months and 6 months after the first dose. Immunity screening after immunization is not recommended.
Influenza FLU (inactivated)	All ages - annually	Administer age-appropriate dose(s) of inactivated influenza vaccine every fall. Influenza vaccine can be given as early as three months post-transplant. Note: <ul style="list-style-type: none"> Solid organ transplant recipients: Live attenuated influenza vaccine (LAIV) is contraindicated. Immunity screening after immunization is not recommended.
MenC-ACYW	MenC-ACYW	One dose (this dose is not needed if a dose has been received at 12 years of age or older). Note: See recommendations for children at high risk due to ongoing medical conditions in Routine Immunization Before Transplant. Immunity screening after immunization is not recommended.
Td	Adults	Booster every ten years. Note: Adults presenting for a Td booster should receive a one-time reinforcing dose of dTap if they have not received a dose of dTap in adulthood. ¹ Immunity screening after immunization is not recommended.

References

- ¹ National Advisory Committee on Immunization. (2016) *Canadian Immunization Guide* (Evergreen ed.). Ottawa, ON: Public Health Agency of Canada. www.canada.ca/en/public-health/services/canadian-immunization-guide.html
- ² Danziger-Isakov, L., et al. (2013). Vaccination in Solid Organ Transplantation. *American Journal of Transplantation*, 13:311-317 <http://onlinelibrary.wiley.com/doi/10.1111/ajt.12122/epdf>
- ³ Centers for Disease Control and Prevention. (2013). Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine among children aged 6 – 18 years with immunocompromising conditions: recommendations of the Advisory Committee on Immunizations practices. *Morbidity and Mortality Weekly Report* 62 (25)
- ⁴ Rubin, L. G., et all. (2013, December 4). 2013 IDSA clinical practice guidelines for vaccination of the immunocompromised host. *Clinical Infectious Diseases, Advanced Access*
- ⁵ Expert opinion of Alberta Infectious Disease, physicians November 2017.

Additional resource

Verolet, C., Posfay-Barbe, K (2015, April). Live Virus Vaccines in Transplantation: Friend or Foe? *Current Infectious Disease Report*, (17:14) <https://link.springer.com/article/10.1007/s11908-015-0472-y>