# TABLE OF CONTENTS

1.0 INTRODUCTION ................................................................. 3
2.0 PRE-TRANSPLANT: INACTIVE VACCINES ......................... 4
  2.1 DIPHTHERIA, PERTUSSIS, TETANUS, POLIO AND HAEMOPHILUS INFLUENZA B .................................. 5
  2.2 MENINGOCOCCAL .......................................................... 6
  2.3 PNEUMOCOCCAL ........................................................... 8
  2.4 HEPATITIS A ................................................................. 10
  2.5 HEPATITIS B ................................................................. 12
  2.6 HUMAN Papilloma virus .................................................. 14
3.0 PRE-TRANSPLANT: LIVE VACCINES ................................. 15
  3.1 MEASLES, MUMPS, RUBELLA ....................................... 16
  3.2 VARICELLA ................................................................. 17
  3.3 ROTAVIRUS ................................................................. 19
4.0 PRE-TRANSPLANT: INFLUENZA VACCINES ...................... 20
  4.0 INFLUENZA VACCINES .................................................. 21
5.0 PRE-TRANSPLANT: TRAVEL VACCINES .......................... 23
  5.1 ENTEROTOXIGENIC E COLI .......................................... 24
  5.2 HEPATITIS A ................................................................. 25
  5.3 HEPATITIS B ................................................................. 26
  5.4 JAPANESE ENCEPHALITIS ............................................. 28
  5.5 RABIES ....................................................................... 29
  5.6 TYPHOID (SALMONELLA TYPHI) ................................... 30
  5.7 YELLOW FEVER ........................................................... 31
1.0 INTRODUCTION

PRE-TRANSPLANT IMMUNIZATION GUIDELINES:
The following tables are suggested immunization schedules for solid organ transplant candidates. They are meant as a guide only and may not be applicable to all patients. Please consult Infectious Diseases as appropriate for patient specific issues. Vaccines listed are those that are licensed for use in children <18 yrs of age. Please consult your local pharmacy for current cost of vaccines that are not covered by the Ontario Ministry of Health and Long Term Care (MOHLTC).

PRE-TRANSPLANT CONSIDERATIONS:
- Accelerated regimen schedules may be possible for some vaccines to facilitate optimal dosing and response with limited time prior to transplant. Refer to tables for the minimum age to receive each vaccine and interval recommended for accelerated scheduling.
- Defer transplant for 2 wks (if possible) following administration of INACTIVE vaccines to ensure adequate vaccine response.
- LIVE vaccines should be administered PRIOR to transplant when possible. Ideally transplant should not occur until at least 4 wks following live vaccine administration.

SIBLINGS AND OTHER FAMILY MEMBERS:
All siblings should be vaccinated per routine guidelines. It is also safe for siblings of solid organ transplant candidates to receive LIVE vaccines.

TRAVEL VACCINES:
Prior to travel, all transplant candidates should consult Infectious Diseases/Travel Clinic for recommended vaccinations. Travel Clinic consultations are not covered by the Ontario Ministry of Health and Long Term Care. Most travel vaccines are also not covered. Families will need to budget for the cost of consultation and vaccination. Some vaccines need to be administered several wks prior to travel in order to provide adequate protection. Families will need to plan consultations well ahead of their travel date.
2.0 PRE-TRANSPLANT: INACTIVE VACCINES
## 2.1 INACTIVE VACCINES: DIPHTHERIA, PERTUSSIS, TETANUS, POLIO AND HAEMOPHILUS INFLUENZA B – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTaP-IPV-Hib Pediacle® Infanrix® IPV/Hib</td>
<td>2, 4, 6 and 18 mths</td>
<td>6 wks1,2,5</td>
<td>Doses 1, 2, 3</td>
<td>4 wks</td>
<td></td>
<td></td>
<td>NOT done routinely</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dose 3 to 4</td>
<td>6 mths but 4th dose</td>
<td></td>
<td></td>
<td>Covered by MOHLTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>must be given at or after 12 mths of age1,2,4,5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tdap-IPV Adacel® Polio Boostrix® Polio</td>
<td>4-6 yrs x1 dose</td>
<td>4 yrs1,2,5,14,15</td>
<td>N/A</td>
<td>As per routine schedule</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tdap Adacel® Boostrix®</td>
<td>14 years: 1 dose + booster in 10 yrs</td>
<td>7 yrs1,2,5,14</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:
- D=diphtheria toxoid high dose; d=diphtheria toxoid low dose; ap or aP=acellular pertussis; T=tetanus toxoid; IPV or Polio=inactivated polio; Hib=haemophilus influenza type b; HB=hepatitis B.
- DTaP-IPV-Hib: Infanrix-hexa® is not part of the Ontario routine immunization schedule and is NOT covered by MOHLTC.
- Act-HIB® and Hiberix® are single entity haemophilus influenza b vaccines licenced for use in patients 2 mths and older.

### CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:
- The National Advisory Committee on Immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.1
- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites. 3
- DTaP-IPV-Hib (Pediacle®) can be given at the same time as other routine vaccinations such as meningococcal C conjugate and hepatitis B.9

### REFERENCES:
7. CDC. Recommended immunization schedules for persons aged 0 through 18 yrs. 2022 Accessed May 18, 2022 https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html
### 2.2 INACTIVE VACCINES: MENINGOCOCCAL – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococcal quadrivalent ACW-135Y conjugate vaccine (Men-C-ACWY)</td>
<td>Nimenrix® 6 wks1, 7 Menveo® 9 mths1, 15 Menactra® 9 mths4, 15 Accelerated Men-C-ACYW schedule: ≥ 12 mths: 4 wks1</td>
<td>Men-C-ACWY® 2 mths17 Menveo® 2 mths9 Menactra® 3 mths4, 15</td>
<td>YES</td>
<td>Transplant candidates are at HIGH RISK* of invasive meningococcal disease (IMD) due to impending immunosuppression and should receive Men-C-ACWY vaccine** Routine Meningococcal Conjugate vaccine does not need to be administered in addition to the quadrivalent vaccine† Defer transplant for 2 wks following administration to ensure adequate response</td>
<td></td>
<td></td>
<td>Covered under MOHLTC school program (grade 7)† OR HIGH RISK* (≥29 mths)‡</td>
</tr>
<tr>
<td>Serogroup B Meningococcal Vaccine 4CMenB Bexsero® MenB-HBP Trumenba® (NOT interchangeable)</td>
<td>4CMenB Bexsero® 2 mths12 MenB-HBP Trumenba® 10 yrs21</td>
<td>Bexsero® 2-5 mths: 1 mth 6-23 mths: 2 mths &gt;2 yrs: 1 mth Trumenba®21 HIGH RISK*: Dose 1 and 2: 1 mth Dose 2 and 3: 4 mths</td>
<td>YES</td>
<td>Transplant candidates are at HIGH RISK* of invasive meningococcal disease (IMD) due to impending immune suppression and should receive MenB-vaccine** Defer transplant for 2 wks following administration to ensure adequate response</td>
<td></td>
<td></td>
<td>Covered by MOHLTC for HIGH RISK* ONLY‡</td>
</tr>
</tbody>
</table>

*HIGH RISK FOR INVASIVE MENINGOCOCCAL DISEASE (IMD) INCLUDE:

1. Functional/anatomic asplenia or sickle cell disease1, 2
2. Complement, properdin, factor D or combined T and B cell deficiencies1, 2
3. Cochlear implants (pre/post implant)3
4. HIV1, 2
5. Acquired complement deficiencies due to receipt of the terminal complement inhibitor eculizumab (Soliris®)1, 2
6. Increased risk of exposure: travelers where meningococcal vaccine is recommended (meningitis belt of Sub-Saharan Africa) or required (Hajj, Mecca)1

**Expert opinion

†Nimenrix® is funded by MOHLTC (June 2022). At the time of TRMC guideline update, NACI was reviewing its recommendations in view of Nimenrix® receiving approval for use in infants as young as 6 wks of age. (Previously Menveo® (Men-C-ACYW-CRM) was the vaccine of choice for children <2 yrs of age per NACI and CPS). Provincial recommendations may vary based on available vaccine products. Choice of vaccine and recommended schedules vary with age1

CONTRAINDICATIONS:

In persons with history of anaphylaxis after a previous dose of the vaccine and in patients with proven hypersensitivity/anaphylaxis to any component of the vaccine or its container.1

CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:

- The National Advisory Committee on immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.1
- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites.1
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- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites.1

NOT done routinely

Covered by MOHLTC for HIGH RISK* ONLY‡
REFERENCES:

## 2.3 INACTIVE VACCINES: PNEUMOCOCCAL – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumococcal Conjugate Vaccine (Pneu-C)</td>
<td>2, 4, 6 and 12-15 mths&lt;sup&gt;1,2&lt;/sup&gt; for HIGH RISK*</td>
<td>2, 4 and 12 mths for other children&lt;sup&gt;1&lt;/sup&gt;</td>
<td>6 wks&lt;sup&gt;1,13&lt;/sup&gt;</td>
<td>8 wks&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td>3-4 doses for HIGH RISK* (schedule dependent on age) &lt;br/&gt; &lt;5 yrs: follow MOHLTC schedule for HIGH RISK* (see Tables 1 and 2 on next page) &lt;br/&gt; &gt;5 yrs, NOT previously immunized: 2 doses Pneu-C, 6-8 wks apart&lt;sup&gt;4&lt;/sup&gt;, then 1 dose Pneu-P (8 wks after last Pneu-C dose&lt;sup&gt;1&lt;/sup&gt;) followed by 2nd Pneu-P dose 5 yrs later&lt;sup&gt;1&lt;/sup&gt;</td>
<td>YES</td>
<td>Covered by MOHLTC per routine schedule for ≤5 yrs age&lt;sup&gt;2&lt;/sup&gt; (Prevnar&lt;sup&gt;®&lt;/sup&gt; 13 only)</td>
</tr>
<tr>
<td>Prevnar&lt;sup&gt;®&lt;/sup&gt; 13 (Pneu-C-13)</td>
<td>Vaxneuvance&lt;sup&gt;®&lt;/sup&gt; (Pneu-C-15)</td>
<td>Synflorix&lt;sup&gt;®&lt;/sup&gt; (Pneu-C-10)</td>
<td>2 doses for HIGH RISK* ≥2 yrs</td>
<td>NOT routine for other children&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2 yrs&lt;sup&gt;1,6&lt;/sup&gt;</td>
<td>5 yrs&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td>≥2 yrs: 1 dose, 8 wks after Pneu-C administration (after completion of age-appropriate Pneu-C series)&lt;sup&gt;3,4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pneumococcal Polysaccharide Vaccine (Pneu-P)</td>
<td>2 doses for HIGH RISK* ≥2 yrs</td>
<td>NOT routine for other children&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2 yrs&lt;sup&gt;1,6&lt;/sup&gt;</td>
<td>5 yrs&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumovax&lt;sup&gt;®&lt;/sup&gt; 23 (Pneu-P-23)</td>
<td>2 doses covered by MOHLTC for transplant candidates ≥2 yrs age&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:
- *NACI: Children 2 months to less than 18 years of age at increased risk of invasive pneumococcal disease (IPD) should receive pneumococcal conjugate (Pneu-C) vaccine, with pneumococcal polysaccharide (Pneu-P) vaccine as a booster dose to increase the serotype coverage<sup>1</sup>.
- Children at increased risk of IPD include those who have: chronic medical conditions (example: heart, kidney, liver or lung disease), are transplant candidates, have sickle cell disease/sickle cell hemoglobinopathies, have other types of functional or anatomic asplenia, have HIV infection, are immunocompromised (e.g., primary immunodeficiencies; malignancies, immunosuppressive therapy, use of long-term systemic corticosteroids, nephrotic syndrome), have chronic medical conditions (e.g., diabetes mellitus or CSF leak) and children with cochlear implants/receiving cochlear implants.<sup>1</sup>

*Expert opinion: Note that expert opinion based on local study data listed in this table differs from that of NACI, which recommends patients >5 yrs receive 1 dose of Pneu-C-13 followed by 2 doses of Pneu-P-23, the first given >8 wks after Pneu-C-13 and the second >5 yrs after the first.<sup>1</sup>*

At the time of TRMC guideline update, NACI was reviewing Pneu-C-15 data in paediatrics and had not yet issued guidance.

### CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:
- The National Advisory Committee on Immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.<sup>1</sup>
- NACI recommends that vaccines adminstered simultaneously should be given using separate syringes at separate sites.<sup>1</sup>
- Prevnar<sup>®</sup> 13 can be given with any of the following vaccine antigens, either as monovalent or combination vaccines: diphtheria, tetanus, acellular pertussis, Haemophilus influenzae type b, inactivated poliomyelitis, hepatitis B, meningococcal serogroup C, measles, mumps, rubella and varicella.<sup>3</sup>
**Table 1: Children <5 yrs not previously immunized with the pneumococcal conjugate vaccine**

<table>
<thead>
<tr>
<th>Age at First Dose</th>
<th>Applies To</th>
<th>PREVNAR® 13 (Pneu-C-13) Minimum Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks-6 mths</td>
<td>HIGH RISK</td>
<td>Dose 1: age ≥6 wks &lt;br&gt; Dose 2: 8** wks after 1st dose &lt;br&gt; Dose 3: 8** wks after 2nd dose &lt;br&gt; Dose 4: 8 wks after 3rd dose AND at age ≥12 mths</td>
</tr>
<tr>
<td>7-11 mths</td>
<td>All</td>
<td>Dose 1: Day 0 &lt;br&gt; Dose 2: 8 wks after 1st dose &lt;br&gt; Dose 3: 8 wks after 2nd dose AND at age ≥12 mths</td>
</tr>
<tr>
<td>12-23 mths</td>
<td>All</td>
<td>Dose 1: Day 0 &lt;br&gt; Dose 2: 8 wks after 1st dose</td>
</tr>
<tr>
<td>24-59 mths (2-5 yrs)</td>
<td>All</td>
<td>1 dose only</td>
</tr>
</tbody>
</table>

*Adapted from Publicly Funded Immunization Schedules for Ontario June 2022* Table 17

**Table 2: Children <5 yrs of age who have interrupted or incomplete vaccination with the pneumococcal conjugate vaccine**

<table>
<thead>
<tr>
<th>Current Age</th>
<th>Applies To</th>
<th>Number of Pneu-C-13 Doses Previously Received</th>
<th>Number of Pneu-C-13 Doses Needed to Complete Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-6 mths</td>
<td>HIGH RISK*</td>
<td>1 dose</td>
<td>Dose 2: 2 mths after 1st dose &lt;br&gt; Dose 3: 2 mths after 2nd dose &lt;br&gt; Dose 4: 2 mths after 3rd dose AND at age ≥12 mths</td>
</tr>
<tr>
<td>7-11 mths</td>
<td>All</td>
<td>1 dose</td>
<td>Dose 2: 2 mths after 1st dose &lt;br&gt; Dose 3: 2 mths after 2nd dose AND at age ≥12 mths</td>
</tr>
<tr>
<td>12-23 mths</td>
<td>All</td>
<td>Any incomplete series</td>
<td>1 dose, 2 mths after the most recent dose</td>
</tr>
<tr>
<td>24-59 mths (2-5 yrs)</td>
<td>All</td>
<td>Any incomplete series</td>
<td>1 dose, 2 mths after the most recent dose</td>
</tr>
</tbody>
</table>

*Adapted from Publicly Funded Immunization Schedules for Ontario June 2022 Table 23*

### References:

### 2.4 INACTIVE VACCINES: HEPATITIS A – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1(^{st}) DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A</td>
<td>None</td>
<td>6 mths(^1)</td>
<td>Monovalent vaccines 6 mths(^1)</td>
<td>2 doses See table 1 for schedule</td>
<td>Recommended for liver transplant candidates, and for other organ candidates meeting HIGH RISK* criteria(^1)</td>
<td>N0**</td>
<td>Covered by ON MOHLTC only for patients &gt;1 yr old with chronic liver disease</td>
</tr>
<tr>
<td>Avaxim(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avaxim Ped(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Havrix(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Havrix Jr(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaqta(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaqta Ped(^a) (Can be used interchangeably)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination Hep A/B Vaccines</td>
<td></td>
<td>1 yr(^1)</td>
<td>Twinrix(^c) 6 mths Twinrix(^c) Junior 1 mth between first and second dose; 6 mths between first and third dose</td>
<td>See table 2 for schedule</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twinrix(^c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twinrix(^c) Junior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*HIGH RISK includes persons travelling to endemic countries, individuals living in communities at risk of hepatitis A (HA) outbreaks or in which HA is endemic\(^1\)

**High response rate to immunization makes routine post immunization serologic testing unnecessary in healthy populations. Commercial assay kits are not universally reliable for detecting vaccine-induced antibody\(^7\)

### TABLE 1: CANADIAN IMMUNIZATION GUIDE (NACI)-HEPATITIS A DOSING RECOMMENDATIONS FOR MONOVALENT HEPATITIS A VACCINES\(^1\)

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>ANTIGEN*</th>
<th>VOLUME</th>
<th>SCHEDULE (BOOSTER)</th>
<th>AGE(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avaxim(^a)</td>
<td>160 antigen units HAV</td>
<td>0.5 mL</td>
<td>0, (6-36) mths</td>
<td>12 yrs and older</td>
</tr>
<tr>
<td>Avaxim Ped(^a)</td>
<td>80 antigen units HAV</td>
<td>0.5 mL</td>
<td>0, (6-36) mths</td>
<td>6 mths&lt;16 yrs</td>
</tr>
<tr>
<td>Havrix(^a)</td>
<td>1440 ELISA units HAV</td>
<td>1 mL</td>
<td>0, (6-12) mths*</td>
<td>19 yrs and older</td>
</tr>
<tr>
<td>Havrix Jr(^a)</td>
<td>720 ELISA units HAV</td>
<td>0.5 mL</td>
<td>0, (6-12) mths</td>
<td>6 mths&lt;19 yrs</td>
</tr>
<tr>
<td>Vaqta(^a)</td>
<td>50 units HAV</td>
<td>1 mL</td>
<td>0, (6-18) mths</td>
<td>18 yrs and older</td>
</tr>
<tr>
<td>Vaqta Ped(^a)</td>
<td>25 units HAV</td>
<td>0.5 mL</td>
<td>0, (6-18) mths</td>
<td>6 mths&lt;18 yrs</td>
</tr>
</tbody>
</table>

\(^*\)There is no international standard for HAV measurement. Each manufacturer uses its own units of measurement.

\(^1\)Ages for which the vaccine is approved

\(^2\)Studies have shown that 720 ELISA units provides an effective booster dose in those over 19 yrs of age

**NOTE:**
- Comparable to the results reported in clinical trials of children more than 12 mths, all reviewed studies have consistently shown that vaccination of infants 6-12 mths with inactivated HA vaccines is immunogenic and safe.
- Product monographs for Avaxim Ped, Havrix Jr and Vaqta Ped indicate 12 mths as the lower age limit.
REFERENCES:


### 2.5 INACTIVE VACCINES: HEPATITIS B – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOES required</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B Engerix® B OR Recombivax HB® (Can be used interchangeably)</td>
<td>Grade 7 (12 yrs) 2 doses (0, 6 mths)</td>
<td>Newborn¹</td>
<td>Varied accelerated schedules available</td>
<td>3 dose schedule preferred</td>
<td>0, 1, 6 mths¹</td>
<td>YES</td>
<td>Monovalent vaccines covered by ON MOHLTC school program (grade 7): 2 doses only. Covered &lt;7 yrs age immigrated from countries of high prevalence or exposed to hepatitis B. Doses 2 and 3 covered for patients: • on dialysis or receiving frequent blood products • listed for transplant 3 doses covered for patients with chronic liver disease²</td>
</tr>
</tbody>
</table>

#### Combination Hepatitis B Vaccines:
- Hepatitis A +B: Twinrix®
- Twinrix® Junior
- DTaP-HB-IPV-Hib INFANRIX Hexa™

**1 yr¹**

NACI: 6 mths³ for urgent cases

See Table 3 for Twinrix® and Twinrix® Junior intervals

See Table 3 for Twinrix® and Twinrix® Junior dosing

---

#### TABLE 1: CANADIAN IMMUNIZATION GUIDE (NACI) – HEPATITIS B STANDARD DOSING RECOMMENDATIONS¹ FOR PAEDIATRIC PATIENTS (3 OR 4 DOSE SCHEDULE ONLY):

<table>
<thead>
<tr>
<th>RECIPIENTS</th>
<th>RECOMBIVAX HB®</th>
<th>ENGERIX® B</th>
</tr>
</thead>
<tbody>
<tr>
<td>µg</td>
<td>mL</td>
<td>SCHEDULE (MTHS)</td>
</tr>
<tr>
<td>Infants (regardless of mothers’ HBV status)</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>12 mths-19 yrs</td>
<td>5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Thimerosal preservative-free preparation is recommended

**Although higher dose with a schedule of 0, 1 and >2 mths is approved, the preferred schedule is 0, 1, and 6 mths

*Expert opinion

---

#### TABLE 2: HEPATITIS B-REVISED DOSING GUIDELINES FOR FUNCTIONALLY IMMUNOSUPPRESSED OR HYPORESPONSIVE PATIENTS (ADAPTED FROM CANADIAN IMMUNIZATION GUIDE-NACI)

**Note:** doses listed are double the routine age recommended dose

<table>
<thead>
<tr>
<th>RECIPIENTS</th>
<th>RECOMBIVAX HB®</th>
<th>ENGERIX® B</th>
</tr>
</thead>
<tbody>
<tr>
<td>µg</td>
<td>mL</td>
<td>SCHEDULE (MTHS)</td>
</tr>
<tr>
<td>Infants (regardless of mothers’ HBV status)</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>12 mths-&lt;16 yrs</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>16&lt;20 yrs</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

*Thimerosal preservative-free preparation recommended

**Although higher dose with a schedule of 0, 1 and >2 mths is approved, the preferred schedule is 0, 1, and 6 mths

---

1. Thimerosal preservative-free preparation is recommended
2. Monovalent vaccines covered by ON MOHLTC school program (grade 7): 2 doses only. Covered <7 yrs age immigrated from countries of high prevalence or exposed to hepatitis B. Doses 2 and 3 covered for patients: • on dialysis or receiving frequent blood products • listed for transplant 3 doses covered for patients with chronic liver disease

---

Table 3 for Twinrix® and Twinrix® Junior intervals

Table 3 for Twinrix® and Twinrix® Junior dosing

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Official controlled document is the SickKids TRMC online copy dated December 2022. The user must ensure that any printed version is the same as the online version before use.
TABLE 3: TWINRIX® AND TWINRIX JR® DOSING SCHEDULE

<table>
<thead>
<tr>
<th>AGE</th>
<th>TWINRIX®</th>
<th></th>
<th>TWINRIX JR®</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>µg</td>
<td>mL</td>
<td>SCHEDULE (MTHS)</td>
<td>µg</td>
</tr>
<tr>
<td>1 yr-&lt;16 yrs</td>
<td>20</td>
<td>1</td>
<td>0, 6-12</td>
<td>10</td>
</tr>
<tr>
<td>16-&lt;19 yrs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
</tbody>
</table>

There are no data to support the use of Twinrix® and Twinrix® Jr on an accelerated schedule in children.

CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:

- The National Advisory Committee on Immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.
- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites.
- According to the National Advisory Committee on Immunization (NACI), RECOMBIVAX HB® (hepatitis B vaccine [recombinant]) may be administered simultaneously with other vaccines at different sites. A separate needle and syringe should be used for each vaccine.

CONTRAINDICATIONS:

- In persons with a history of anaphylaxis after previous administration of a HB-containing vaccine and in persons with proven immediate or anaphylactic hypersensitivity to any component of the product or its container.
- TWINRIX® and TWINRIX® Junior: latex in plunger stopper of pre-filled syringe, neomycin, yeast.

REFERENCES:

## 2.6 Inactive Vaccines: Human Papilloma Virus – Pre-Transplant Guidelines

<table>
<thead>
<tr>
<th>Name of Vaccine Products Available in Canada</th>
<th>Routine Schedule (Ontario)</th>
<th>Minimum Age for 1st Dose</th>
<th>Minimum Interval Between Doses</th>
<th>Number of Doses Required</th>
<th>Recommend Pre-Transplant</th>
<th>Serology Pre/Post Vaccination</th>
<th>Coverage in Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Papilloma Virus Gardasil® 9 (9-valent HPV 9 type 6, 11, 16, 18, 31, 33, 45, 52, 58)</td>
<td>Grade 7 females and males</td>
<td>9 yrs1, 2</td>
<td>3 dose series 4 wks between first and second dose1, 2, 3</td>
<td>Gardasil® 9 3 doses: 0, 2 and 6 mths1, 2, 3</td>
<td>YES</td>
<td>NO</td>
<td>Covered under ON MOHLTC school program (grade 7-12) for immunocompromised: 3 doses</td>
</tr>
<tr>
<td>Cervarix® (Bivalent HPV 2 type 16, 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cervarix® Not covered in Ontario</td>
</tr>
</tbody>
</table>

### Notes:
- Dose 0.5 mL IM
- Higher incidence of fainting in younger individuals; observe patients for full 15 minutes post dose.

### Concomitant Administration of Vaccines Listed in This Table:
- The National Advisory Committee on Immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.1
- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites.1
- GARDASIL® 9 may be administered concomitantly (at a separate injection site) with Menactra* [Meningococcal (Groups A, C, Y and W-135) Polysaccharide Diphtheria Toxoid Conjugate Vaccine] and Adacel* [Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine Adsorbed (Tdap)], and Poliomyelitis (inactivated) Vaccine.2

### References:
3.0 PRE-TRANSPLANT: LIVE VACCINES
3.1 LIVE VACCINES: MEASLES, MUMPS, RUBELLA – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priorix® (MMR)</td>
<td>MMR at 12 mths</td>
<td>6 mths$^1$</td>
<td>4 wks-6 wks$^5, 6, 7, 9, 10$ in consultation with Infectious Diseases</td>
<td>2 doses recommended</td>
<td>YES</td>
<td>Ideally defer transplant for 4 wks following vaccine administration$^1, 4$</td>
<td>Covered by MOH LTC</td>
</tr>
<tr>
<td>Priorix-Tetra® (MMR-V)</td>
<td>MMRV at 4-6 yrs$^2$</td>
<td>Priorix-Tetra® 9 mths$^4$</td>
<td>ProQuad® 12 mths$^5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>In consultation with Infectious Diseases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
- Upper limit for MMR-V products is 12 yrs of age.
- Blood products of human origin contain significant amounts of antibodies to infectious agents such as measles virus and varicella zoster virus (VZV). Administration of WIG preparations can interfere with the immune responses to live virus vaccines given concomitantly with or shortly before or after the vaccine. The duration of interference with the immune response to the vaccine is related to the amount of antibody in the Ig preparation.$^4, 10$
- If the interval between administration of any of these vaccines and subsequent administration of an IVIG preparation is less than the recommended intervals, immunization should be repeated at 3 mths or longer, unless serologic test indicates that the antibodies were produced.$^4, 10$ [https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-1-key-immunization-information/page-11-blood-products-human-immune-globulin-timing-immunization.html].
- Egg allergy is NOT a contraindication to MMR or MMRV vaccine-trace amount of egg protein appears insufficient to elicit a hypersensitivity reaction in egg allergic individuals.$^4$

CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:
- Measles, mumps and rubella vaccine may be given at the same time as the inactivated polio vaccine (IPV), diphtheria, tetanus and pertussis vaccines (DTPw/DTPa) and Haemophilus influenzae type b (Hib) as well as hepatitis A and B, meningococcal B, meningococcal C conjugate, meningococcal polysaccharide groups Ac, C, W- 135 and Y conjugate and pneumococcal polysaccharide vaccines if they are administered at separate injection sites.$^4, 5, 9, 10$
- Per NACI, a minimum interval of 4 wks between 2 varicella-containing vaccines is acceptable under exceptional circumstances. With respect to other live vaccinations: NACI recommends that if the live vaccines were not given concomitantly, a minimum interval of 4 wks interval should be observed between administration of other live vaccines.$^4$

REFERENCES:
16. CDC. Recommended immunization schedules for persons aged 0 through 18 yrs-2022 Accessed May 18, 2022. [https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html]
### 3.2 LIVE VACCINES: VARICELLA – PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varivax® III (Varicella only)</td>
<td>Varicella at 15 mths&lt;sup&gt;15&lt;/sup&gt;</td>
<td>12&lt;sup&gt;+&lt;/sup&gt; mths (varicella alone)</td>
<td>Varivax®</td>
<td>4 wks&lt;sup&gt;4&lt;/sup&gt;, 10, 12, 13, 25</td>
<td>2 doses recommended</td>
<td>YES</td>
<td>Check serology minimum 4-6 wks&lt;sup&gt;6&lt;/sup&gt; following last dose</td>
</tr>
<tr>
<td>Varilrix® (Varicella only)</td>
<td></td>
<td></td>
<td>Varilrix®</td>
<td>6 wks&lt;sup&gt;24&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priorix-Tetra® (MMR-V)</td>
<td>MMR-V at 4-6 yrs&lt;sup&gt;15&lt;/sup&gt;</td>
<td>Priorix-Tetra®</td>
<td>Priorix-Tetra®</td>
<td>4 wks&lt;sup&gt;2&lt;/sup&gt;, 10, 14, 16, 17</td>
<td>2 doses recommended</td>
<td>YES</td>
<td>Initial dose as varicella vaccine; second dose in combination with MMR (MMR-V)</td>
</tr>
<tr>
<td>ProQuad® (MMR-V)</td>
<td></td>
<td></td>
<td>ProQuad®</td>
<td>12 mths&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- *Varicella vaccine may be given at 9 mths<sup>5, 6, 11, 12, 26</sup> in consultation with Infectious Diseases.
- Upper limit for MMR-V products is 12 yrs of age.
- Use of immune globulin or other antibody-containing blood products: Delay immunization for 3 to 11 mths depending on the product to avoid vaccine failure secondary to passively acquired varicella/measles antibodies.<sup>14</sup> 
- Blood products of human origin contain significant amounts of antibodies to infectious agents such as measles virus and varicella zoster virus (VZV). Administration of IVIG preparations can interfere with the immune responses to live virus vaccines given concomitantly with or shortly before or after the vaccine. The duration of interference with the immune response to the vaccine is related to the amount of antibody in the Ig preparation.<sup>11, 14</sup> 
- If the interval between administration of any of these vaccines and subsequent administration of an IVIG preparation is less that the recommended intervals, immunization should be repeated at 3 mths or longer, unless serologic test indicates that the antibodies were produced.<sup>11, 14</sup> 
- Refer to product monographs for information regarding potential allergens such as neomycin, gelatin and egg protein.
- Contraindicated in patients with history of anaphylaxis after previous administration of the vaccine or with proven immediate/anaphylactic hypersensitivity to any component of the product.
- Egg allergy is NOT a contraindication to MMR-V vaccine-trace amount of egg protein appears insufficient to elicit a hypersensitivity reaction in egg allergic individuals.<sup>14</sup>
- Close contacts should be vaccinated against varicella if they do not have a previous history of chicken pox. Isolate contacts from the transplant recipient if they develop a varicella-like rash (>50 lesions).<sup>7, 27</sup>

**CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:**
- Varicella vaccine can be administered concomitantly with diphtheria and tetanus toxoids and pertussis vaccine adsorbed (DTaP) and Haemophilus b (Hib) conjugate vaccine.
- MMR vaccine can be administered concomitantly with diphtheria and tetanus toxoids and pertussis vaccine adsorbed, Haemophilus b conjugate vaccine and inactivated polio (IPV) vaccine if given at separate sites.<sup>4, 9, 10</sup>
- MMR-V vaccines: Priorix Tetra® can be given at the same time as DTaP; Hib and IP vaccines if administered at separate sites, 3 ProQuad® can be given at the same time as Hib, Hepatitis B, Hepatitis A and pneumococcal vaccines if given at separate sites. There is insufficient evidence with DTaP and no data with IP vaccine.<sup>2</sup>
- Per NACI, a minimum interval of 4 wks between 2 varicella-containing vaccines is acceptable under exceptional circumstances. With respect to other live vaccinations: NACI recommends that if the live vaccines were not given concomitantly, a minimum interval of 4 wks interval should be observed between administration of other live vaccines.<sup>14</sup>
REFERENCES:

# 3.3 Live Vaccines: Rotavirus – Pre-Transplant Guidelines

<table>
<thead>
<tr>
<th>Name of Vaccine Products Available in Canada</th>
<th>Routine Schedule (Ontario)</th>
<th>Minimum Age for 1st Dose</th>
<th>Minimum Interval Between Doses</th>
<th>Number of Doses Required</th>
<th>Recommend Pre-Transplant</th>
<th>Serology Pre/Post Vaccination</th>
<th>Coverage in Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotavirus oral vaccine</td>
<td>Rotarix® 2 and 4 mths¹,²,⁴</td>
<td>6 wks²,⁴,⁵</td>
<td>4 wks²,⁴,⁵</td>
<td>Rotarix® 2 doses² All doses completed by &lt;25 wks of age¹,²,⁴</td>
<td>YES</td>
<td>NO</td>
<td>Rotarix® Covered by MOHLTC for infants: 6-25 wks of age</td>
</tr>
<tr>
<td></td>
<td>RotaTeq® 2, 4, 6 mths²,3,⁵</td>
<td></td>
<td></td>
<td>RotaTeq® 3 doses All doses completed by &lt;32 wks of age¹,²,⁵</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Notes:
- Contraindicated with history of intussusceptions²,³, severe combined immunodeficiency disorder (SCID).²,⁴,⁵
- Infants with moderate to severe gastroenteritis should have rotavirus vaccine deferred until clinical condition improves, unless deferral will result in first dose being given >15 wks.² If an incomplete dose is administered for any reason (for example, infant spits or regurgitates the vaccine) a replacement dose should NOT be administered.²
- Live virus sheds in stool; care with diaper changes.²,⁴,⁵
- Typically NOT be given in hospital due to risk of transmission.
- Siblings may receive vaccine however careful handwashing recommended. Older transplant recipients should not change/handle their vaccinated sibling’s diapers for 10 days following vaccine dose.²

### Concomitant Administration of Vaccines Listed in This Table:
- Rotavirus oral vaccines may be given at the same time as other routine vaccinations (diphtheria, tetanus, pertussis, Haemophilus influenzae type b, inactivated polio, hepatitis B, pneumococcal vaccines as well as meningococcal serogroup C conjugate vaccine).²,³

## References
4.0 PRE-TRANSPLANT: INFLUENZA VACCINES
### 4.0 INFLUENZA VACCINES: PRE-TRANSPLANT GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>ROUTINE SCHEDULE (ONTARIO)</th>
<th>MINIMUM AGE FOR 1ˢᵗ DOSE</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>RECOMMEND PRE-TRANSPLANT</th>
<th>SEROLOGY PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Vaccine availability may vary annually</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Covered by MOHLTC for all patients at risk</td>
</tr>
<tr>
<td>Quadrivalent Inactivated:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Flulaval® Tetra</td>
<td></td>
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<tr>
<td>Fluzone® Quad</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Flucelvax® Quad</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Influvac® Tetra</td>
<td></td>
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<tr>
<td>Afluria® Tetra</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>(age ≥5 yrs)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Trivalent Inactivated, Adjuvanted:</td>
<td></td>
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<tr>
<td>Flud Pediatric®</td>
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<tr>
<td>(age 6-23 mths)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mths¹</td>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mths-&lt;9 yrs, no previous influenza vaccination:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 doses, 4 wks apart¹,²,⁵</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mths-&lt;9 yrs, previous influenza vaccination:</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥9 yrs: 1 dose¹</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrivalent vaccine preferred for paediatric patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live-attenuated Influenza Vaccine (LAIV) quadrivalent:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FluMist®</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reserve FluMist® for needle averse patients; less data regarding efficacy in the CKD population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(age 2-&lt;9 yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recommendations may vary across international jurisdictions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Defer transplant for 2 wks following vaccine administration to ensure adequate response⁹,¹⁰</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 yrs¹</td>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 doses, 4 wks apart¹,²,³,⁴</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 to &lt;9 yrs, no prior influenza vaccination:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥9 yrs: 1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live-attenuated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza Vaccine (LAIV) quadrivalent:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FluMist®</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(age 6-23 mths)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 yrs¹</td>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 doses, 4 wks apart¹,²,³,⁴</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 to &lt;9 yrs, no prior influenza vaccination:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥9 yrs: 1 dose¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- If a quadrivalent vaccine is not available, any of the available trivalent vaccines licensed for the pertinent age group should be used.³

**CONCOMITANT ADMINISTRATION OF VACCINES LISTED IN THIS TABLE:**
- The National Advisory Committee on Immunization (NACI) states that administering the most widely used live and inactivated vaccines during the same patient visit has produced seroconversion rates and rates of adverse reactions similar to those observed when the vaccines are administered separately.¹
- NACI recommends that vaccines administered simultaneously should be given using separate syringes at separate sites.¹
- As a precaution, siblings who have been vaccinated with LAIV should avoid contact with recently transplanted patients who are still in hospital for one wk following LAIV dose.⁹,²⁷,³¹

**CONTRAINDICATIONS:**
- Persons who have developed an anaphylactic reaction to a previous dose of influenza vaccine or any of its components (with the exception of egg*), have developed Guillain-Barre Syndrome (GBS) within 6 wks of influenza vaccination.¹
- *Egg allergic individuals can be vaccinated with influenza vaccine with inactivated TIV and QIV or LAIV without an influenza skin test and with the full dose of the vaccine.¹ There is low risk of adverse reaction to trace amounts of ovalbumin exist in the current influenza vaccines.¹
- Consult individual product monographs for specific warnings in this regard.
REFERENCES:


17. AstraZeneca Canada Inc. Product Monograph FluMist® Quadriivalent April 2022.


5.0 PRE-TRANSPLANT: TRAVEL VACCINES
## 5.1 Enterotoxigenic E Coli - Pre-Transplant Travel Guidelines

<table>
<thead>
<tr>
<th>Name of Vaccine Products Available in Canada</th>
<th>Minimum Age for 1st Dose</th>
<th>Minimum Interval Prior to Travel</th>
<th>Number of Doses Required</th>
<th>Minimum Interval Between Doses</th>
<th>Indication Pre-Transplant</th>
<th>Serology Required Pre/Post Vaccination</th>
<th>Coverage in Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterotoxigenic E coli Dukoral® (Oral, inactivated)</td>
<td>2 yrs¹</td>
<td>2 wks¹</td>
<td><strong>Primary Immunization</strong> 2 doses* 1st dose 2 wks before departure; 2nd dose 1 wk following first dose and at least 1 wk before departure  <strong>Booster</strong> Every 3 mths if in area of ongoing risk. If more than 5 yrs have passed since primary immunization or last booster dose, repeat primary series.²</td>
<td>1 wk² ³</td>
<td>YES If indicated²</td>
<td>NO</td>
<td>Not routinely covered by ON-MOH/TC</td>
</tr>
</tbody>
</table>

### Notes:

*If 6 wks elapses between doses patient will need to repeat the primary series.

Dukoral dose is prepared differently for younger children. See below:

- Open the white sachet of powder and pour into 150 ml (5 oz) of cool water.
- Stir gently with spoon to dissolve.
- Do not use any other liquid.
- For children aged 2–6 yrs, pour away half of the powder/water mixture before adding the vaccine component.³

### References:

4. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non HIV-related; adult).
5.2 HEPATITIS A – PRE-TRANSPLANT TRAVEL GUIDELINES

### TABLE 1: CANADIAN IMMUNIZATION GUIDE (NACI)-HEPATITIS A DOSING RECOMMENDATIONS FOR MONOVALENT HEPATITIS A VACCINES

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>ANTIGEN*</th>
<th>VOLUME</th>
<th>SCHEDULE (BOOSTER)</th>
<th>AGE†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avaxim®</td>
<td>160 antigen units HAV</td>
<td>0.5 mL</td>
<td>0, (6-36) mths</td>
<td>12 yrs and older</td>
</tr>
<tr>
<td>Avaxim Ped®</td>
<td>80 antigen units HAV</td>
<td>0.5 mL</td>
<td>0, (6-36) mths</td>
<td>6 mths&lt;16 yrs</td>
</tr>
<tr>
<td>Havrix®</td>
<td>1440 ELISA units HAV</td>
<td>1 mL</td>
<td>0, (6-12) mths*</td>
<td>19 yrs and older</td>
</tr>
<tr>
<td>Havrix Jr®</td>
<td>720 ELISA units HAV</td>
<td>0.5 mL</td>
<td>0, (6-12) mths</td>
<td>6 mths&lt;19 yrs</td>
</tr>
<tr>
<td>Vaqta®</td>
<td>50 units HAV</td>
<td>1 mL</td>
<td>0, (6-18) mths</td>
<td>18 yrs and older</td>
</tr>
<tr>
<td>Vaqta Ped®</td>
<td>25 units HAV</td>
<td>0.5 mL</td>
<td>0, (6-18) mths</td>
<td>6 mths&lt;18 yrs</td>
</tr>
</tbody>
</table>

*There is no international standard for HAV measurement. Each manufacturer uses its own units of measurement.

† Ages for which the vaccine is approved.

* Studies have shown that 720 ELISA units provides an effective booster dose in those over 19 yrs of age.

**NOTE:**
- Comparable to the results reported in clinical trials of children more than 12 mths, all reviewed studies have consistently shown that vaccination of infants 6-12 mths with inactivated HA vaccines is immunogenic and safe.
- The manufacturer of Twinrix and Twinrix Jr has not authorized use of the combination products in children <1 yr of age.
- *HIGH RISK* includes patients with chronic liver disease, patients awaiting liver transplants, and individuals living in communities at risk of hepatitis A (HA) outbreaks or in which HA is endemic.

### REFERENCES:
6. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non HIV-related; adult).
### 5.3 Hepatitis B - Pre-Transplant Travel Guidelines

<table>
<thead>
<tr>
<th>Hepatitis B</th>
<th>RECOMBIVAX HB® OR ENGERIX® B (Interchangeable) IM inj</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recipients</strong></td>
<td><strong>NUMBER OF DOSES REQUIRED</strong></td>
</tr>
<tr>
<td>Newborn2</td>
<td>3 dose schedule preferred (0, 1 and 6 mths) if travel not imminent2 (Various dosing schedules available, refer to dosing tables below)</td>
</tr>
<tr>
<td>Infants (regardless of mothers’ HBV status)</td>
<td>12 mths-19 yrs</td>
</tr>
<tr>
<td>12 mths-19 yrs</td>
<td>Twinrix® 6 mths12 Twinrix® Junior 1 mth between 1st and 2nd dose12 6 mths between 1st and 3rd dose12</td>
</tr>
</tbody>
</table>

### Table 1: Canadian Immunization Guide (NACI)- Hepatitis B Standard Dosing Recommendations1 for Paediatric Patients (3 or 4 Dose Schedule Only):

<table>
<thead>
<tr>
<th>RECIPIENTS</th>
<th>RECOMBIVAX HB®</th>
<th>ENGERIX® B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants (regardless of mothers’ HBV status)</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>12 mths-19 yrs</td>
<td>5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Thimerosal preservative-free preparation is recommended.

**Although a schedule of 0, 1 and >2 mths is approved, the preferred schedule is 0, 1, and 6.

### Table 2: Hepatitis B-Revised Dosing Guidelines for Transplant (Adapted from Canadian Immunization Guide-NACI)

<table>
<thead>
<tr>
<th>RECIPIENTS</th>
<th>RECOMBIVAX HB®</th>
<th>ENGERIX® B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants (regardless of mothers’ HBV status)</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>12 mths-19 yrs</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>16 to &lt;20 yrs</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

*Thimerosal preservative-free preparation recommended;

**Although schedule of 0, 1 and >2 mths is approved, the preferred schedule is 0, 1, and 6.
There are no data to support the use of Twinrix® and Twinrix® Jr on an accelerated schedule in children. The manufacturer of Twinrix and Twinrix Jr has not authorized use of the combination products in children <1 yr of age.

<table>
<thead>
<tr>
<th>AGE</th>
<th>TWINRIX®</th>
<th>TWINRIX® JR</th>
</tr>
</thead>
<tbody>
<tr>
<td>µg</td>
<td>mL</td>
<td>SCHEDULE (MTHS)</td>
</tr>
<tr>
<td>1 yr-&lt;16 yrs</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>16-&lt;19 yrs</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

REFERENCES:

6. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non HIV-related; adult).
### 5.4 JAPANESE ENCEPHALITIS – PRE-TRANSPLANT TRAVEL GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL PRIOR TO TRAVEL</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>INDICATION PRE-TRANSPLANT</th>
<th>SEROLOGY REQUIRED PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese encephalitis IIXARO® (Inactivated)</td>
<td>2 mths(^{3,4,7})</td>
<td>Consult travel clinic</td>
<td>2 doses(^{5,7}) Children younger than 3 yrs of age receive half of the adult dose(^{7}) If primary series was administered ≥1 yr ago, a booster dose should be given prior to potential re-exposure or if there is a continued risk for JEV infection(^{5,7})</td>
<td>28 days</td>
<td>YES If indicated(^{3,4})</td>
<td>NO</td>
<td>Not covered routinely by ON-MOHLC</td>
</tr>
</tbody>
</table>

**NOTES:**

Children receive 2 doses, 28 days apart:\(^7\):
- 2 mths-<3 yrs of age: 0.25 mL per single dose.
- Refer to product monograph for Special Handling Instructions for preparing a 0.25 mL dose.
- 3 yrs-<18 yrs of age: 0.5 mL per single dose.

**REFERENCES:**

3. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non HIV-related; adult).
### 5.5 RABIES – PRE-TRANSPLANT TRAVEL GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>MINIMUM AGE FOR 1st DOSE</th>
<th>MINIMUM INTERVAL PRIOR TO EXPOSURE OR TRAVEL</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>INDICATION PRE-TRANSPLANT</th>
<th>SEROLOGY REQUIRED PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabies IMOVAX® RabAvert® (inactivated vaccine) (Can be used interchangeably)</td>
<td>Newborn&lt;sup&gt;1&lt;/sup&gt;</td>
<td>7 days</td>
<td>Pre-Exposure Prophylaxis 3 doses Day 0, 7 and between day 21 to 28&lt;sup&gt;8&lt;/sup&gt; Post-Exposure prophylaxis Day 0, 3, 7 and 14 (immunocompromised patients should receive 5th dose on Day 28)&lt;sup&gt;1, 4&lt;/sup&gt;</td>
<td>Interval varies depending on prescribed prophylaxis</td>
<td>Pre-Exposure No; unless immunocompromised and expecting intense animal exposure or who will be distant from medical care Post-Exposure Prophylaxis Yes, if indicated&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Pre Exposure NO Post Exposure Consider serology 7 to 14 days post-completion of series&lt;sup&gt;2, 3&lt;/sup&gt; If titre &lt;0.5 re-vaccinate with 2nd series</td>
<td>Pre-exposure prophylaxis is not routinely covered by ON MOHLC Post-exposure immunization is covered by OHIP for exposures in Ontario</td>
</tr>
<tr>
<td>Rabies Pasteurized immune globulin IMOGAM® (rabies immune globulin)</td>
<td></td>
<td></td>
<td>Recommended dose of Rabig: 20 IU/kg body weight for all age groups&lt;sup&gt;2&lt;/sup&gt; Given on Day 0&lt;sup&gt;2&lt;/sup&gt;</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Whenever possible, the complete complement of vaccines should be administered before transplantation. Vaccines noted to be safe for administration after transplantation may not be sufficiently immunogenic after transplantation.<sup>7</sup>

Persons with egg allergies are not necessarily at increased risk of a hypersensitivity reaction to RabAvert®. However, for pre-exposure vaccination, an alternative vaccine, Imovax<sup>®</sup>, should be used in patients with a history of hypersensitivity reactions to egg or egg products. If an alternative vaccine is not available, post-exposure prophylaxis using RabAvert should be administered with strict medical monitoring. Facilities for emergency treatment of anaphylactic reactions should be available.<sup>2</sup>

### REFERENCES:

4. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non HIV-related; adult).
### 5.6 Typhoid (Salmonella Typhi) – Pre-Transplant Travel Guidelines

<table>
<thead>
<tr>
<th>Name of Vaccine Products Available in Canada</th>
<th>Minimum Age for 1st Dose</th>
<th>Minimum Interval Prior to Travel</th>
<th>Number of Doses Required</th>
<th>Minimum Interval Between Doses</th>
<th>Indication Pre-Transplant</th>
<th>Serology Required Pre/Post Vaccination</th>
<th>Coverage in Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella Typhi (Parenteral inactivated)</td>
<td>2 yrs</td>
<td>14 days prior to travel</td>
<td>1 dose</td>
<td>N/A</td>
<td>YES</td>
<td>If indicated2,3</td>
<td>Not covered routinely by ON MOHLTC</td>
</tr>
<tr>
<td>TYPHIM Vi® IM</td>
<td>5 yrs</td>
<td>7 days following last dose of capsules</td>
<td>4 enteric-coated capsules* taken on alternate days (7-day course)*</td>
<td>8 days</td>
<td>Re-immunize by IM route every 3 yrs if ongoing risk1,2,3</td>
<td>Re-immunization by PO route every 7 yrs if ongoing risk4,5</td>
<td>Not covered routinely by ON MOHLTC</td>
</tr>
<tr>
<td>Oral, LIVE attenuated Vivotif®</td>
<td>5 yrs</td>
<td>7 days following last dose of capsules</td>
<td>4 enteric-coated capsules* taken on alternate days (7-day course)*</td>
<td>8 days</td>
<td></td>
<td></td>
<td>Not covered routinely by ON MOHLTC</td>
</tr>
</tbody>
</table>

Whenever possible, the complete complement of vaccines should be administered before transplantation. Vaccines noted to be safe for administration after transplantation may not be sufficiently immunogenic after transplantation.

*Vivotif capsules MUST be swallowed whole, 1 hour before or 2 hours after a meal.8

---

### REFERENCES:

### 5.7 YELLOW FEVER – PRE-TRANSPLANT TRAVEL GUIDELINES

<table>
<thead>
<tr>
<th>NAME OF VACCINE PRODUCTS AVAILABLE IN CANADA</th>
<th>MINIMUM AGE FOR 1ST DOSE</th>
<th>MINIMUM INTERVAL PRIOR TO TRAVEL</th>
<th>NUMBER OF DOSES REQUIRED</th>
<th>MINIMUM INTERVAL BETWEEN DOSES</th>
<th>INDICATION PRE-TRANSPLANT</th>
<th>SEROLOGY REQUIRED PRE/POST VACCINATION</th>
<th>COVERAGE IN ONTARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Fever YF-VAX® (LIVE attenuated) SC inj</td>
<td>9* mths1,2,4</td>
<td>10 days2,4 (Neutralizing antibodies develop 10 days after vaccination in 80% of immunized persons3)</td>
<td>1 dose1,2,4 Booster only required every 10 yrs1,2 if patient meets certain criteria</td>
<td>N/A</td>
<td>YES</td>
<td>For patients who become immunocompromised following immunization, serologic testing should be considered two to five yrs post-immunization1</td>
<td>Not routinely covered by MOHLTC</td>
</tr>
</tbody>
</table>

Whenever possible, the complete complement of vaccines should be administered before transplantation.2

*If travel is unavoidable, the decision to vaccinate infant between 6 to <9 mths needs to balance the risk of YF exposure with the risks of vaccination (increased risk of encephalitis) in this age group.2

### REFERENCES


4. CDC Yellow Book 2020: Immunocompromised travelers-severe immunosuppression (non-HIV-related; adult).


The Transplant and Regenerative Medicine Centre’s 2017 Pre- and Post-Transplant Immunization Guidelines were revised by the Immunization Working Group, a subgroup of the TRMC Clinical and Education Committee.

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