Immunization for Adult Solid Organ Transplant Candidates and Recipients

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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.

1. Routine Immunizations – Before Transplant

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]

Vaccine	Series	Comments
Td or dTap	3 doses Dose 2: Four weeks after dose 1 Dose 3: Six months after dose 2 Td booster every 10 years.	If an adult requires completion of a primary series of Td, the first dose in the series should be replaced with dTap. Adults who have not previously received a dose of acellular pertussis in adulthood should receive a one-time booster dose of dTap. Subsequent boosters should be Td. **Note:** If both dTap and polio are indicated, dTap-IPV may be used.
Polio IPV	3 doses Dose 2: Four weeks after dose 1 Dose 3: Six months after dose 2.	Primary immunization with inactivated polio vaccine is recommended for all previously unimmunized SOT candidates and recipients.[1] **Notes**: • Booster doses of IPV are not necessary for adults living in Canada except for adults at high risk of exposure. Those at higher risk (e.g., health care workers and laboratory workers) may receive a single lifetime booster dose.[1] • If available, TdP may be used when both Td and IPV vaccines are indicated. Immunity screening after immunization is not recommended.
Pneumococcal Pneu-C13 and Pneumo-P	Pneu-C13 followed by Pneumo-P at least eight weeks later. 1 booster dose of Pneumo-P Five years after the initial dose of Pneumo-P.[1]	There should be at least eight weeks between Pneu-C13 and Pneumo-P[1,2] Adults who have already received Pneumo-P should receive Pneu-C13. Pneu-C13 should be administered at least one year after any previously administered dose of Pneumo-P.[2,3] Immunity screening after immunization is not recommended.
Hib	1 dose	One dose is recommended for candidates/ recipients of SOT five years of age and older regardless of previous Hib immunization (at least one year after any previous dose) [1] Immunity screening after immunization is not recommended.

Vaccine	Series	Comments
MenC-ACYW **(18 years to 24 years of age inclusive and those 25 years of age and older at higher risk)**	**18 – 24 years of age***: One dose (unless received as an adolescent at 12 years of age or older.)[1] *Booster doses are not indicated. **Increased risk: 18 years of age and older**.** (Under lying medical condition) Two doses eight weeks apart **Booster dose every five years if risk continues.[1] **Increased risk of exposure (laboratory workers)**: One dose	Recommended for individuals: • 18 – 24 years of age inclusive • Increased risk - 18 years of age and older as listed[1]: ➢ Anatomical or functional asplenia including sickle cell disease ➢ HIV infection ➢ Congenital complement, properdin, factor D or primary antibody deficiencies. ➢ Acquired complement deficiency e.g. those receiving eculizumab (Soliris™). ➢ Laboratory workers routinely exposed to *Neisseria meningitides*. **Note:** Provincially funded vaccine is not provided for international travellers. Refer individuals to local travel clinics. Immunity screening after immunization is not recommended.
Hepatitis B HBVD[1]	Follow the dosage and schedule for hypo-responsive individuals for Hepatitis B Vaccine. Repeat series if response is less than 10 IU/mL after series completion.[1]	Follow the dosage and schedule for hypo-responsive individuals for Hepatitis B Vaccine. **Laboratory Recommendations** Screen for anti-HBs within 1 – 6 months after the series is completed. If antibody levels are suboptimal, repeat the series once and retest for anti-Hbs within 1 – 6 months after the repeat series.[1] Periodic screening as recommended by the transplant physician taking into account the severity of the immunocompromised state and whether or not the risk of hepatitis B is still present.[1] Ordering serology and interpretation of the results is the responsibility of the transplant physician.
Hepatitis A HAV	Two doses: Second dose 6 – 12 months after the first dose.	Only for those considered at high risk: • Lifestyle risks of infection, including people engaging in illicit drug use (injectable and non-injectable) and men having sex with men • Chronic liver disease, liver transplantation; chronic liver GVHD following HSCT • Individuals receiving repeated replacement of plasma-derived clotting factors. • Workers involved in hepatitis A virus research or production of hepatitis A vaccine who may be exposed to hepatitis A virus. • Zoo-keepers, veterinarians and researchers who handle non-human primates. • Household /close contacts of children adopted from hepatitis A endemic countries. • Populations/communities at risk of hepatitis A outbreaks or in which hepatitis A is highly endemic. **Note**: Provincially funded vaccine is not provided for travellers – refer individuals to local travel clinics. Immunity screening after HAV immunization is not routinely recommended.[1]

Vaccine	Series	Comments
Human Papillomavirus Vaccine HPV (18 – 26 years of age inclusive[2])	Three doses administered at 0, 2 and 6 months[1]	Immunity screening after immunization is not recommended.
INFLUENZA (inactivated)	Annually	Administer a dose of inactivated influenza vaccine annually. Influenza vaccine can be administered as early as three months post-transplant. • Solid organ transplant recipients: Live attenuated influenza vaccine (LAIV) is contraindicated. • Household contacts: Immunize annually with either inactivated influenza vaccine or live attenuated influenza vaccine. Immunity screening after immunization is not recommended.
MMR (only susceptible adults***** pre-transplant)[1]	One or two doses. If a second dose is indicated the interval between doses should be at least four weeks.[1] (See Laboratory Recommendations)	MMR must be administered at least four weeks prior to transplant.[1] **Not recommended post-transplantation** *****Evidence of Measles Immunity: • Individuals born prior to 1970 • Individuals born in 1970 or later ➢ with a documented history of two doses of measles-containing vaccine OR ➢ history of laboratory confirmed measles disease OR ➢ laboratory evidence of measles immunity. **Laboratory Recommendations** Routine immunity screening prior to transplant is not recommended because of waning immunity. Screen for measles and rubella immunity (IgG) one month after the first dose of vaccine. If non-immune and a second dose can be administered, provide a second dose (after consult with the transplant physician) and repeat screening in one month. Annual screening for immunity is not recommended. Ordering serology and interpretation of the results is the responsibility of the transplant physician.
Varicella (chickenpox) **VZ** (only susceptible adults***** pre-transplant)	1 or 2 doses	*Evidence of Immunity: • history of two doses of varicella vaccine after 12 months of age OR • laboratory evidence of immunity Varicella must be administered at least four weeks prior to transplantation.[2,4] **Not recommended post-transplantation** **Laboratory Recommendations** Routine screen pre-transplant includes varicella IgG testing to confirm disease history. Serology is recommended one month after the after one dose of VZ vaccine and if seroconversion is demonstrated consider immune. If non-immune and depending upon discussion with transplant physician either: • Provide a second dose four[2] to six weeks after the first dose[1] OR • Administer no further doses and consider non-immune. Provide PEP if exposed to varicella. Ordering serology and interpretation of the results is the responsibility of the transplant physician.

Vaccine	Series	Comments
Varicella-Zoster Vaccine (Shingles) Var-S	Adults 50 years of age and older[2]	ZOSTAVAX® may be considered pre-transplant for individuals who are varicella positive (i.e., have had chickenpox or shingles or are varicella seropositive with no history of previous varicella vaccine doses[2]); with no contraindications to the use of live vaccines or ZOSTAVAX® and if the vaccine can be administered four weeks or more prior to the transplant. Individuals should discuss the vaccine with their transplant physician. ZOSTAVAX® is not available through the provincially funded immunization program. It is available by prescription and may be purchased and administered at local pharmacies. **ZOSTAVAX® is contraindicated post-transplant.** Immunity screening after immunization is not recommended.

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 3 to 6 months after transplant,[1,4] and as determined appropriate by the individual's attending transplant physician. **Live vaccines are contraindicated post-transplant.**

Vaccine	Series (if needed)	Comments
Hepatitis A HAV	Two doses: Second dose 6 – 12 months after the first dose.	Only for those considered at high risk: • Lifestyle risks of infection, including people engaging in illicit drug use (injectable and non-injectable) and men having sex with men • Chronic liver disease, liver transplantation; chronic liver GVHD following HSCT • Individuals receiving repeated replacement of plasma-derived clotting factors. • Workers involved in hepatitis A virus research or production of hepatitis A vaccine who may be exposed to hepatitis A virus. • Zoo-keepers, veterinarians and researchers who handle non-human primates. • Household /close contacts of children adopted from hepatitis A endemic countries. • Populations/communities at risk of hepatitis A outbreaks or in which hepatitis A is highly endemic. **Note**: Provincially funded vaccine is not provided for travellers – refer individuals 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**: Rabies Immune Globulin and vaccine on day 0, and vaccine only on days 3, 7, 14 and 28. (Require 5 dose post-exposure series.) Serology every two years if pre- exposure risk continues. Booster as indicated depending upon serology results.	**Pre-exposure**: Should be administered intramuscularly only to those considered high risk (e.g. veterinary health technicians). Should be administered pre- transplant if possible, and completed at least 14 days before starting immunosuppressants.[1] **Post-exposure**: Rabies prophylaxis can be administered intramuscularly at any time before or after transplantation if indicated. **Laboratory Recommendations** Pre-exposure: Immunity screening is recommended 7 –14 days after last dose of the series.[1] Post-exposure: Immunity screening is recommended 7 – 14 days after the completion of the vaccine series.[1] If an acceptable antibody response is not obtained, revaccination with a second rabies vaccine series is recommended, followed by further serologic testing.[1] **Ordering serology and interpretation of the results is the responsibility of the transplant physician**.
Typhoid Fever TYVI* (inactivated)	1 dose Booster every three years if at continued high risk.[1]	*Only for those considered high risk. Individuals at high risk include household and/or intimate contacts of a typhoid carrier and laboratory workers who manipulate *Salmonella typhi*. Immunity screening after immunization is not recommended.

3. 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, are contraindicated after transplant.**

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] Rubin, L. G., et all. (2013, December 4). 2013 IDSA clinical practice guidelines for vaccination of the immunocompromised host. *Clinical Infectious Diseases*, *Advanced Access*

[3] National Advisory Committee on Immunization. (2013). Statement on the use of conjugate pneumococcal vaccine – 13 valent in adults (PNEU-C-13). *Canada Communicable Disease Report 39 (ACS-5*).

[4] 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

