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Pneumococcal 13-valent Conjugate Vaccine (Pneu-C-13) (Prevnar® 13)

What is it?

Pneu-C-13 is a vaccine against 13 serotypes of *Streptococcus pneumoniae*. *S. pneumoniae* is a common pathogen causing serious pneumococcal disease such as bacteremia, meningitis and pneumonia. In Canada these conditions are most commonly seen in the elderly population or those who are very young.[1] Pneu-C-13 is a conjugated vaccine, which means the vaccine is able to induce a long-term protective response by activating T-cell recognition and the formation of memory B cells. This allows the body to respond quicker and more efficiently when it encounters this molecule again.[2, 3] Pneu-C-13 is effective in inducing an immune response in infants, children and those who are immunocompromised.

Who is it for?

Pneu-C-13 is indicated for[1]:

- Infants as part of routine immunizations.
- Children <17 years old who have not been previously immunized or who have had incomplete vaccination schedules (e.g. missed second dose)
- Immunocompromised patients (followed 8 weeks later by Pneu-P-23).

Should both vaccines be given?

Pneu-C-13 was added to the routine vaccinations provided in infancy for all provinces by 2011 so many individuals will not have received this vaccine yet. Other conjugated vaccines were used prior to this, dating back to 2002 (e.g. Pneu-C-7). Currently a single dose of Pneu-P-23 is recommended at age 65 in otherwise healthy adults.

In high risk children and adolescents, Pneu-P-23 is recommended for children 24 months or older, at least 8 weeks after Pneu-C-13.[1,3] This will increase the immunogenicity, and the ability of the immune system to detect, recognize, and respond to pneumonia molecules of the involved serotypes.[3] For moderate to low risk children this is often unnecessary.

In immunocompromised patients Pneu-C-13 is recommended, followed by Pneu-P-23 to increase the immunogenicity of the vaccine.

Interestingly, the American Advisory Committee on Immunization Practices (ACIP) released an update to their recommendations, published September 2014, which now recommends both Pneu-C-13 and Pneu-P-23 be administered in series to all adults ages 65 and older. [4]

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Pneumococcal 23-valent Polysaccharide Vaccine (Pneu-P-23) (Pneumovax® 23)

What is it?

Pneu-P-23 is a vaccine against 23 serotypes of *Streptococcus pneumoniae. S. pneumoniae* is a common pathogen causing serious pneumococcal disease such as bacteremia, meningitis and pneumonia. In Canada these conditions are most commonly seen in the elderly population or those who are very young.[1] Pneu-P-23 is a subunit vaccine which contains only the antigenic part of the pathogen and no live components. With subunit vaccines there is no guarantee that immunological memory will be formed in the correct manner and thus may not be effective in incomplete immune systems (infants, children, immunocompromised) or may only provide short-term protection.[2]

Who is it for?

Pneu-P-23 is indicated for immunocompetent adults who[1]:

- Are ≥65 years old
- Are at high risk for pneumococcal disease
  - <65 years of age living in long term care facility
  - Illicit drug users
  - Smokers
  - Alcoholics
  - Homeless persons
  - Have certain medical conditions. (See Table 1 below)

Table 1. Conditions resulting in HIGH RISK of invasive pneumococcal disease (IPD) [1]

ImmunoCOMPETENT conditions	ImmunoCOMPROMISED conditions
- Chronic cerebral spinal fluid (CSF) leak - Chronic cardiac/pulmonary disease - Cochlear implants - Diabetes mellitus - Chronic kidney disease - Chronic neurologic condition that may impair clearance of oral secretions - Nephrotic syndrome - Chronic liver disease (including cirrhosis) - Asthma requiring medical attention in past 12 months	- Sickle cell disease - Congenital immune deficiencies - Asplenia (functional or anatomic) - Immunosuppressive therapy (e.g. corticosteroids, chemotherapy, radiation, post-organ transplant therapy, some anti-rheumatic drugs) - HIV infection - Stem cell transplant - Malignancies - Solid organ or islet transplant (candidate or recipient)

Is a booster recommended?

Although it is thought that the duration of the immune response following Pneu-P-23 administration may be limited, revaccination is not recommended in most healthy adults due to a lack of evidence.[1] In those who require re-vaccination (high risk of IPD, see Table 1) a single dose of Pneu-P-23 can be given >5 years after the first dose (>3 years if the first dose was received when ≤10 years old).[1]

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Which Pneumococcal Vaccine When? Recommendations for Use[1]

Age / Condition	Pneumovax®23 (Pneu-P-23)	Prevnar®13 (Pneu-C-13)
2 months – 11 months	Not recommended	Routine infant immunization; 3-4 doses at 8 week intervals
12-23 months	Not recommended	See the CIG for guidelines on incomplete vaccinations. All children who have never received Pneu-C-13 should receive 1 or 2 doses
24-35 months	Children at high risk of IPD who have not previously received Pneu-P-23, should receive one dose of Pneu-P-23†	1 dose recommended for children who have not received Pneu-C-13 vaccine
36-59 months		1 dose of Pneu-C-13 is recommended for: - children of aboriginal descent or who attend group child care who have not previously received Pneu-C-13 - Children at high risk but have not received Pneu-C-13 - Children with no or incomplete vaccination schedules with any conjugate pneumococcal vaccine For other healthy children who have received age-appropriate vaccination but have not received Pneu-C-13, one dose may be CONSIDERED
60 months to 17 years		1 dose of Pneu-C-13 vaccine is recommended for high risk children and adolescents who have not previously received Pneu-C-13
18 years and older	In adults ≥ 65 years and high risk individuals. See above for specific indications	
Immunocompromising conditions	1 dose should be given† if not previously immunized with Pneu-P-23	1 dose followed by Pneu-P-23
Hematopoietic stem cell transplant	1 dose, 12-18 months post-transplant (6-12 months after last dose of Pneu-C-13)	3 doses (>4 weeks apart)
Boosters	Consider in high risk pts. No sooner than 3-5 years after initial Pneu-P-23	No evidence of benefit

†At least 8 weeks after the Pneu-C-13 vaccine.
CIG = Canadian Immunization Guidelines; IPD=Invasive Pneumococcal Disease

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Comparison of Pneu-P-23 and Pneu-C-13

	Pneumovax®23 (Pneu-P-23)	Prevnar®13 (Pneu-C-13)
Type of Vaccine	Subunit	Conjugated
Route	IM/SC	IM
Efficacy	>80% in healthy young adults 50%-80% in elderly and high risk	79%-95%¥
Immunogenicity	Antibody response to all 23 serotypes. Less immunogenic in children than conjugated vaccines	Antibody response to all 13 serotypes
Safe in pregnancy	YES – for high risk	YES – for high risk
Safe in lactation	YES	YES
Cost (acquisition) /dose	$ 19.92	$ 97.73
Use in immunocompromised	8 weeks after Pneu-C-13	Yes
Use in children (<17)	In high risk group	Yes
Serotypes common to both vaccines	4, 9v, 6b, 14, 18c, 19f, 23f, 1, 5, 7f, 3 19a	
Serotypes unique to vaccine	2, 8, 9n, 10a, 11a, 12f, 15b, 17f, 20, 22f, 33f	6a

¥Among 2-59 month old children based on preliminary estimates from an unpublished case-control study conducted in the US.

Example Scenarios

1. Routinely immunized in infancy with a conjugate vaccine. At age 65 would be eligible for a dose of Pneumovax23.
    a. If at high risk (DM, CKD, liver dx) a second dose is recommended to "re-immunize"
        i. Must be at least 5 years after first dose given
2. Adult with immunocompromising condition. Administer one dose of pneu-c-13 followed 8 weeks later by one dose of pneu-p-23
    a. A single re-immunization with pneu-p-23 is recommended
3. Routinely immunized in infancy with a conjugate vaccine. High risk of IPD so should receive one dose of pneu-p-23 at least 8 weeks after pneu-c-13
4. Routinely immunized in infancy with a conjugate vaccine. Developed HIV in early 20s
    a. Immunize with 1 dose of pneu-c-13 followed 8 weeks later by 1 dose of pneu-p-23
    b. Single re-immunization with pneu-p-23 is recommended
5. Routinely immunized in infancy with a conjugate vaccine. High risk group so pneu-p-23 was given at age 15. Developed RA in late 20s requiring immunosuppressive therapy (Enbrel).
    a. If able, try to give vaccine at least 14 days before the initiation of therapy
    b. Wait a period of 3 months after stopping drug before administering pneumococcal vaccine to ensure immunogenicity.
    c. If immunocompromising therapy cannot be stopped, pneumococcal vaccine should be given when the person is least immunosuppressed. Both pneu-c-13 and pneu-p-23 are recommended along with a single re-immunization with pneu-p-23

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