Hong Kong Reference Framework for Preventive Care for Children in Primary Care Settings

Module on Immunisation

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1. Public health importance

1.1. Benefits of immunisation

Immunisation is among the most successful and cost-effective public health interventions\(^1,2\). Immunisation programmes have led to eradication of smallpox, elimination of measles and poliomyelitis in regions of the world, and substantial reductions in the morbidity and mortality attributed to diphtheria, tetanus, and pertussis. The World Health Organization (WHO) estimates that two million child deaths were prevented by vaccinations in 2003\(^3\). In addition, contagion is reduced and strain on health-care systems is eased, as a result money is frequently saved that can be used for other health services.

1.2. Vaccine effectiveness and safety

All vaccines used for routine immunisation are very effective in preventing disease, although no vaccine attains 100% effectiveness. For most vaccines, more than one dose is given to increase the chance of developing immunity. Vaccines are very safe, and side effects are minor, especially when compared to the diseases they are designed to prevent. An adverse event following immunisation (AEFI) is a health problem that is reported after someone gets vaccinated. It may or may not have been caused by the vaccine. Some of these events may occur by chance during the post-vaccination period and are unrelated to vaccination. Serious AEFIs occur rarely. For example, an immediate severe allergic reaction to vaccines (anaphylaxis) occurs in less than one case per million doses given\(^4\).

1.3. Importance of maintaining high vaccination coverage

Despite the availability of safe and effective vaccines and substantial progress in reducing vaccine-preventable disease, it is essential to maintain high vaccination coverage with a view to further reducing and eliminating vaccine-preventable causes of morbidity and mortality in the community. Herd protection is the indirect effects as efficacious vaccines not only protect the immunized, but can also reduce disease among unimmunized individuals in the community. Taking measles elimination as an example, the WHO regarded 95% population immunity through a two-dose vaccination regimen as the key to this achievement\(^5\). The vaccine coverage rate is determined by factors including the delivery to and acceptance of vaccination by targeted population.

1.4. Immunisation programme for children

The Expanded Programme on Immunization (EPI) of the WHO is developed to target at six high-risk infectious diseases, namely, tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus and measles. The WHO has also suggested to its member states that they should assess whether vaccines for other infectious diseases should be included in their childhood immunisation programmes having regard to their local epidemiological profiles. In considering whether to include a new vaccine in the immunisation programme for children, health authority needs to take into account a number of scientific factors including
epidemiology (such as incidence and fatality rates), disease burden, as well as the safety, efficacy, side effects, cost-effectiveness, supply of the vaccine, etc. The acceptance of the vaccine among the public, the availability of other preventive measures, and the administrative arrangements for vaccination are also important factors for consideration.

References


2. Local Situation

2.1. The Scientific Committee of Vaccine Preventable Diseases (SCVPD)
In Hong Kong, the SCVPD under the Centre for Health Protection of the Department of Health (DH) closely monitors and reviews scientific developments and application of new vaccines, vaccine formulations and cost-effectiveness, changes in the global and local epidemiology of vaccine preventable diseases and the experiences of other health authorities. The SCVPD will then make recommendations to DH on immunisation matters, including incorporation of vaccines into the Childhood Immunisation Programme and their schedules, in order to provide science-based advice on vaccine use at the population level.

2.2. Hong Kong Childhood Immunisation Programme
In Hong Kong, immunisation programmes for infants and children have been introduced since 1950s\(^1\). At present, the Hong Kong Childhood Immunisation Programme (CIP) provides children with immunisations for eleven childhood infectious diseases, namely, tuberculosis, hepatitis B, diphtheria, tetanus, whooping cough (pertussis), poliomyelitis, measles, mumps, rubella, varicella and pneumococcal infection (Table 1\(^2\)). They are provided free-of-charge to all eligible children in Hong Kong. Under the CIP, vaccines are given at birth in hospitals, during pre-school period by the Maternal and Child Health Centres (MCHCs) of the Department of Health (DH) and by DH’s outreaching School Immunisation Teams (SIT) to primary school students. Student Health Service Centres (SHSC) will provide catch-up immunisations for those enrolled secondary school students who have missed any of the recommended doses. Parents may also have their children vaccinated in private medical sectors at their own expenses.\(^3\)

Table 1. Hong Kong Childhood Immunisation Programme (as of January 2015)

<table>
<thead>
<tr>
<th>Age</th>
<th>Immunisation recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>BCG vaccine</td>
</tr>
<tr>
<td></td>
<td>Hepatitis B vaccine – first dose</td>
</tr>
<tr>
<td>1 month</td>
<td>Hepatitis B vaccine – second dose</td>
</tr>
<tr>
<td>2 months</td>
<td>DTaP-IPV vaccine(^{\text{(Note 1)}}) – first dose</td>
</tr>
<tr>
<td></td>
<td>Pneumococcal vaccine – first dose</td>
</tr>
<tr>
<td>4 months</td>
<td>DTaP-IPV vaccine – second dose</td>
</tr>
<tr>
<td></td>
<td>Pneumococcal vaccine – second dose</td>
</tr>
<tr>
<td>6 months</td>
<td>DTaP-IPV vaccine – third dose</td>
</tr>
<tr>
<td></td>
<td>Pneumococcal vaccine – third dose</td>
</tr>
<tr>
<td></td>
<td>Hepatitis B vaccine – third dose</td>
</tr>
<tr>
<td>1 year</td>
<td>MMR vaccine (Measles, Mumps &amp; Rubella) – first dose</td>
</tr>
<tr>
<td></td>
<td>Varicella vaccine – first dose</td>
</tr>
<tr>
<td></td>
<td>Pneumococcal vaccine – booster dose</td>
</tr>
<tr>
<td>1.5 years</td>
<td>DTaP-IPV Vaccine – booster dose</td>
</tr>
<tr>
<td>Primary 1</td>
<td>MMRV vaccine (Measles, Mumps, Rubella &amp; Varicella) – second dose</td>
</tr>
<tr>
<td></td>
<td>DTaP-IPV vaccine – booster dose</td>
</tr>
<tr>
<td>Primary 6</td>
<td>dTap-IPV vaccine(^{\text{(Note 2)}}) – booster dose</td>
</tr>
</tbody>
</table>

Note 1. DTaP-IPV Vaccine: Diphtheria, Tetanus, acellular Pertussis & Inactivated Poliovirus Vaccine

Note 2. dTap-IPV Vaccine: Diphtheria, Tetanus, acellular Pertussis (reduced dose) & Inactivated Poliovirus Vaccine. Components of diphtheria and acellular pertussis in this vaccine are reduced.
Whilst the vaccines given at birth are usually administered in public and private hospitals, majority of pre-school children receive their vaccines at DH’s MCHCs, followed by private healthcare sector and other places such as Mainland China.

2.3. Immunisation coverage for vaccines under the CIP

Immunisation coverage is a reflection of the extent to which children are protected from vaccine-preventable disease. The UNICEF defines the percentage of children receiving the third dose of combined diphtheria, pertussis and tetanus vaccine (DPT3) as an indicator of how well countries provide routine immunisation. The DPT3 coverage for Hong Kong is one of the highest among industrialized areas. In Hong Kong, territory-wide immunisation coverage surveys on children aged two to five were conducted by DH in 2001, 2003, 2006, 2009, 2012 and 2015. The results of these surveys showed that for children born from 1995 to 2012, DPT3 coverage for both local- and mainland-born children were consistently higher than 95%.

The DPT3 coverage in industrialised countries in 2001 ranged from 84 to 99 percent. (Table 2). Furthermore, high coverage of vaccines under CIP has been maintained in primary school students. In 2015, the coverage of various vaccines including measles, mumps and rubella, diphtheria, tetanus, acellular pertussis, and inactivated poliomyelitis, and hepatitis B vaccines in primary 1 and 6 students were above 98%. These data again reaffirmed that the immunisation coverage in Hong Kong is among the best in industrialised countries and areas.

Table 2. DPT3 coverage rate in Hong Kong and some industrialised countries

<table>
<thead>
<tr>
<th>Countries/ areas</th>
<th>DPT3 coverage rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hong Kong SAR, children born 1995-2012</strong></td>
<td></td>
</tr>
<tr>
<td>Local-born</td>
<td>99.4-100</td>
</tr>
<tr>
<td>Mainland-born</td>
<td>97.0-100</td>
</tr>
<tr>
<td><strong>Selected industrialized countries</strong></td>
<td></td>
</tr>
<tr>
<td><strong>(2016 data)</strong></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>93</td>
</tr>
<tr>
<td>Denmark</td>
<td>93</td>
</tr>
<tr>
<td>Finland</td>
<td>97</td>
</tr>
<tr>
<td>Iceland</td>
<td>92</td>
</tr>
<tr>
<td>New Zealand</td>
<td>92</td>
</tr>
<tr>
<td>Sweden</td>
<td>98</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>96</td>
</tr>
<tr>
<td>United States</td>
<td>95</td>
</tr>
</tbody>
</table>
2.4. Vaccines to be considered for personal protection

Besides vaccines covered by the CIP, parents can choose to have their children immunised with other vaccines from the private sector for personal protection. Some of the vaccines that are not covered by the CIP but are available in private sector in Hong Kong include human papillomavirus vaccine, hepatitis A vaccine, *Haemophilus influenzae* type b (Hib) vaccine, seasonal influenza vaccine, Japanese encephalitis vaccine, meningococcal vaccine, pneumococcal polysaccharide vaccine, rotavirus vaccine and cholera vaccine. In addition, the Government is providing subsidised seasonal influenza vaccination under the Childhood Influenza Vaccination Subsidy Scheme to Hong Kong children aged between 6 months and 11 years or those attending primary schools in Hong Kong. Some children may also be eligible for free seasonal influenza vaccination under Government Vaccination Programme.

References


3. Recommendations to ensure vaccine safety and effectiveness

Vaccine safety and effectiveness are of important concern for the community. Effective vaccination lowers disease risk and improves overall health of the population. Contraindications and precautions of vaccines need to be observed carefully in order to ensure safety of vaccines. Appropriate timing and spacing of vaccines, appropriate vaccine storage and handling, proper administration and injection technique are other essential factors which account for vaccine safety and effectiveness.

Principles of vaccination

Immunity is the ability of the human body to tolerate the presence of material indigenous to the body ("self"), and to eliminate foreign ("nonself") material. It can be further divided into passive and active immunity. Vaccines produce active immunity and immunologic memory similar to natural infection but with minimal risk of disease. There are two basic types of vaccines: live attenuated and inactivated.

Table 3. Comparison between live attenuated and inactivated vaccines

<table>
<thead>
<tr>
<th>Live attenuated vaccines</th>
<th>Inactivated vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakened form of the “wild” virus or bacteria – can replicate</td>
<td>Composed of either whole virus or bacteria, or fractions of either – cannot replicate</td>
</tr>
<tr>
<td>Produce immune response virtually identical to that produced by a natural infection</td>
<td>Mostly humoral (antibody) immune response</td>
</tr>
<tr>
<td>Interference from circulating antibody</td>
<td>Less interference from circulating</td>
</tr>
<tr>
<td>Usually produce immunity with 1-2 doses depending on individual vaccines</td>
<td>Generally require 3-5 doses</td>
</tr>
<tr>
<td>Severe reactions possible such as uncontrolled replication in persons with immunodeficiency</td>
<td>Cannot cause disease from infection, even in immunodeficient persons</td>
</tr>
</tbody>
</table>

Table 4. Live attenuated and inactivated vaccines in Hong Kong

<table>
<thead>
<tr>
<th>Live attenuated vaccines</th>
<th>Inactivated vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillus Calmette-Guérin (BCG)</td>
<td>Diphtheria and tetanus vaccine</td>
</tr>
<tr>
<td>Japanese encephalitis vaccine</td>
<td>Diphthera, tetanus and pertussis (whole cell or acellular) vaccine</td>
</tr>
<tr>
<td>Measles, mumps and rubella vaccine (MMR)</td>
<td>Diphtheria, tetanus, acellular pertussis and inactivated poliovirus vaccine (DTaP –IPV, dTap-IPV)</td>
</tr>
<tr>
<td>Oral typhoid vaccine</td>
<td><em>Haemophilus influenzae</em> type b vaccine</td>
</tr>
<tr>
<td>Rotavirus vaccine</td>
<td>Hepatitis A vaccine</td>
</tr>
<tr>
<td>Varicella vaccine</td>
<td>Hepatitis B vaccine</td>
</tr>
<tr>
<td>Live attenuated vaccines</td>
<td>Inactivated vaccines</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Yellow fever vaccine</td>
<td>Herpes simplex vaccine</td>
</tr>
<tr>
<td></td>
<td>Human papillomavirus vaccine</td>
</tr>
<tr>
<td></td>
<td>Influenza vaccine</td>
</tr>
<tr>
<td></td>
<td>Japanese encephalitis vaccine#</td>
</tr>
<tr>
<td></td>
<td>Meningococcal vaccine</td>
</tr>
<tr>
<td></td>
<td>Oral cholera vaccine</td>
</tr>
<tr>
<td></td>
<td>Pneumococcal vaccine (polysaccharide or conjugate)</td>
</tr>
<tr>
<td></td>
<td>Poliomyelitis vaccine (injectable)</td>
</tr>
<tr>
<td></td>
<td>Rabies vaccine</td>
</tr>
<tr>
<td></td>
<td>Tetanus vaccine</td>
</tr>
<tr>
<td></td>
<td>Typhoid (intramuscular or subcutaneous) vaccine</td>
</tr>
</tbody>
</table>

# Both live attenuated and inactivated Japanese encephalitis vaccines are available. It is advisable to clarify with clients about the type of vaccine.

References


3.1. Contraindications and precautions

3.1.1. General contraindications and precautions

1. Contraindication is a condition in a recipient that greatly increases the chance of a serious adverse reaction.¹

   ● Contraindications for all vaccines:²
     - Confirmed anaphylactic reaction to a previous dose of a vaccine containing the same antigens, or
     - Confirmed anaphylactic reaction to another component contained in the relevant vaccine, e.g. neomycin, streptomycin or polymyxin B (which may be present in trace amounts in some vaccines).
   
   ● Live attenuated vaccines may be temporarily contraindicated in individuals who are immunosuppressed or pregnant.²
2. **Precaution** is a condition in a recipient that might increase the chance or severity of an adverse reaction or compromise the ability of the vaccine to produce immunity. Vaccination is generally deferred when a precaution condition is present.

- Precautions for all vaccines:
  - Moderate or severe acute illness with or without a fever.

3. Some vaccines may have their unique contraindications and precautions. Individual product insert should be consulted before administration of each vaccine. In case of doubt, advice should be sought from manufacturer.

### Table 5. General contraindications and precautions to live and inactivated vaccines

<table>
<thead>
<tr>
<th>Various conditions</th>
<th>Live vaccines</th>
<th>Inactivated vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe allergy to vaccine component</td>
<td>Contraindication</td>
<td>Contraindication</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Contraindication</td>
<td>Vaccinate if indicated*</td>
</tr>
<tr>
<td>Immunosuppression (See Box 1)</td>
<td>Contraindication</td>
<td>Vaccinate if indicated</td>
</tr>
<tr>
<td>Severe acute illness</td>
<td>Delay vaccination until illness has improved</td>
<td>Delay vaccination until illness has improved</td>
</tr>
<tr>
<td>Recent blood product</td>
<td>Precaution**</td>
<td>Vaccinate if indicated</td>
</tr>
</tbody>
</table>

* Except HPV vaccine which is not recommended because of a lack of safety and efficacy data for this vaccine in pregnant women

** for MMR and varicella vaccines

### Box 1. Patients considered to be immunosuppressed

(Adopted from the Green Book, Department of Health, UK and the Pink Book, CDC)

- Patients with evidence of severe primary immunodeficiency.
- Patients with leukaemia, lymphoma or generalised malignancy.
- Patients currently being treated for malignant disease with immunosuppressive chemotherapy or radiotherapy, or who have terminated such treatment within at least the last six months.
- Patients who have received a solid organ transplant and are currently on immunosuppressive treatment.
- Patients who have received a bone marrow transplant, until at least 12 months after finishing all immunosuppressive treatment, or longer where the patient has developed graft-versus-host disease.
- Patients receiving systemic high-dose steroids, until at least three months after treatment has stopped. They include children who receive prednisolone, orally or rectally, at a daily dose (or its equivalent) of 2mg/kg/day for at least one week, or 1mg/kg/day for one month.
- Patients receiving other types of immunosuppressive drugs (e.g. azathioprine, cyclosporin, methotrexate, cyclophosphamide, leflunomide and the newer cytokine inhibitors) alone or in combination with lower doses of steroids, until at least six months after terminating such treatment.
- Patients with immunosuppression due to human immunodeficiency virus (HIV) infection.
3.1.2. **Invalid contraindications and common misconceptions on contraindication of vaccination**

Invalid contraindication 1. Mild illness including low-grade fever, upper respiratory infection, otitis media, and mild diarrhoea.

Invalid contraindication 2. Antimicrobial therapy
- Antibiotics do not have an effect on the immune response to most vaccines
  - Exception: the manufacturer advises that Ty21a oral typhoid vaccine should not be administered to persons receiving sulfonamides or other antibiotics; Ty21a should be administered at least 72 hours after a dose of an antibacterial drug.¹
- Antiviral drugs may affect vaccine replication in some circumstances
  - Live attenuated influenza vaccine should not be administered until 48 hours after cessation of therapy using antiviral drugs active against influenza (amantadine, rimantadine, zanamivir, oseltamivir).¹
  - Antiviral drugs active against herpesviruses (acyclovir, famciclovir) should be discontinued 24 hours before administration of varicella-containing vaccines, if possible.¹

Invalid contraindication 3. Disease exposure or convalescence

Invalid contraindication 4. Pregnant or immunosuppressed person in the household
- Exception: live attenuated influenza vaccine should not be administered to persons who have contact with severely immunosuppressed persons who are hospitalised and require care in isolation because of immunosuppression.¹

Invalid contraindication 5. Breastfeeding
- Except yellow fever vaccine which should be avoided in breastfeeding women. However, according to CDC, when nursing mothers cannot avoid or postpone travel to areas endemic for yellow fever in which risk for acquisition is high, these women should be vaccinated.¹

Invalid contraindication 6. Preterm birth

Invalid contraindication 7. Allergy to products not present in vaccine or allergy that is not anaphylactic

Invalid contraindication 8. Family history of adverse events

Invalid contraindication 9. Tuberculin skin test (TST)
- All vaccines, including MMR, can be given on the same day as a TST, or any time after a TST is applied.¹
- If MMR has been given and 1 or more days have elapsed, in most situations a wait of at least 4 weeks is recommended before giving a routine TST. No information on the effect of varicella-containing vaccine or LAIV on a TST is available. Until such information is available, it is prudent to apply rules for spacing measles vaccine and TST to varicella vaccine and LAIV.¹

Invalid contraindication 10. Multiple vaccines
3.1.3. **Screening for contraindications and precautions to vaccination**

Every patient should be screened for contraindications and precautions before receiving any vaccine dose. If there is a “YES” to any question, primary care providers should use their own judgment in the interpretation of the questionnaire. Information from the product inserts and advice from manufacturer or specialist (e.g. paediatrician) should be consulted if in doubt.

Box 2. Screening questionnaire for childhood immunisation – English version (Modified from Pink Book, CDC1)

<table>
<thead>
<tr>
<th>Screening questionnaire for childhood immunisation</th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For parents/guardians:</strong> The following questions will help us determine which vaccines your child may be given. If you answer “yes” to any question, it does not necessarily mean your child should not be vaccinated, and further clarifications may be needed. If you find any difficulties in answering a question, please consult your primary care provider.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Is the child sick today?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Does the child have allergies to medications, eggs, or any vaccine?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Has the child had a serious reaction to a vaccine in the past?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Has the child had a seizure, or brain or neurological problem?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Has the child had a health problem with asthma, lung disease, heart disease, kidney disease, metabolic disease such as diabetes, or a blood disorder?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Does the child have cancer, leukaemia, AIDS or any other immune system problem?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Has the child, taken cortisone, prednisone, other steroids, anticancer drugs, or radiotherapy in the past 3 months?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Has the child received a transfusion of blood or blood products, or immunoglobulin in the past year?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Is the child/teen pregnant or is there a chance she could become pregnant during the next 3 months?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Has the child received vaccinations in the past 4 weeks?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Please specify the type of vaccine: )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Box 3. Screening questionnaire for childhood immunisation – Chinese version (Modified and translated from Pink Book, CDC1)

<table>
<thead>
<tr>
<th>項目</th>
<th>有</th>
<th>否</th>
<th>無</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 你的孩子今天有生病嗎？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. 你的孩子是否對藥物、雞蛋、或任何疫苗過敏？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. 你的孩子在過去曾否在接種疫苗後產生嚴重反應？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. 你的孩子是否患有癲癇、腦或神經系統的問題？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. 你的孩子是否患有哮喘、肺病、心臟病、腎病、新陳代謝疾病（如糖尿病）或是血液系統疾病？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. 你的孩子是否患有癌症、白血病、愛滋病或其他免疫系統疾病？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7. 在過去三個月內，你的孩子是否曾服用類固醇、抗癌藥物，或是接受放射治療？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8. 在過去一年內，你的孩子是否曾接受過輸血、血液產品或免疫球蛋白？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>9. 在現在及未來三個月內，你的孩子有沒有機會懷孕？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>10. 在過去四星期內，你的孩子是否有接受過疫苗注射？</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

(請註明疫苗種類：__________________________)
Table 6. Information for primary care providers for interpretation of the screening questionnaire for childhood immunisation

<table>
<thead>
<tr>
<th>Question</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the child sick today?</td>
<td>➢ Moderate to severe acute illness is a precaution to all vaccines.¹</td>
</tr>
<tr>
<td>2. Does the child have allergies to medications, eggs, or any vaccine?</td>
<td>➢ A history of anaphylactic reaction to a previous dose of a vaccine or vaccine components is a contraindication for further doses.¹</td>
</tr>
<tr>
<td></td>
<td>➢ Individuals with mild egg allergy who are considering an influenza vaccination can be given TIV in primary care. Individuals with diagnosed or suspected severe egg allergy should be seen by an allergist/immunologist for evaluation of egg allergy and for administration of TIV if clinically indicated.³</td>
</tr>
<tr>
<td></td>
<td>➢ Live attenuated influenza vaccine (LAIV) is contraindicated in persons with a history of hypersensitivity, including anaphylaxis, to any of the components of LAIV or to eggs.³</td>
</tr>
<tr>
<td>3. Has the child had a serious reaction to a vaccine in the past?</td>
<td>➢ A history of anaphylactic reaction to a previous dose of a vaccine or vaccine components is a contraindication for further doses.</td>
</tr>
<tr>
<td></td>
<td>➢ For DTaP-IPV or pertussis-containing vaccine, it is contraindicated in person who had a history of encephalopathy not due to another identifiable cause within 7 days following previous dose.⁴</td>
</tr>
<tr>
<td></td>
<td>➢ Any of these conditions within the specific time after previous dose of DTaP-IPV or a pertussis-containing vaccine which are precautions to the future use of DTaP-IPV:⁴</td>
</tr>
<tr>
<td></td>
<td>➢ Temperature of ≥40.5°C (≥105°F) within 48 hours, not attributable to another identifiable cause.</td>
</tr>
<tr>
<td></td>
<td>➢ Collapse or shock-like state (hypotonic hyporesponsive episode) within 48 hours.</td>
</tr>
<tr>
<td></td>
<td>➢ Persistent crying lasting ≥3 hours, occurring within 48 hours.</td>
</tr>
<tr>
<td></td>
<td>➢ Convulsions with or without fever, occurring within 3 days.</td>
</tr>
<tr>
<td>4. Has the child had a seizure, or brain or neurological problem?</td>
<td>➢ For DTaP-IPV or pertussis-containing vaccine, it is contraindicated in person who had a history of encephalopathy not due to another identifiable cause within 7 days following previous dose.⁴</td>
</tr>
<tr>
<td></td>
<td>➢ An unstable progressive neurologic problem is a precaution to the use of DTaP and dTap vaccine. Children with stable/resolved neurologic condition (including seizures) unrelated to vaccination may be vaccinated as usual.¹</td>
</tr>
<tr>
<td></td>
<td>➢ A history of Guillain-Barré syndrome is a precaution for tetanus-containing and influenza vaccine.¹</td>
</tr>
</tbody>
</table>

(Continue on next page)
Table 6. (cont.) Information for primary care providers for interpretation of the screening questionnaire for childhood immunisation

<table>
<thead>
<tr>
<th>Question</th>
<th>Information</th>
</tr>
</thead>
</table>
| 5. Has the child had a health problem with asthma, lung disease, heart disease, kidney disease, metabolic disease such as diabetes, or a blood disorder? | ➢ Children with any of these conditions should not receive live-attenuated influenza vaccine (LAIV). They should receive inactivated influenza vaccine only.  

1                                                                                                                                                                                                                                                                                      |
| 6. Does the child have cancer, leukaemia, AIDS or any other immune system problem?                              | ➢ *Live attenuated vaccines* (e.g. MMR, varicella, rotavirus, and LAIV) are usually contraindicated in immunocompromised children.                                                                             |
| 7. Has the child, taken cortisone, prednisone, other steroids, anticancer drugs, or radiotherapy in the past 3 months? | ➢ *Live attenuated vaccines* (e.g. MMR, varicella, rotavirus, and LAIV) should be postponed until after chemotherapy or long-term, high dose steroid therapy has ended.  

1  

➢ See Box 1 for further information.                                                                                                                                                                                                                                           |
| 8. Has the child received a transfusion of blood or blood products, or immunoglobulin in the past year?        | ➢ Certain *live attenuated vaccines* (e.g. MMR and varicella) may need to be deferred, depending on the type of blood product and the interval since the blood product was administered.  

1  

➢ Refer to Chapter 3.2.1 Tables 7 and 8.                                                                                                                                                                                                                                       |
| 9. Is the child/teen pregnant or is there a chance she could become pregnant during the next 3 months?          | ➢ Certain *live attenuated vaccines* (e.g. MMR, varicella, and LAIV) are contraindicated in pregnancy because of the theoretical risk of virus transminssion to foetus.  

1  

Avoidance of pregnancy for one to three months after vaccination is recommended by different authorities. If there is doubt, it is generally recommended that pregnancy should be avoided for 3 months following last dose of live attenuated vaccines.  

➢ Because of limited data, *Human papillomavirus (HPV) vaccination* during pregnancy is not recommended.  

3                                                                                                                                                                                                                                                                                      |
| 10. Has the child received vaccinations in the past 4 weeks?                                                  | ➢ If *live parenteral (injected) vaccines* (MMR, varicella zoster and yellow fever) and *live attenuated intranasal influenza vaccine (LAIV)* and the combination of the above vaccines are not administered at the same visit, they should be separated by at least 4 weeks.  

1                                                                                                                                                                                                                                                                                      |

References


3.2. Timing and spacing

Timing and spacing of vaccine doses are two of the most important issues in the appropriate use of vaccines. Specific circumstances that are commonly encountered by primary care providers in immunisation practice will be discussed in this section.

3.2.1. Timing of antibody-containing blood products and vaccines

- Antibody-containing blood products include:
  - blood products containing substantial amounts of immune globulin, such as intramuscular and intravenous immune globulin,
  - specific hyperimmune globulin (e.g., hepatitis B immune globulin, tetanus immune globulin, varicella zoster immune globulin, and rabies immune globulin),
  - whole blood,
  - packed red blood cells,
  - plasma, and
  - platelet products.

- Inactivated vaccines generally are not affected by circulating antibody to the antigen. Therefore they can be administered before, after, or at the same time as antibody.

- Live attenuated vaccines may be affected by circulating antibody to the antigen. The immune response to the vaccine may be reduced or completely eliminated if the timing of administration between them is inappropriate.
Simultaneous administration

<table>
<thead>
<tr>
<th>Products administered</th>
<th>Recommended minimum interval between doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibody-containing products and <em>inactivated</em> vaccine</td>
<td>Can be administered simultaneously at different anatomic sites or at any time interval between doses</td>
</tr>
<tr>
<td>Antibody-containing products and <em>live attenuated</em> vaccine</td>
<td>Should not be administered simultaneously.† If simultaneous administration of antibody-containing products and measles-containing vaccine or varicella vaccine is unavoidable, administer at different sites and revaccinate or test for seroconversion after the recommended interval</td>
</tr>
</tbody>
</table>

Table 8. Recommended interval for non-simultaneous administration of antibody-containing products and vaccines²

<table>
<thead>
<tr>
<th>Administered first</th>
<th>Administered second</th>
<th>Recommended minimum interval between doses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Inactivated</em> vaccine</td>
<td><em>Inactivated</em> vaccine</td>
<td>No interval necessary</td>
</tr>
<tr>
<td>Antibody-containing products</td>
<td>Antibody-containing products</td>
<td>No interval necessary</td>
</tr>
<tr>
<td><em>Live attenuated</em> vaccine</td>
<td><em>Live attenuated</em> vaccine</td>
<td>Dose related†§</td>
</tr>
<tr>
<td>Antibody-containing products</td>
<td>Antibody-containing products</td>
<td>2 weeks†</td>
</tr>
</tbody>
</table>

† Yellow fever vaccine, rotavirus vaccine, oral Ty21a typhoid vaccine, live attenuated influenza vaccine and zoster vaccine are exceptions to these recommendations. These live attenuated vaccines can be administered at any time before or after or simultaneously with an antibody-containing product.

§ The duration of interference of antibody-containing products with the immune response to the measles component of measles-containing vaccine, and possibly varicella vaccine, is dose related.

### 3.2.2. Simultaneous and non-simultaneous administration of different vaccines

- Simultaneous administration of vaccines is defined as administering more than one vaccine on the same clinic day, at different anatomic sites, and not combined in the same syringe.²
- Simultaneous administration of the most widely used live attenuated and inactivated vaccines does not result in decreased antibody responses or increased rates of adverse reaction. It is very important in childhood vaccination programmes since it increases the probability that a child will be fully immunised at the appropriate age.¹
- Individual vaccines should not be mixed in the same syringe unless they are licensed for mixing. Combination vaccines are generally preferred over simultaneous administration of single component vaccines.¹
- If two live attenuated parenteral vaccines, or live attenuated intranasal influenza vaccine (LAIV), are not administered at the same visit, they should be separated by at least 4 weeks. This interval is intended to reduce or eliminate interference from the vaccine given first on the vaccine given later. If they are given less than 4 weeks apart, the vaccine given second should be repeated in 4 weeks or confirmed to have been effective by serologic testing.¹
Live attenuated parenteral vaccines and LAIV are not believed to have an effect on live attenuated oral vaccines.¹

Live attenuated oral vaccines may be given at any time before and after live attenuated parenteral vaccines or LAIV.¹

Table 9. Guidelines for spacing of live attenuated and inactivated vaccines²

<table>
<thead>
<tr>
<th>Vaccine combination</th>
<th>Recommended minimum interval between doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two or more inactivated*</td>
<td>May be administered simultaneously or at any interval between doses</td>
</tr>
<tr>
<td>Inactivated and live attenuated</td>
<td>May be administered simultaneously or at any interval between doses</td>
</tr>
<tr>
<td>Two or more live attenuated (injectable or nasally administered live attenuated vaccines#)</td>
<td>28 days minimum interval, if not administered simultaneously</td>
</tr>
</tbody>
</table>

* Certain experts suggest a 28-day interval between tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine and tetravalent meningococcal conjugate vaccine if they are not administered simultaneously.

# Live attenuated oral vaccines (e.g. Ty21a typhoid vaccine and rotavirus vaccine) may be administered simultaneously or at any interval before or after inactivated or live attenuated injectable vaccines.

3.2.3. **Interval between doses of the same vaccine**

3.2.3.1 **Increase in interval**

- Increasing the interval between doses of a multidose vaccine does not diminish the effectiveness of the vaccine.¹
- It is not necessary to restart the series or add doses of any vaccine because of an extended interval between doses.¹
- The only exception is oral typhoid vaccine. Some experts recommend repeating the series of oral typhoid vaccine if the 4-dose series is extended to more than 3 weeks.¹

3.2.3.2 **Decrease in interval**

- Decreasing the interval between doses of a multidose vaccine may interfere with antibody response and protection.¹
- Vaccine doses should not be administered at intervals less than the recommended minimum intervals or earlier than the recommended minimum ages.¹
- In general, vaccine doses given up to 4 days before the minimum interval or age are counted as valid (The 4-day rule).¹ However, it should not be regarded as a routine. This does not apply to some vaccines such as rabies and hepatitis B vaccines.

**References**


3.3. Vaccine storage and handling

The success against vaccine-preventable diseases is attributable in part to proper storage and handling of vaccines. Vaccines are sensitive to temperature and light. Vaccines must be stored properly from the time they are manufactured until they are administered. Storage and handling errors reduce vaccine potency and protective effect. It is better to not vaccinate than to administer a dose of vaccine that has been mishandled. In each primary care practice providing vaccination, an adequately trained person, with at least one backup person, should be designated for this responsibility. In addition, detailed written protocols for routine and emergency vaccine storage and handling should be available and updated annually.

3.3.1. Vaccine storage equipment and placement

- A proper cold chain is a temperature-controlled supply chain that includes all equipment and procedures used in the transport and storage and handling of vaccines from the time of manufacturer to administration of the vaccine.
- The optimal cold chain temperature for the majority of commonly recommended vaccines is +2°C to +8°C.
- Primary care providers should strictly follow the manufacturers’ recommendation on storage temperatures of individual vaccines.

Choice of refrigerators

- Purpose-built vaccine refrigerators (PBVR) are the preferred means of storage for vaccines.
- Cyclic defrost and bar refrigerators (a combined refrigerator/ freezer unit with a single exterior door only) should not be used because they produce wide fluctuations in the internal temperatures and there is regular internal heating.
- Domestic frost-free refrigerator or stand-alone domestic refrigerator (without freezer compartment) can be used if PBVR is not available with the following precautions being made:
  - Only use the refrigerator compartment for storing vaccines if a domestic combination refrigerator/freezer unit is used.
  - Modify and stabilize the temperature of the refrigerator before stocking with vaccine.
  - Fill the empty shelves, floor, drawers and the door with plastic water bottles or containers to maintain temperature stability. Leave a small space between the bottles/containers.
  - Do not store vaccines near fan unit or cold air outlet.
  - Do not store vaccines in the door of the refrigerator.
  - Do not store vaccines in drawers or on floor of refrigerator.
  - Ensure the door of the refrigerator remains closed properly.

Placing the refrigerator and its maintenance

- Refrigerator should be placed in a secure area accessible to staff only.
- Ensure the refrigerator is placed out of direct sunlight. Follow the manufacturer’s instructions for air circulation around the back and sides of the unit. Be aware of seasonal changes in the room temperature that may affect the refrigerator temperature.
- Ensure the power source is marked clearly in a way to prevent the refrigerator from being accidentally unplugged or turned off.
- It is a good practice to have an annual check and proper maintenance of the designated fridge for vaccine storage.

Keeping vaccines inside the refrigerators

- Keep vaccines contained in original packaging, inside designated storage trays or open-weave baskets with clear labeling for the type of vaccine.
Place vaccines in center refrigerator space, and position away from refrigerator walls.\textsuperscript{2-4} Allow space between stocks for air circulation.\textsuperscript{2-4}

Keep vaccines with shorter expiration dates to the front of the shelf/basket.\textsuperscript{3, 4}

The refrigerator should be used exclusively for the storage of vaccines. No food or beverage is allowed.\textsuperscript{2-4}

Opening of the refrigerator door should be kept to a minimum.\textsuperscript{2-4}

### 3.3.2. Vaccine storage temperature and monitoring

- The temperature of the vaccine refrigerator should be monitored by a data logger or minimum/maximum thermometer.\textsuperscript{2}
- It is a good practice to check and record manually the minimum/maximum temperatures of the vaccine storage unit twice daily onto a temperature log sheet.\textsuperscript{2-4}
- The minimum/maximum thermometer should be reset after each recording.
- It is a good practice to calibrate the data logger or minimum/maximum thermometer regularly.
- The sensing device of the temperature monitor should be placed in the center of the vaccine storage unit away from the coils, walls, door, floor, and fan.\textsuperscript{3}
- For the vaccine storage temperature of each vaccine, primary care providers should refer to individual package inserts.

#### Table 10. Storage temperature of some vaccines (Information as at June 2016)

**Important:** This table is not exhaustive and is for reference only. Primary care provider should always refer to individual package insert for the storage temperature of each vaccine.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Vaccine storage temperature</th>
<th>Diluent storage temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria, tetanus, pertussis-containing vaccines</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze.</td>
<td>No diluent</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze.</td>
<td>No diluent</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze.</td>
<td>No diluent</td>
</tr>
<tr>
<td><em>Haemophilus influenzae</em> type b</td>
<td>Subject to brand: i) +2°C to +8°C (35°F-46°F) Do not freeze. (Reg. No. HK37568) ii) +2°C to +8°C (35°F-46°F) Not affected by freezing. (Reg. No. HK43304)</td>
<td>Subject to brand: i) +2°C to +8°C (35°F-46°F) Do not freeze. (Reg. No. HK37568) ii) +2°C to +8°C (35°F-46°F), or at ambient temperature (up to 25°C) Do not freeze. (Reg. No. HK43304) Protect from light.</td>
</tr>
<tr>
<td>Human papillomavirus</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze. Protect from light.</td>
<td>No diluent</td>
</tr>
<tr>
<td>Influenza (TIV)</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze. Protect from light.</td>
<td>No diluent</td>
</tr>
<tr>
<td>Influenza (QIV)</td>
<td>+2°C to +8°C (35°F-46°F) Do not freeze.</td>
<td>No diluent</td>
</tr>
<tr>
<td>Vaccine Type</td>
<td>Subject to brand:</td>
<td>Subject to brand:</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Measles, mumps and rubella     | i) +2°C to +8°C (35°F-46°F)  
Do not freeze.  
(Reg. No. HK25030)  
(Reg. No. HK43861) | i) +2°C to +8°C (35°F-46°F)  
Do not freeze.  
(Reg. No. HK25030) |
|                                | ii) +2°C to +8°C (35°F-46°F). To maintain potency, must be stored between -50°C to +8°C  
(-58°F-46°F)  
(HK01891) | ii) Can be refrigerated (+2°C to +8°C) or stored at room temperature. Do not freeze.  
(HK43861)  
(HK01891) |
| Measles, mumps and rubella-varicella | i) +2°C to +8°C (35°F-46°F)  
Do not freeze  
(Reg. No. HK57798) | i) No diluent  
(Reg. No. HK01891) |
|                                | ii) +2°C to +8°C (35°F-46°F)  
(Reg. No. HK54831) | ii) +2°C to +8°C (35°F-46°F)  
(Reg. No. HK54831) |
|                                | Protect from light.                                                              | Protect from light.                                                              |
| Meningococcal conjugate vaccine | i) +2°C to +8°C (35°F-46°F)  
Do not freeze  
(Reg. No. HK60659) | i) No diluent  
(Reg. No. HK060659) |
|                                | ii) +2°C to +8°C (35°F-46°F)  
Do not freeze  
(Reg. No. HK60659) | ii) +2°C to +8°C (35°F-46°F)  
Do not freeze  
(Reg. No. HK62095) |
|                                | Protect from light.                                                              | Protect from light.                                                              |
|                                | i) +2°C to +8°C (35°F-46°F)  
(Reg. No. HK60659) | |
|                                | ii) +2°C to +8°C (35°F-46°F)  
(Reg. No. HK36398) | |
|                                | Protect from light.                                                              | |
|                                | +2°C to +8°C (35°F-46°F)            | |
|                                | Protect from light.                                                              | |
| Pneumococcal conjugate vaccine  | +2°C to +8°C (35°F-46°F)  
Do not freeze                      | No diluent                                                                       |
| Pneumococcal polysaccharide vaccine | +2°C to +8°C (35°F-46°F)  
Do not freeze                      | No diluent                                                                       |
| Polio (IPV)                    | +2°C to +8°C (35°F-46°F)            | No diluent                                                                       |
| Rotavirus                      | +2°C to +8°C (35°F-46°F)  
Do not freeze                      | No diluent                                                                       |
### 3.3.3. Management of cold chain breach

- Establish protocols for response to cold chain breach.
- Stored vaccines exposed to temperatures outside the recommended ranges should remain properly stored, but segregated from the unexposed vaccines and marked “Do NOT Use”.
- Record the range, date and duration of temperature breach.
- Contact the manufacturer or drug company to evaluate the stability/effectiveness of the exposed vaccines and determine whether the vaccines are still usable. If in doubt, it is better not to vaccinate.
- Take active steps to correct and prevent the problem from recurring.

### 3.3.4. Vaccine stocking and disposal

- Written protocol for ordering, rotating and receiving stock and vaccine disposal should be available. (Refer to Annex 1)
- Order appropriate levels of stock. Overstocking of vaccines may
  - Increase wastage and the cost of disposal.
  - Lead to poor air circulation, failure to achieve stable temperature throughout the refrigerator and make all vaccines at risk.
  - Lead to poor stock rotation and increase the risk of using expired vaccines.
  - Increase the cost of replacement of stocks if the refrigerator fails.
- When receiving the vaccines, staff must check them against the order for discrepancies and leakage or damage. Vaccines must be refrigerated immediately on receipt. Vaccine types, brands, quantities, batch numbers and expiry dates should be recorded with the date and time at which the vaccines were received.
- Rotate stock so that vaccines with the shortest expiry date are used first.
- Keep an up-to-date inventory record of vaccines and perform vaccine storage audit at least every 12 months.
- Any expired vaccine should be labeled clearly and removed from the refrigerator immediately.
- Expired vaccines should be disposed according to guidelines from the Environmental Protection Department.

### 3.3.5. Handling of spillage

- Spillage should be cleared up quickly; personal protective equipment should be worn.
- Cover the spill with disposable absorbent materials. For live attenuated vaccines, mop the area with a cloth or paper towels wetted with one part of household bleach (5.25% hypochlorite solution) in 4 parts of water, leave for 10 minutes then rinse with water. Use 70% alcohol to disinfect metal surfaces. Use forceps to transfer the sharps into sharp box.
- Dispose of all contaminated waste material into appropriate plastic waste bag.
- Spillages on skin should be washed with soap and water. For mucosal contact such as spillage into the eyes, the exposed part should be washed immediately and liberally with running water. Medical advice should be sought.
3.4. Administration and injection technique

Appropriate vaccine administration is a critical component of a successful immunisation programme. All vaccine administrators should receive competency-based training and education on vaccine administration before providing vaccines to patients. Administering vaccine involves handling of sharps. Standard occupational health guideline and infection control protocol should always be followed to minimize the risk of needle-stick injury. Needles and syringes must be discarded into designated sharp containers. Healthcare providers should also follow Standard Precautions to minimise the risks of spreading disease during the administration of vaccines. Handwashing is crucial before vaccine preparation, between patients, and any time hands become soiled.

The “rights of medication administration” should be applied for vaccine administration. These rights include:

1. The right patient;
2. The right vaccine or diluent;
3. The right time (e.g. correct age, correct interval, vaccine not expired);
4. The right dosage;
5. The right route, needle length and technique;
6. The right site; and
7. The right documentation.
3.4.1. **Patient preparation and care**

- Screen for contraindications and precautions.\(^2\)
- Primary care providers should fully inform the vaccinee or carer about the vaccine(s) to be given and make sure he/she understands the vaccination procedure.\(^2\)
- Primary care providers should explain to vaccinee or carer the possible adverse reactions (ADRs) and they should know how to treat them.\(^2\)
- Alcohol and other disinfecting agents must be allowed to dry before vaccine injection.\(^3\)
- Position the child properly. Positions suggested: *(Refer to Pictures 1-4)*
  - For infants and toddlers: have parent hold the child on parent’s lap.
  - For older children: hold the child on parent’s lap or have the child standing in front of the seated parents.
- Distract the child such as using toys or playing music (when another assistant or caretaker is present). In case of multiple injections, inject BCG first as it requires more skillful techniques. (If other vaccines are administered first, the child is likely to struggle and make the BCG injection much more difficult to be administered smoothly). Inject the most painful vaccines (e.g. MMR, PCV or HPV) last.

Pictures 1-4. Proper positions of holding a child during injection *(By courtesy of Family Health Service, Department of Health)*
3.4.2. **Vaccine preparation**

- Check the thermometer inside the refrigerator before removing vaccine from the refrigerator.³
- Inspect vaccine: check for damage, contamination and expiry date.¹
- For vaccine requiring reconstitution, the vaccine should be reconstituted immediately before administration.³
- When filling syringes, agitate (shake) the vial to mix the vaccine thoroughly and obtain a uniform suspension prior to withdrawing each dose. A vaccine dose should not be drawn into the syringe until it is to be administered.¹
- It is a good practice to label the syringe with information such as vaccine type, lot number, and date of filling.¹

3.4.3. **Vaccination technique, route and site**

- Almost all vaccines are given by either intramuscular (IM) or subcutaneous (SC) injection, and only a few are given orally.³
- Oral vaccines, such as currently registered rotavirus vaccines, are for oral administration only and must never be injected.
- A couple of vaccines (e.g. BCG) have to be administered intradermally.
- For most vaccines, local adverse events are minimised and immunogenicity enhanced by ensuring vaccine is deposited into the muscle and not into the subcutaneous layer. However, some vaccines are only licensed for SC administration.³ Deviation from the recommended route of administration might reduce vaccine efficacy or increase the risk for local adverse reactions.⁴
- For the route of administration of each vaccine, primary care providers may refer to individual package inserts.
- For IM injection, it is not considered necessary to draw back on the syringe plunger before injecting a vaccine. However, if this is done, and a flash of blood appears in the needle hub, the needle should be withdrawn and a new site selected for injection.³

(Please refer to Annex 2 Tables 56 and 57 for resources for vaccine preparation and administration.)
**Table 11. Route of administration of selected vaccines (Information as at June 2016)**

*Important:* This table is for reference only. Primary care provider should always refer to individual package insert for clarification.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCG</strong></td>
<td>Intradermal</td>
</tr>
<tr>
<td><strong>Diphtheria, tetanus, pertussis (DTaP)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Haemophilus influenzae type b (Hib)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Hepatitis A (HAV)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Hepatitis B (HBV)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Human papillomavirus (HPV)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Influenza, inactivated (TIV)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Influenza, inactivated (QIV)</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Japanese encephalitis</strong></td>
<td>SC or IM, depending on individual preparations</td>
</tr>
<tr>
<td><strong>Measles, mumps, rubella (MMR)</strong></td>
<td>SC or IM, depending on individual preparations</td>
</tr>
<tr>
<td><strong>Meningococcal, conjugate</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Meningococcal, polysaccharide</strong></td>
<td>SC or IM depending on individual preparations</td>
</tr>
<tr>
<td><strong>Pneumococcal, conjugate</strong></td>
<td>IM</td>
</tr>
<tr>
<td><strong>Pneumococcal, polysaccharide</strong></td>
<td>IM or SC</td>
</tr>
<tr>
<td><strong>Polio, inactivated (IPV)</strong></td>
<td>IM or SC</td>
</tr>
<tr>
<td><strong>Rotavirus</strong></td>
<td>Oral</td>
</tr>
<tr>
<td><strong>Varicella</strong></td>
<td>SC</td>
</tr>
</tbody>
</table>

**Other combination vaccines**

- DTaP+IPV+HBV+Hib
- DTaP+IPV+Hib
- DTaP+IPV
- MMR+Varicella
- HAV+HBV

**Remarks:**

- IM: Intramuscular
- SC: Subcutaneous

---

**Table 12. Intramuscular injection site and needle size**

**Intramuscular (IM) injection:**
Use a 22-25 gauge needle. Choose the injection site and needle length appropriate to the person’s age and body mass.

<table>
<thead>
<tr>
<th>Age</th>
<th>Needle length</th>
<th>Injection site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborns (1st 28 days)</td>
<td>16mm*</td>
<td>Anterolateral thigh muscle</td>
</tr>
<tr>
<td>Infants (1-12 months)</td>
<td>25mm</td>
<td>Anterolateral thigh muscle</td>
</tr>
<tr>
<td>Toddlers (1-2 years)</td>
<td>16*-25mm</td>
<td>Deltoid muscle of arm</td>
</tr>
<tr>
<td></td>
<td>25-32mm</td>
<td>Anterolateral thigh muscle</td>
</tr>
<tr>
<td>Children and teens (3-18 years)</td>
<td>16*-25mm</td>
<td>Deltoid muscle of arm</td>
</tr>
<tr>
<td></td>
<td>25-32mm</td>
<td>Anterolateral thigh muscle</td>
</tr>
</tbody>
</table>

*A 16mm needle may be used only if the skin is stretch tight, subcutaneous tissue is not bunched and injection is made at a 90-degree angle.*
Table 13. Subcutaneous injection site and needle size

<table>
<thead>
<tr>
<th>Subcutaneous (SC) injection:</th>
<th>Use a 23-25 gauge needle. Choose the injection site that is appropriate to the person’s age and body mass.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Needle length</td>
</tr>
<tr>
<td>Infants (1-12 months)</td>
<td>16mm</td>
</tr>
<tr>
<td>Children 12 months older, and adolescents</td>
<td>16mm</td>
</tr>
</tbody>
</table>

Figure 1. Needle insertion technique

3.4.4. Special situations

3.4.4.1 Multiple vaccinations at a single visit

- Administration of each vaccine at a different anatomic site is desirable.
- For infants and younger children, if more than two vaccines are injected in a single limb, the thigh is the preferred site because of the greater muscle mass.
- For older children and adults, the deltoid muscle can be used for more than one intramuscular injection.
- The injections should be separated by 2.5 cm or more, if possible, so that any local reactions can be differentiated.
- Vaccines that are more likely to cause local reactions (e.g., tetanus-containing and PCV) should be administered in different limbs if possible.
- Use of combination vaccines can reduce the number of injections.

3.4.4.2 Intramuscular injections in persons with bleeding disorder

- For individuals with a bleeding disorder, vaccines normally given by an IM route should be given by deep subcutaneous injection to reduce the risk of bleeding.

References


4. Recommendations to ensure high immunisation coverage

Effective immunisation requires good immunisation coverage to the target group of recipients. Primary care providers are encouraged to ensure that all children without a valid contraindication receive immunisations on time. A number of strategies are proposed in this chapter to support the progress toward the goal of maintaining high immunisation coverage of all children in Hong Kong. For primary care providers, they can assist in maintaining high immunisation coverage by actively identifying and overcoming the barriers to immunisation, setting up reminder and recall systems, keeping proper record, and establishing individualised catch-up schedule for children who have not received vaccines appropriate for their ages.

4.1. Reduction of barriers to immunisation

4.1.1. Child or parental factors

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Solutions</th>
</tr>
</thead>
</table>
| 1a. Lack of awareness and knowledge on immunisation  
1b. Safety concerns | - Develop a routine to assess immunisation record checking of all the children attending the practice. Recommend childhood immunisation programme to parents accordingly.  
- Provide education with clear explanation on the benefits and risk of vaccination, correct misunderstanding.  
- Provide source of reliable, accurate and evidence-based information.  
- Use good and effective interpersonal and communication skill.  
- Provide pamphlets and post up posters in the practice.  
- Promote immunisation in community level. |
| 2. Missed visits | - Create reminder and recall systems.  
- Reduce the number of visits by using combination vaccines when indicated. |
| 3a. Lack of continuity of care and received immunisation in different practice  
3b. Difficult to determine immunisation status due to no or poor quality immunisation record | - Promote primary care and continuity of care.  
- Ensure appropriate, accurate and up-to-date immunisation documentation.  
- Use shared immunisation record in different primary care providers including both private and public sectors when the system is in place. |
### 4.1.2. Primary care provider and practice factors

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of awareness and knowledge (e.g. lack of knowledge on individual vaccine, storing and handling of vaccines, management of children with incomplete immunisations.)</td>
<td>- Get familiarised with indications, schedule, common side effects, contraindication and precaution of vaccines. - Participate in continuous medical education and update knowledge with relevant information especially local and international recommendations.</td>
</tr>
<tr>
<td>2. Fear of adverse events following immunisation and its management in practice</td>
<td>- Get familiarised with local reference framework. - Get familiarised with common adverse events, contraindication and precaution of vaccines. - Set up and update protocols on adverse events monitoring and management. - Get familiarised with the reporting system for monitoring local adverse events following immunisation.</td>
</tr>
<tr>
<td>3. Missed opportunities (i.e. failure to provide vaccination during practice visit)</td>
<td>- Set up reminder and recall systems. - Share responsibility for identifying need of vaccinations with other practice staff (e.g. nursing personnel). - Clients who are likely to have lower level of age appropriate immunisation should be identified. - Review and update all children immunisation status and actively provide vaccination during daily practice if indicated. - Maintain accurate and up-to-date immunisation records. - Vaccinate siblings during the same visit if indicated.</td>
</tr>
<tr>
<td>4. Practice issues (e.g. lack of facility, lack of knowledge on handling vaccines, lack of experience personnel)</td>
<td>- Refer to chapter 3 for practical issues for vaccine storage and handling. - Set up and regularly update protocol for procurement, storage and handling of vaccines. Ensure training of practice staff. - Undertake practice-based assessment and improvement activities necessary to maximise effectiveness in immunising children. - Measure practice immunisation rate over time as part of a quality assurance exercise.</td>
</tr>
<tr>
<td>5. Lack of vaccine supply</td>
<td>- Liaise with vaccine manufacturers and relevant parties to maintain an adequate supply of vaccines. - Consider referral if supply of certain vaccine(s) is inadequate. - Track and encourage children to return for immunisation by recall system after supply available.</td>
</tr>
</tbody>
</table>
4.2. Reminder / recall system

Reminder is the notification that immunisation are due soon whereas recall is the notification that immunisations are past due. Patient reminder and recall systems in primary care settings are found to be effective in improving immunisation rates. For primary care providers, combining reminder and recall system are important to ensure attendance of the recipients and high immunisation coverage.

4.2.1. Reminder / recall system to children/parents
- Reinforce the need to return for vaccination.
- Schedule next appointment date after completing current vaccination dose.
- It is a good practice to generate a daily list of children who are scheduled to have vaccination. Remind children to attend and recall those who have failed to attend by practice reception.
- Both written or verbal (including telephone call) reminder or recall can be used.

4.2.2. Reminder / recall system to primary care providers
- Develop a protocol in the practice and assign a dedicated person with a back up person who are responsible for reminder and recall.
- Review the reminder and recall system periodically for improvement.
- Ensure proper and up-to-date documentation of the immunisation status on the record.
- Review immunisation record for every child and actively discuss for vaccination during their practice visit.
- Review records at the practice periodically. Mark and select those without age-appropriate immunisation and designated staff should proceed to recall those children for catch-up vaccination.

References

4.3. Record keeping

Immunisation record must be accurate and up-to-date. Vaccines administrated to a child should be recorded in both the personal record and the primary care provider record. Since children may receive vaccines at more than one provider office, use of single personal immunisation record in different primary care providers is preferable in order to provide a complete and accurate immunisation records. Communication between health care providers may be necessary for such information if no record is available, or when the record is neither complete nor up-to-date.
4.3.1. Components of immunisation record

The following information should be documented in both the personal and practice records:

Table 14. Information documented in personal and practice immunisation records.

<table>
<thead>
<tr>
<th>On both personal and practice immunisation records</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Type of vaccine (and disease against which it protects)</td>
</tr>
<tr>
<td>- Date given (day, month and year)</td>
</tr>
<tr>
<td>- Place given</td>
</tr>
<tr>
<td>- Site of BCG administered if it is given at area other than the deltoid</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On practice immunisation record</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Dose</td>
</tr>
<tr>
<td>- Trade name of the product, manufacturer, lot number*</td>
</tr>
<tr>
<td>- Site and route of administration</td>
</tr>
<tr>
<td>- Name and title of person administering the vaccine</td>
</tr>
</tbody>
</table>

*A pre-printed, peel-off and bar coding of products can facilitate such recording.

4.3.2. Personal record

- Each person who is immunised should be given a permanent personal immunisation record.
- Individual should be reminded that the immunisation record is an official medical record and should be kept in a safe place.
- Parents and caretakers should be encouraged to bring all immunisation records in every practice visit.
- Parents should help to maintain these records on behalf of their children.
- Allergy card should be given if patient is allergic to any type of vaccine or vaccine components. The person should be reminded to show the allergy card when attend other primary care providers.
- Immunisation record card of the Hong Kong SAR (DH6) is available at website of Family Health Service, Department of Health http://www.fhs.gov.hk/tc_chi/main_ser/child_health/files/record_card.pdf

4.3.3. Primary care provider record

- Primary care providers should maintain a record of all vaccinations given to individuals including vaccines provided in other practices. The record must be accurate and kept up-to-date.
- Relevant serologic data should also be documented if available.
- Any adverse events following immunisation as well as contraindications and precautions, exemptions or reasons for deterring vaccinations should also be documented.
- Summary of immunisation (such as chart), serologic results and any significant adverse vaccine reactions should be available in the record for easy retrieval, regular checking and updating.
- For electronic medical records, primary care providers should be capable to collect, maintain and retrieve all required vaccination information. The Hong Kong Clinical Terminology Table (HKCTT) is a standardised clinical terminology table developed to support the interoperable Electronic Health Record Sharing System (eHRSS) in Hong Kong. The table provides a uniform way for healthcare providers to record and transmit clinical information. It makes reference to various international terminologies commonly used in Hong Kong and supports secondary use of clinical data for healthcare research, teaching, health care management, disease surveillance and clinical decision support. More information on HKCTT can be found on http://www.ehealth.gov.hk.
References


4.4. Catch-up schedule

Catch-up immunisation is indicated if the child has not received age-appropriate vaccine(s). The objective of catch-up immunisation is to complete a course of vaccination and provide optimal protection as quickly as possible. The catch-up schedule should be determined on a case-by-case basis. Please refer to Chapter 3 for the recommendation on principle of vaccination and Chapter 6 for the information of different vaccines.

4.4.1. Approach on determining a catch-up schedule

The following tasks are needed for planning a catch-up schedule:

1. Check the individual’s most updated vaccination status. For each vaccine, determine how many doses have been received and the date that the last dose was given.
2. Decide which type of vaccine(s) and the number of dose(s) is/are required for catch-up. These may be affected by the age of the child.
3. Check the minimum interval between doses and the age limit of different doses.
4. Work out a catch-up schedule that is personalised to the individual.

4.4.2. Points for determining vaccination status

- Search for all proof of previous immunisation including written documentation or immunisation information from other primary care providers.
- For children who have received vaccination outside Hong Kong, primary care providers should refer to the vaccination received and assess the needs for catch-up immunisation with reference from the Hong Kong CIP. Primary care providers are advised to countercheck the immunisation status with the carers even though they may claim that the child has received age-appropriate vaccinations. Primary care providers should make reference to all available immunisation documentation.
- Immunisation programme in mainland China may vary among different provinces. Vaccines not included in the national immunisation programme of Ministry of Health of China may be provided in certain provinces according to the local epidemiology, population immunity and other factors.
Table 15. English name conversion of the vaccines that may be included in the national immunisation programme of Ministry of Health, mainland China. *(Information as at July 2012) (Remarks: some of the vaccines are only registered in mainland China)*

<table>
<thead>
<tr>
<th>疫苗</th>
<th>Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+C 群流腦疫苗</td>
<td>Meningococcal A+C</td>
</tr>
<tr>
<td>A 群流腦疫苗</td>
<td>Meningococcal A</td>
</tr>
<tr>
<td>乙肝疫苗</td>
<td>Hepatitis B</td>
</tr>
<tr>
<td>乙腦減毒活疫苗</td>
<td>Japanese encephalitis (live attenuated)</td>
</tr>
<tr>
<td>乙腦滅活疫苗</td>
<td>Japanese encephalitis (inactivated)</td>
</tr>
<tr>
<td>卡介苗</td>
<td>BCG</td>
</tr>
<tr>
<td>甲肝減毒活疫苗</td>
<td>Hepatitis A (live attenuated)</td>
</tr>
<tr>
<td>甲肝滅活疫苗</td>
<td>Hepatitis A (inactivated)</td>
</tr>
<tr>
<td>白破疫苗</td>
<td>Diphtheria-tetanus</td>
</tr>
<tr>
<td>百白破疫苗</td>
<td>Diphtheria-tetanus-pertussis</td>
</tr>
<tr>
<td>脊灰疫苗（又稱糖丸）</td>
<td>Oral polio</td>
</tr>
<tr>
<td>麻疹疫苗</td>
<td>Measles</td>
</tr>
<tr>
<td>麻腮疫苗 / 麻腮二聯</td>
<td>Measles-mumps</td>
</tr>
<tr>
<td>麻風疫苗 / 麻風二聯</td>
<td>Measles-rubella</td>
</tr>
<tr>
<td>麻腮風疫苗 / 麻腮風三聯</td>
<td>MMR</td>
</tr>
</tbody>
</table>

### 4.4.3. Points for planning catch-up vaccination

- For most vaccines, there are little adverse events associated with administration of extra dose(s). In the case of diphtheria and tetanus vaccines, additional doses may occasionally be associated with an increase in local adverse events in immune individuals.
- Doses administered earlier than the minimum interval should not be considered as valid doses.
- When commencing the catch-up schedule, the standard scheduled interval between doses may be reduced (according to minimum interval between doses) or extended. For incomplete or overdue vaccinations, catch up schedule can be built on the previous documented doses and there is no need to restart the whole schedule.
- Give all the due vaccines at the same visit in a catch-up schedule which may require multiple vaccinations.
- The standard intervals and ages recommended in the childhood immunisation programme should be used once the child is up-to-date with the schedule.
Table 16. Suggested catch-up immunisation schedule for vaccines included in the Hong Kong Childhood Immunisation Programme

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum interval between doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dose 1 to dose 2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hepatitis B</strong> (see 4.4.4 section 1)</td>
<td>4 weeks</td>
</tr>
<tr>
<td>(Recommended interval = 1 month)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DTaP-IPV / dTap-IPV</strong> (see 4.4.4 section 2)</td>
<td>4 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pneumococcal conjugate (PCV)</strong> (see 4.4.4 section 4)</td>
<td></td>
</tr>
<tr>
<td><strong>MMR</strong> (see 4.4.4 section 5)</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

# 4 weeks for children below 10 years old, and 6 months for children 10 years old or above.

4.4.4. Catch-up guidelines for individual vaccines (Schedule adopted by the Department of Health)

(Refer to Chapter 6 for more information of individual vaccines)

4.4.4.1 **Hepatitis B**
- Administer the 3-doses series to those not previously vaccinated.
- The minimum age for the 3rd dose is 24 weeks.

Table 17. Recommended schedule for catch-up for hepatitis B vaccine.

<table>
<thead>
<tr>
<th>Dose</th>
<th>Recommended interval from previous dose</th>
<th>Minimum interval from previous dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st dose</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2nd dose</td>
<td>1 month</td>
<td>4 weeks</td>
</tr>
<tr>
<td>3rd dose</td>
<td>5 months</td>
<td>8 weeks*</td>
</tr>
</tbody>
</table>

*At least 16 weeks after the first dose

4.4.4.2 **Diptheria, tetanus, pertussis and poliovirus (DTaP-IPV or dTap-IPV)** (Schedule adopted by the Department of Health)

- A child below the age of 10 years is considered having completed a valid primary series if he/she has received three doses of DTaP-IPV or equivalent with at least 4 weeks in between every two doses, and the first dose is given at or after 6 weeks of age. For children aged 10 years or above, the same applies except that at least 6 months is required between the second and third doses of the primary series.
A child after Primary Six or aged 10 years or older is considered having completed the full DTP and IPV vaccination if:

- He/she has completed a valid 3-dose primary series and at least one booster after the tenth birthday.
- He/she has completed a valid 3-dose primary series with at least 2 doses of the primary series given at 10 years old or above provided there is a minimum interval of 6 months between the second and third primary doses.

**Catch-up for primary series**

- During a catch-up schedule, the second and third doses of the primary series should be given at a minimum interval of 4 weeks after the previous dose.
- However, if second dose is given at or above 10 years of age, the third dose of primary series is to be given at least 6 months after the second dose of primary series. No booster dose is required in this situation.
- A child 10 years old or above should only be given one dose of dTap-IPV, dT and IPV should be used if more vaccination is required.
- Oral polio vaccine (OPV) and IPV are interchangeable upon immunisation record review.

**Table 18. Catch-up for primary series of diphtheria, tetanus, pertussis and poliovirus vaccine**

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Minimum interval from previous dose</th>
<th>Vaccine to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary series</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 1st dose</td>
<td>--</td>
<td>Up to 9 years old: DTaP-IPV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 years old or above: dTap-IPV</td>
</tr>
<tr>
<td>Primary series</td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>- 2nd dose</td>
<td></td>
<td>Up to 9 years old: DTaP-IPV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 years old or above:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dTap-IPV (if no previous dose of dTap-IPV received, give 1 dose of dTap-IPV and remaining dose(s) with dT and IPV); or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dT and IPV (if previously received dTap-IPV)</td>
</tr>
<tr>
<td>Primary series</td>
<td>4 weeks (If the 2nd dose is given before the 10th birthday), or 6 months (If the 2nd dose is given after the 10th birthday)</td>
<td></td>
</tr>
</tbody>
</table>

**Catch-up for booster doses**

- During a catch-up schedule, the first booster should be given at least 6 months after completion of the primary series. The age of the first booster will affect the number of subsequent booster doses.
- If the first booster dose is administered at 4 years of age or above, the booster dose at Primary One or equivalent is not necessary. With the completion of a 3-dose primary series and one booster dose at 4 to 5 years of age, immunity can last up to 10 years. The child should be given a second booster at Primary Six or equivalent and no further booster is required.
- If the first booster dose is administered at 10 years or above, further boosters are not required.
- Any child who has completed the primary series with two valid doses of the primary series at 10 years old or above will not require any further boosters.
- A child who has completed the primary series with only one of the three primary series at 10 years old or above will require only one more booster.
- During a catch-up schedule, the second booster should be given in Primary One if the first booster is given before 4 years old; or in Primary Six, if the first booster is given between 4 – 9 years of age. If the first booster is given at 10 years old or above, the second booster is not required.

### Table 19. Catch-up for booster doses of diphtheria, tetanus, pertussis and poliovirus vaccine

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Minimum interval from previous dose</th>
<th>Vaccine to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booster - 1st dose</td>
<td>➢ 6 months</td>
<td>➢ Up to 9 years old: DTaP-IPV</td>
</tr>
<tr>
<td></td>
<td>➢ Persons who has received 2 valid</td>
<td>➢ 10 years old or above:</td>
</tr>
<tr>
<td></td>
<td>doses of the primary series after</td>
<td>➢ dTap-IPV (if no previous dose of DTaP-IPV received, give 1 dose of dTap-IPV and</td>
</tr>
<tr>
<td></td>
<td>10th birthday will not require any</td>
<td>remaining dose(s) with dT and IPV); or</td>
</tr>
<tr>
<td></td>
<td>further boosters</td>
<td>➢ dT and IPV (if previously received dTap-IPV)</td>
</tr>
<tr>
<td>Booster - 2nd dose</td>
<td>➢ 2 years</td>
<td>➢ If the 1st booster is given before 4 years old, the 2nd booster should be given</td>
</tr>
<tr>
<td></td>
<td>➢ If the 1st booster dose is given</td>
<td>➢ If previously received dTap-IPV)</td>
</tr>
<tr>
<td></td>
<td>in 10 years or above, the booster</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dose is to be omitted</td>
<td></td>
</tr>
<tr>
<td>Booster - 3rd dose</td>
<td>➢ 2 years</td>
<td>➢ If the previous booster is given before 10 years of age, proceed to Primary 6</td>
</tr>
<tr>
<td></td>
<td>➢ If the previous booster is given</td>
<td>booster</td>
</tr>
<tr>
<td></td>
<td>in 10 years old or above, the booster</td>
<td>➢ If the previous booster is given at 10 years old or above, the booster dose at</td>
</tr>
<tr>
<td></td>
<td>dose is to be omitted</td>
<td>Primary 6 is to be omitted</td>
</tr>
</tbody>
</table>

**Glossary:**

- DTaP-IPV Vaccine: Diphtheria, Tetanus, acellular Pertussis & Inactivated Poliovirus Vaccine
- dTap-IPV Vaccine: Diphtheria, Tetanus, acellular Pertussis (reduced dose) & Inactivated Poliovirus Vaccine
- DT Vaccine: Diphtheria & Tetanus Vaccine
- dT Vaccine: Tetanus & Diphtheria Vaccine (reduced dose)
- IPV: Inactivated Poliovirus Vaccine
4.4.4.3  *Measles, mumps and rubella vaccine (MMR)*
- The minimum interval between first and second doses MMR vaccines is 4 weeks.

4.4.4.4  *Pneumococcal vaccine*

Table 20. Catch up schedule for missed or delayed doses of pneumococcal conjugate vaccine (PCV) in the CIP\(^2\) (For further information, please refer to chapter 6.5)

<table>
<thead>
<tr>
<th>Age</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months or below</td>
<td>• A 3-doses primary series at any time with 4-8 weeks interval between doses;</td>
</tr>
<tr>
<td></td>
<td>• A booster dose at 12-15 months or 2 months after the last dose whichever is later (i.e. 3+1)</td>
</tr>
<tr>
<td>7 months to &lt; 1 year</td>
<td>• A 2-doses primary series with 4-8 weeks interval but not later than the age of 1 year;</td>
</tr>
<tr>
<td></td>
<td>• A booster dose at 12-15 months with an interval of at least 2 months after the last dose (i.e. 2+1)</td>
</tr>
<tr>
<td></td>
<td>• If the second dose of the primary series is not administered by the age of 1 year, a booster dose at 12-15 months with an interval of at least 2 months after the last dose (i.e. 1+1)</td>
</tr>
<tr>
<td>1 year to &lt; 2 years</td>
<td>• One single dose</td>
</tr>
</tbody>
</table>

References

1  中國疾病預防控制中心免疫規劃中心 . 疫苗免疫程序 . [ 網上資料 ] [2012 年 9 月 27 日更新；2013 年 3 月引用 ]. 連結：
http://nip.chinacdc.cn/zstd/mycx/201209/t20120927_69741.htm

2  Scientific Committee on Vaccine Preventable Diseases. Recommendations on the Use of Pneumococcal Vaccines. [Internet] Hong Kong SAR: Centre for Health Protection, Department of Health, 2007. [Updated March 2009; Cited on 24th August 2011]. Available from:
4.5. Child without any previous immunisation record or evidence of immunisation received

- On determining the catch-up schedule for children without any immunisation record or evidence of immunisation received, the general principles mentioned in Section 4.4 should be followed. Besides, catch-up guidelines for individual vaccines should be observed.
- The suggested catch-up schedule for child aged ≥ 1 year with no immunisation record in Table 21 is adopted by the Family Health Service, Department of Health. This is for reference only. The administration and arrangement is subject to individual professional’s decision and client’s availability and suitability.

Table 21. Suggested schedule for child without any immunisation record or evidence of immunisation received and age ≥ 1 year old (By courtesy of Family Health Service, Department of Health)

<table>
<thead>
<tr>
<th>With BCG scar or evidence of BCG vaccine received before</th>
<th>Without BCG scar or no evidence of BCG vaccine received before</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time from 1st vaccination</strong></td>
<td><strong>Vaccines</strong></td>
</tr>
<tr>
<td>0 month</td>
<td>MMR+ DTaP-IPV 1st dose#</td>
</tr>
<tr>
<td>1 month</td>
<td>DTaP-IPV 2nd dose# + HBV 1st dose + PCV13*</td>
</tr>
<tr>
<td>2 month</td>
<td>DTaP-IPV 3rd dose# + HBV 2nd dose</td>
</tr>
<tr>
<td>8 month</td>
<td>DTaP-IPV booster dose# + HBV 3rd dose</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Paediatric dose of pertussis for <10 years of age
* For children <2 years of age

Remarks: The above is only a suggested schedule which can be adjusted according to different situations.
5. Monitoring and Management of Adverse Events Following Immunisation

Adverse event following immunisation (AEFI) is defined as any untoward medical occurrence which follows immunisation and which does not necessarily have a causal relationship with the usage of the vaccine. All vaccines, like other medicinal products, have the potential to cause an adverse event. To minimise adverse events, vaccinees should be carefully screened for precautions and contraindications before vaccine administration. Vaccinees or the carers should also be informed of the possible AEFI and the management of these events. Primary care providers should be prepared for their management if any adverse reaction occurs.

5.1. Adverse events following immunisation

5.1.1. Classification of AEFI

AEFI can be classified into one of the following categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergic reaction</td>
<td>Anaphylaxis is the severe reaction that characteristically evolves rapidly towards cardiovascular collapse requiring resuscitative therapy. Other examples of severe allergic reactions are wheezing or shortness of breath due to bronchospasm, swelling of mouth or throat, skin manifestation (e.g. hives, eczema, pruritus); or facial or generalised oedema. Allergic reactions usually occur within 24 hours of immunisation.</td>
</tr>
<tr>
<td>Local reaction</td>
<td>Local reactions, usually occur within 5 days of immunisation, of concern may include abscess (sterile or infected), or other severe local reactions, such as redness and swelling that extend beyond the nearest joint or last 4 days or more.</td>
</tr>
<tr>
<td>Systemic reaction</td>
<td>Systemic reactions usually occur within 5 days but may occur up to 3 months after immunisation. Early onset ones of concern include toxic shock syndrome, hypotonic-hypo responsiveness episode, persistent crying or screaming episodes, high fever (greater than 39°C or 102.2°F), sepsis, or rash (especially those lasts for 4 days or more or requires hospitalisation). Thrombocytopenia (with platelet &lt; 50,000/mm³) may have a delayed onset.</td>
</tr>
<tr>
<td>Neurological disorders</td>
<td>Some neurological adverse reactions may be related to vaccination. Seizures (usually generalized convulsion), encephalopathy, meningitis or encephalitis, if occurred, may have an onset within 15 days of immunisation. Guillain-Barré Syndrome, if occurred, may have an onset within 6 weeks of immunisation. Brachial neuritis, if occurred within 3 months of immunisation, may be related to the immunisation.</td>
</tr>
</tbody>
</table>
The frequency of adverse events can be classified as follows: very common (>10%), common (1-10%), uncommon (0.1-1%), rare (0.01-0.1%), very rare (<0.01%) and not previously reported. Most vaccines cause mild adverse events such as low-grade fever, pain or redness at the injection site and these should be anticipated. Anaphylaxis is a severe form of allergic reaction. It is very rare but can be fatal. 

5.1.2. Events where evidence demonstrates no causal link or favours rejections of the causal relationship with immunisation

- Sudden infant death syndrome (SIDS) and any vaccine;
- Autism and MMR vaccine;
- Multiple sclerosis and hepatitis B vaccine;
- Inflammatory bowel disease and MMR vaccine;
- Diabetes and Hib vaccine;
- Type 1 diabetes and MMR vaccine or DTaP vaccine;
- Asthma and any vaccine;
- Asthma exacerbation or reactive airway disease episodes in children and adults and inactivated influenza vaccine;
- Bell’s palsy and inactivated influenza vaccine

5.1.3. Reporting vaccine adverse events

- Primary care providers are encouraged to report any suspected AEFI which are serious (even if the reaction is well-known), non-serious but deemed medically significant by the healthcare professional, or unexpected, to the Pharmacovigilance Unit of the Drug Office, Department of Health, to facilitate assessment process.
- Further information and Adverse Drug Reaction (ADR) report form are available on the next page or online at the following link:
**Department of Health**

**Adverse Drug Reactions (ADR) Report Form**

Please read the following instructions:
2. ADR can be briefly described as a noxious and unintended response to a pharmaceutical product (i.e. drug or vaccine).
3. If the ADR of a newborn/child may be related to the mother, please submit a separate report for the mother.
4. Please provide information to every section.
5. **Full name and any kind of personal identifier of the patient**, such as identity card number and hospital admission number, should not be provided on the report form.
6. Information of individual reporter will be treated in strict confidence. Please read the Statement of Purposes overleaf in respect of the collection of your personal data.
7. As limited space is provided, please use another page for additional information if necessary.
8. For further enquiries, please contact the Pharmacovigilance Unit of Drug Office of the DH at 2319 2920.

### Section (A): Patient Information

<table>
<thead>
<tr>
<th>Patient initials or ref. no.:</th>
<th>(Please read instruction 5 above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: F ☐ M ☐ Unknown ☐</td>
<td>For woman, is she pregnant? ☐ No ☐ Yes ☐ Unknown ☐</td>
</tr>
<tr>
<td>Weight (if known): kg</td>
<td>Date of birth: (dd/mm/yyyy) / /</td>
</tr>
<tr>
<td>Ethnic group: Chinese ☐ Asian (Not Chinese) ☐ African ☐ Caucasian ☐ European ☐ Unknown ☐ Others ☐</td>
<td></td>
</tr>
</tbody>
</table>

### Section (B): About the Adverse Drug Reaction

| Date of onset of ADR: (dd/mm/yyyy) / / |
| Description of event: | |

ADR category (for vaccine related ADR only):
- ☐ Allergic reaction
- ☐ Local reaction
- ☐ Systemic reaction
- ☐ Neurological disorders
- ☐ Life threatening
- ☐ Prolonged hospitalization
- ☐ Hospitalized on: (dd/mm/yyyy) / / |
- ☐ Hospitalization NOT required

Laboratory result (if applicable):

<p>| All Drug Therapies/Vaccines Prior to ADR |
| (Please use trade names and, for vaccine, indicate batch number. Please circle the suspected drug.) |
| Daily Dosage (dose number for vaccines e.g. 1st DT) |</p>
<table>
<thead>
<tr>
<th>Route</th>
<th>Date Begun</th>
<th>Date Stopped</th>
<th>Reason for Use</th>
</tr>
</thead>
</table>

### Section (C): Treatment & Outcome

Treatment for ADR: ☐ No ☐ Yes. Details (including dosage, frequency, route, duration) __________________________ |
Laboratory result (if applicable):

Outcome: ☐ Recovered on: (dd/mm/yyyy) / / ☐ Not yet recovered ☐ Unknown ☐ Died on: (dd/mm/yyyy) / / |
Sequelae: ☐ No ☐ Yes: Persistent disability ☐ Birth defect ☐ Medical significant events Details: __________________________ |
Allergies or other relevant history (including medical history, liver/kidney problems, smoking, alcohol use etc) __________________________ |

### Section (D): Reporter Details (Please read instruction 6 above)

<table>
<thead>
<tr>
<th>Name of Reporter and Organization:</th>
<th>Sector of service: ☐ Private ☐ Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation: ☐ Doctor ☐ Chinese medicine practitioner ☐ Dentist ☐ Pharmacist ☐ Nurse ☐ Others</td>
<td></td>
</tr>
<tr>
<td>Correspondence Address:</td>
<td></td>
</tr>
<tr>
<td>Tel. no.:</td>
<td>Fax. no.:</td>
</tr>
<tr>
<td>Also report to: ☐ Manufacturer ☐ Distributor/Importer ☐ Others</td>
<td>Date of this report: __________________________</td>
</tr>
</tbody>
</table>

DH 2580 (1/2015)
References


5.2. Allergic reactions to vaccine constituents
Person may be allergic to the vaccine antigen or to a vaccine component such as animal protein, antibiotic, preservative or stabiliser. The recipient may present with skin rash as a minor form of allergic reaction. Anaphylaxis is a more severe form of allergic reaction. Typical symptoms and signs of anaphylactic reactions are generalized urticaria (hives), swelling of the mouth and throat, difficulty in breathing, wheezing, hypotension, or shock.

5.2.1. Allergic reactions to vaccine components
1. MMR vaccine
   ● According to the Pink Book from CDC, because measles and mumps vaccine viruses are both grown in chick embryo fibroblasts, not actually in eggs, children who have a history of severe allergy to eggs rarely have reactions to MMR vaccine.1
   ● Many MMR reactions are attributable to gelatine allergy.2

2. Yellow fever vaccine
   ● Grown on egg embryos and do contain residual egg protein.2
   ● Person with history of anaphylactic reactions to eggs should be referred for further evaluation.1
3. Influenza vaccine

- Most inactivated influenza vaccines and live attenuated influenza vaccine are grown on egg embryos and do contain residual egg protein.

- Person with history of anaphylactic reactions to egg but considering an influenza vaccination should be evaluated by an allergist/immunologist for evaluation of egg allergy and for administration of inactivated influenza vaccine if clinically indicated.

- Person with history of anaphylactic reactions to eggs should not receive live attenuated influenza vaccines.

4. Varicella, MMR, MMRV and zoster vaccines

- These vaccines contain gelatine and persons with history of anaphylactic reaction to gelatine should avoid or exercise extreme caution when receiving these vaccines.

5. Hepatitis B vaccine

- Allergy to yeast or allergy to latex has been suggested as a possible cause of vaccine reactions.

As the above list is not exhaustive, primary care providers should consult package inserts of individual vaccines for the list of vaccine constituents before vaccination.

5.2.2. Antibiotic-induced allergic reaction

1. IPV, MMR, varicella and zoster vaccines contain neomycin.

2. In addition to neomycin, IPV also contains streptomycin and polymyxin B.

- Person with history of anaphylactic reactions to the above antibiotics should not receive these vaccines.

- More often, neomycin allergy present as contact dermatitis (delayed-type cell-mediated immune response) rather than anaphylaxis, which is not a contraindication for administration of vaccines containing neomycin.

Table 22. Immunisation for known pre-existing anaphylactic reactions or conditions.

<table>
<thead>
<tr>
<th>Pre-existing anaphylactic reaction or condition</th>
<th>Vaccine(s)</th>
<th>Vaccinate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>To any vaccine component or previous dose of vaccine</td>
<td>All</td>
<td>No</td>
</tr>
<tr>
<td>To 2-phenoxyethanol</td>
<td>Hepatitis A vaccine (Havrix only)</td>
<td>No</td>
</tr>
<tr>
<td>All others</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>To alum</td>
<td>Hepatitis A vaccine</td>
<td>No</td>
</tr>
<tr>
<td>All others</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>To yeast</td>
<td>Hepatitis B vaccine</td>
<td>No</td>
</tr>
<tr>
<td>Human papillomavirus vaccine</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>All others</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>To duck meat or duck feathers</td>
<td>All</td>
<td>Yes</td>
</tr>
<tr>
<td>To eggs</td>
<td>Influenza vaccine</td>
<td>(See 5.2.1 and chapter 6.7)</td>
</tr>
<tr>
<td>Yellow fever vaccine</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>All others</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Pre-existing anaphylactic reaction or condition</td>
<td>Vaccine(s)</td>
<td>Vaccinate?</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>To gelatine</td>
<td>Measles, mumps and rubella vaccine</td>
<td>See Note 1</td>
</tr>
<tr>
<td></td>
<td>Varicella vaccine</td>
<td>See Note 1</td>
</tr>
<tr>
<td></td>
<td>Zoster vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
<tr>
<td>To latex</td>
<td>All</td>
<td>See Note 2</td>
</tr>
<tr>
<td>To neomycin</td>
<td>Inactivated poliovirus vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Measles, mumps and rubella vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Varicella vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Zoster vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
<tr>
<td>To penicillin</td>
<td>All</td>
<td>Yes</td>
</tr>
<tr>
<td>To polymyxin B</td>
<td>Inactivated poliovirus vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
<tr>
<td>To proteins of rodent or neural origin</td>
<td>Japanese encephalitis vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
<tr>
<td>To streptomycin</td>
<td>Inactivated poliovirus vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
<tr>
<td>Non-specific or non-anaphylactic</td>
<td>All</td>
<td>Yes</td>
</tr>
<tr>
<td>In relatives</td>
<td>All</td>
<td>Yes</td>
</tr>
<tr>
<td>To thimerosal</td>
<td>Diphtheria, tetanus and acellular pertussis vaccine/Diphtheria and tetanus vaccine</td>
<td>See Note 3</td>
</tr>
<tr>
<td></td>
<td>Inactivated influenza vaccine</td>
<td>See Note 3</td>
</tr>
<tr>
<td></td>
<td>Hepatitis B vaccine</td>
<td>See Note 3</td>
</tr>
<tr>
<td></td>
<td>Japanese encephalitis vaccine</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Meningococcal polysaccharide vaccine</td>
<td>See Note 3</td>
</tr>
<tr>
<td></td>
<td>All others</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Remarks:

Note 1: If vaccinating persons with a history of an anaphylactic reaction to gelatine or gelatine-containing products with MMR or its component vaccines, or with varicella vaccine, extreme caution should be exercised. Before administering these vaccines to such persons, skin testing for sensitivity to gelatine can be considered. However, no specific protocols for this purpose have been published.


Note 3: Some formulations still contain thimerosal as a preservative. Alternatively some may contain trace amounts of thimerosal that are a remnant of the manufacturing process. Check the appropriate manufacturer’s package insert for more information.
5.3. Management

Vaccinees should remain under observation for a short interval to ensure that they do not experience an immediate adverse event. It is recommended that the recipients remain in the vicinity of the place of vaccination for at least 15 minutes. Severe anaphylactic reactions usually have a rapid onset and most life-threatening adverse events manifest within 10 minutes of vaccination.¹

5.3.1. Management of local and systemic adverse reactions

- Treatment of local adverse reaction such as pain and swelling at the injection site can be alleviated by applying a cold compress to the injection site.²
- Paracetamol can be prescribed for pain or fever if necessary.¹
- The most common immediate adverse event in adults and older children is a vasovagal episode either immediate or soon after vaccination.¹ Anyone who complains of giddiness or light-headedness before or after vaccination should be advised to lie down until free of symptoms. Most faints following vaccination occur within 5 minutes, and 98% occur within 30 minutes.¹
- Specialist medical care is needed for management of the rare but more severe AEFI such as Guillain-Barré syndrome, encephalitis and idiopathic thrombocytopenic purpura.

5.3.2. Management of anaphylaxis (See Figure 2)

- All primary care providers providing vaccinations should be familiar with the practice

References


emergency plan and resuscitation procedures. Emergency equipments and medications should be checked regularly and readily available for immediate use.

- Early recognition of anaphylaxis is important. Primary care providers should distinguish anaphylaxis from other conditions such as vasovagal episode. (see Table 23)
- Seek help and call ambulance immediately if anaphylaxis is suspected.
- Assess airway, breathing, circulation and level of consciousness of patient. Perform cardiopulmonary resuscitation (CPR) if necessary.
- Administer adrenaline intramuscularly in case of anaphylaxis. (See Table 24).
- If oxygen is available, administer by facemask at a high flow rate.
- Record all vital signs, medications administered to the patient, including the time, dosage, response, and the name of the medical personnel who administered the medication, and other relevant clinical information.
- Because of the possibility of delayed reactions, individuals who have had an anaphylactic reaction should be sent to hospital, even though they may appear to have made a full recovery.³
- Report the adverse event (See chapter 5.1.3).

Table 23. Clinical features which may assist differentiation between a vasovagal episode and anaphylaxis.¹,³

<table>
<thead>
<tr>
<th></th>
<th><strong>Vasovagal episode</strong></th>
<th><strong>Anaphylaxis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onset</strong></td>
<td>Immediate, usually within minutes of or during vaccine administration</td>
<td>Usually within 15 minutes, but can occur within hours, of vaccine administration</td>
</tr>
<tr>
<td><strong>Symptoms / Signs</strong></td>
<td><strong>Skin</strong></td>
<td><strong>Respiratory</strong></td>
</tr>
<tr>
<td>Skin</td>
<td>Generalised pallor, cool, clammy skin</td>
<td>Normal respiration; may be shallow, but not laboured</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

¹,³Table 23. Clinical features which may assist differentiation between a vasovagal episode and anaphylaxis.¹,³
Figure 2. Anaphylactic reactions: treatment algorithm for healthcare providers (Modified from anaphylaxis algorithm of Resuscitation Council UK\(^4\))

- Call for help, never leave patient alone
- Lie patient supine in “head down and feet up” position if conscious (unless this results in breathing difficulties)
- Lie patient on left side and position to keep airway clear if unconscious
- Cardiopulmonary resuscitation if necessary

↓

Table 24. Quick reference for dosage of adrenaline (The recommended dose for adrenaline is 0.01mg/kg body weight) (Adopted from Immunization Action Coalition\(^2\))

<table>
<thead>
<tr>
<th>Age group</th>
<th>Range of weight (kg)*</th>
<th>Range of weight (lb)</th>
<th>Adrenaline dose 1mg/ml injectable (1:1000 dilution) IM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants and Children</td>
<td>4-8.5 kg</td>
<td>9-19 lb</td>
<td>0.05 ml (or mg)</td>
</tr>
<tr>
<td></td>
<td>9-14.5 kg</td>
<td>20-32 lb</td>
<td>0.1 ml (or mg)</td>
</tr>
<tr>
<td></td>
<td>15-17.5 kg</td>
<td>33-39 lb</td>
<td>0.15 ml (or mg)</td>
</tr>
<tr>
<td></td>
<td>18-25.5 kg</td>
<td>40-56 lb</td>
<td>0.2-0.25 ml (or mg)</td>
</tr>
<tr>
<td></td>
<td>26-34.5 kg</td>
<td>57-76 lb</td>
<td>0.25-0.3 ml (or mg)†</td>
</tr>
<tr>
<td>Teens</td>
<td>35-45 kg</td>
<td>77-99 lb</td>
<td>0.35-0.4 ml (or mg)‡</td>
</tr>
<tr>
<td></td>
<td>≥ 13 years</td>
<td>100+ lb</td>
<td>0.5 ml (or mg)‡</td>
</tr>
</tbody>
</table>

Note: If body weight is known, then dosing by weight is preferred. If weight is not known or not readily available, dosing by age is appropriate.

* Rounded weight at the 50th percentile for each age range
† Maximum dose for children
‡ Maximum dose for teens

References

6. Vaccine information for primary care providers

6.1. Bacillus Calmette-Guérin (BCG)

6.1.1. Epidemiology

Bacillus Calmette-Guérin (BCG) vaccination was first introduced in 1952 in Hong Kong. It is one of the core components of tuberculosis (TB) control strategies and has contributed to the significant decline in the local TB notification and death rates among young children during the past several decades. Hong Kong is being classified as a place of intermediate TB burden with good health infrastructure in the Western Pacific Region. Although TB is now relatively less common among young children, once infected, they are at higher risk of progression from infection to disease; or the child harbouring the latent infection will have a life-time risk of TB reactivation when their body immunity is weakened some time later in life.

6.1.2. Vaccine characteristics

- **Type**: Live attenuated vaccine
- **Storage**: The unreconstituted vaccine (freeze-dried powder) and its diluents should be refrigerated at +2 to +8°C. The vaccine should be protected from light and should not be frozen. After reconstitution, the vaccine is usable for up to four hours at room temperature and the unused reconstituted vaccine should be discarded after four hours.
- **Route and site of administration**: The currently recommended practice in Hong Kong is by intradermal injection to the arm (usually the left arm to facilitate future identification of BCG scar) at the insertion of the deltoid. The intradermal method is described as follows:
  1. Stretch the skin taut, hold the syringe parallel to (almost resting on) the skin surface, insert the needle, bevel up, under the first one or two layers of skin. (Tip of the needle would be visible just below the surface of the skin.)
  2. Slowly inject the content of the syringe. A slight resistance would be felt.
  3. A firm, white round wheal, about 6 mm diameter, should appear at the injection site immediately.

6.1.3. Immunogenicity and efficacy

- The protection offered by BCG vaccination is only partial and not 100%.
- BCG is shown to be highly effective in preventing TB in young children, especially the severe forms of TB like miliary TB and TB meningitis, with efficacy of 75% to 86%. Efficacy in reducing overall risk of TB is about 50%.
- BCG protection against adult pulmonary tuberculosis is less certain and study results are more controversial.
- A second or booster dose is generally not recommended.
6.1.4. **Schedule**
The following recommendations by Advisory Committee on Immunisation of the Department of Health in Hong Kong in 2000 are still in effect:\(^3\)
1. BCG vaccination for all newborn babies in Hong Kong.
2. For children under age 15 and residing in Hong Kong, and who have never had BCG vaccination before, direct BCG vaccination is recommended and prior tuberculin testing is not required.
3. There is no evidence for the efficacy of BCG revaccination. Hence, for persons who have received BCG vaccination previously, repeat vaccination is not recommended.

Table 25. Dose of BCG vaccine.\(^2\)

<table>
<thead>
<tr>
<th>Age</th>
<th>BCG dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 12 months</td>
<td>0.05ml</td>
</tr>
<tr>
<td>12 months or older</td>
<td>0.1ml</td>
</tr>
</tbody>
</table>

**Remarks:**
- The chest clinics of TB and Chest Service of the Department of Health ([http://www.info.gov.hk/tb_chest](http://www.info.gov.hk/tb_chest)) provide BCG vaccination to children aged below 15 years residing in Hong Kong who have never received BCG before.
- BCG vaccination is not required if the child has a history of proven TB or is above 15 years of age.\(^4\)
- Primary care providers may be requested to report the result of Mantoux test (tuberculin skin test) for children studying in some countries according to the policy of the individual school/country. Mantoux test may be performed at any chest clinics of the Department of Health after assessment and considered appropriate by the attending doctor.\(^5\) (Please see Annex 3 for interpretation of tuberculin skin test.)

6.1.5. **Contraindication and precaution**\(^4,6\)
- Conditions with impaired immunity
  - Any form of malignancy, in particular, leukaemia and lymphoma
  - Under immnosuppressive therapy such as irradiation and treatment with cytotoxic drugs or systemic steroids; immunodeficiency, either congenital or acquired (e.g. HIV infection)
  - For neonates who have likely been exposed to HIV infection (e.g., mother with HIV infection), vaccination should be withheld until HIV infection is ruled out.
- Having received live attenuated vaccine within the past four weeks (e.g. measles, mumps, rubella)
- Acute febrile conditions
- Severe skin diseases such as burns
- Pregnancy
6.1.6. **Adverse events following immunisation (AEFI)**

1. **Indurated papule**\(^1,7\)
   - Frequency: common\(^7\)
   - Occur within 2-4 weeks at injection site.
   - The papule may progress to become ulcerated.
   - A pustule develops in 6-8 weeks
   - Heal after 2-5 months leaving a superficial scar.
   - Care of injection site:\(^1\)
     - Keep clean and dry.
     - Clean with distilled water and dry up with gauze if necessary.
     - Bath should be taken as usual.
     - No medication or ointment should be applied.
     - Do not cover with adhesive plaster or dressing.
     - Avoid tight clothing.

2. **Deep ulceration or subcutaneous abscess at injection site**\(^6,8\)
   - Frequency: uncommon\(^6,8\)

3. **Ulceration greater than 1cm, caseous lesions, abscesses or drainage at the injection site** should be referred to a chest physician or paediatrician for investigation and management.\(^2\)

4. **Lymphadenitis**\(^1,8,9\)
   - Frequency: uncommon\(^1\); rare for suppurative lymphadenitis\(^10\)
   - Occur in the first 2 to 6 months after vaccination.
   - Swelling of the ipsilateral regional lymph nodes (usually axillary, and occasionally cervical and/or supra-clavicular) may occur.\(^7\)
   - Uncomplicated cases generally resolve spontaneously.
   - Regional suppurative lymphadenitis with draining sinuses following BCG vaccination should be referred to a chest physician or paediatrician for investigation and management.\(^2,9\)

5. **Osteitis**\(^6,10\)
   - Frequency: rare\(^6,10\)
   - Can occur as long as several years after BCG immunization.\(^6\)
   - Refer for further management.\(^6\)

6. **Disseminated disease**\(^1,6,8\)
   - Frequency: rare\(^1,6,8\)
   - Can be fatal.\(^1,6\)
   - Primarily in immunocompromised patients.\(^1,6\)
   - Refer for further management.\(^6\)

6.1.7. **Resource**

- Please refer to Annex 2 Table 59 for resource information related to BCG vaccination and chest clinics.
- Please refer to Annex 3 for interpretation of tuberculin skin test.
Reference


6.2. Hepatitis B vaccine

6.2.1. Epidemiology
Hepatitis B is endemic in Southeast Asia. In Hong Kong, the overall prevalence of chronic hepatitis B infection is moderate.\(^1\) People with chronic hepatitis B are at increased risk of developing cirrhosis and hepatocellular carcinoma (HCC),\(^2\) and 15% to 40% of them will develop serious sequelae during their lifetime.\(^3\) The risk of chronic infection varies with the age of infection; it occurs in 90-95% of infants by perinatal transmission, 30% of children aged 1 to 5 years, and 5-10% in older children, adolescents and adults.\(^4\)

HBV vaccination was first introduced in Hong Kong in 1983 that initially targeted at high-risk groups. A universal neonatal hepatitis B vaccination was initiated in 1988. Furthermore, a supplementary hepatitis B vaccination program had been introduced for primary 6 students in 1998. The introduction of these vaccination programmes had brought to a decline in the rate of chronic hepatitis B in Hong Kong.\(^5\)

6.2.2. Vaccine characteristics
- **Type:** Recombinant vaccine
- **Storage:** Refrigerated at +2 to +8° C. Do not freeze
- **Route:** Intramuscular injection. Anterolateral thigh for infants and neonates and deltoid muscle for older children. The product insert for individual vaccine should be consulted.
- Registered hepatitis B vaccines in Hong Kong are listed in Table 26. The information on name of product and ingredients are extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 26. Hepatitis B vaccines registered in Hong Kong (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>Age group for 3 dose regimen according to manufacturer*</th>
<th>Dose of recombinant HBsAg</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGERIX-B ADULT INJ 20MCG/ML</td>
<td>Hepatitis B antigen</td>
<td>≥16 years</td>
<td>20mcg</td>
<td>1ml</td>
</tr>
<tr>
<td>ENGERIX-B JUNIOR VACCINE INJ 10MCG/0.5ML</td>
<td>Hepatitis B antigen</td>
<td>0-15 years</td>
<td>10mcg</td>
<td>0.5ml</td>
</tr>
<tr>
<td>ENGERIX-B PAEDIATRIC INJ 10MCG/0.5ML</td>
<td>Hepatitis B antigen</td>
<td>0-15 years</td>
<td>10mcg</td>
<td>0.5ml</td>
</tr>
<tr>
<td>HBVAXPRO (HEP. B VACCINE) INJ 10MCG/1ML</td>
<td>Hepatitis B antigen</td>
<td>&gt;20 years</td>
<td>10mcg</td>
<td>1ml</td>
</tr>
</tbody>
</table>
### Single antigen vaccine

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>Age group for 3 dose regimen according to manufacturer*</th>
<th>Dose of recombinant HBsAg</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBVAXPRO (HEP. B VACCINE) INJ 5MCG/0.5ML</td>
<td>Hepatitis B antigen</td>
<td>0-19 years</td>
<td>5mcg</td>
<td>0.5ml</td>
</tr>
<tr>
<td>SCI-B-VAC HEP B VACCINE (RDNA) 10MCG/ML</td>
<td>Hepatitis B antigen</td>
<td>&gt;10 years</td>
<td>10mcg</td>
<td>1ml</td>
</tr>
<tr>
<td>SCI-B-VAC HEP B VACCINE 2.5MCG/0.5ML</td>
<td>Hepatitis B antigen</td>
<td>0-10 years</td>
<td>2.5mcg</td>
<td>0.5ml</td>
</tr>
<tr>
<td>SCI-B-VAC HEP B VACCINE(RDNA) 5MCG/0.5ML</td>
<td>Hepatitis B antigen</td>
<td>0-10 years in highly endemic areas</td>
<td>5mcg</td>
<td>0.5ml</td>
</tr>
</tbody>
</table>

### Combination hepatitis A/B vaccines (refer to Chapter 6.9)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>Age group for 3 dose regimen</th>
<th>Dose of recombinant HBsAg</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWINRIX ADULT VACCINE</td>
<td>Hepatitis A antigen Hepatitis B antigen Neomycin</td>
<td>≥16 years</td>
<td>20mcg</td>
<td>1ml</td>
</tr>
<tr>
<td>TWINRIX JUNIOR VACCINE INJ</td>
<td>Hepatitis A antigen Hepatitis B antigen Neomycin</td>
<td>1-15 years</td>
<td>10mcg</td>
<td>0.5ml</td>
</tr>
</tbody>
</table>

### Other combination vaccines (refer to chapter 6.6 and annex 4)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFANRIX HEXA VACCINE</td>
<td>Acellular pertussis toxoid Diphtheria toxoid Hepatitis B antigen Poliomyelitis virus Tetanus toxoid Neomycin Polymyxin B</td>
<td>0.5ml</td>
</tr>
<tr>
<td>HEXAXIM VACCINE</td>
<td>Acellular pertussis toxoid Diphtheria toxoid <em>H. Influenzae b</em> Hepatitis B antigen Poliomyelitis virus Tetanus toxoid</td>
<td>0.5ml</td>
</tr>
</tbody>
</table>

*According to recommendation from Scientific Working Group on Viral Hepatitis Prevention, Department of Health in 2004, half adult doses are recommended up to the age of 16 years.
6.2.3. Vaccine efficacy

- A three-dose regimen of 0, 1, 6 months is among the most widely tested regimen, reporting consistent results of achieving above 95% seroconversion rates.
- Any deviation from this regimen may not result in the necessary protection.
- Local studies since the early 80s have demonstrated good response rate and technical feasibility both in health care workers and neonatal vaccination.
- Routine boosting is not required for those who have satisfactorily completed a standard three-dose regimen.

6.2.4. Schedule

- In Hong Kong, a 3-dose schedule given at 0, 1, 6 months is recommended.
- Half the adult doses are recommended up to the age of 16 by the Department of Health. There are variations in the recommendations of some manufacturers. (see Table 26)
- Licensed vaccines contain different concentrations of antigen per millilitre. Primary care providers should adhere to the appropriate manufacturer’s dosage.
- Different hepatitis B vaccine products can be used to complete a primary immunisation course (i.e. interchangeable).

Table 27. Recommended schedule for hepatitis B vaccine.

<table>
<thead>
<tr>
<th>Dose</th>
<th>Recommended age</th>
<th>Recommended interval from previous dose (for catch-up)</th>
<th>Minimum interval from previous dose (for catch-up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st dose</td>
<td>Within 24 hours after birth</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2nd dose</td>
<td>1 month</td>
<td>1 month</td>
<td>4 weeks</td>
</tr>
<tr>
<td>3rd dose</td>
<td>6 months</td>
<td>5 months</td>
<td>8 weeks*</td>
</tr>
</tbody>
</table>

*At least 16 weeks after the first dose.

**Special considerations**

A. Newborns
- First dose of hepatitis B vaccine at birth.
- For babies born to HBsAg positive mother
  - Hepatitis B vaccine + Hepatitis B immunoglobulin (HBIG) at birth.

B. Pre-term infants <2 kg
- For HBsAg positive mother or women with unknown HBsAg status
  - Hepatitis B vaccine + HBIG at birth. (However, this dose of vaccine should not be counted in the 3-dose course of vaccination. The first valid dose of vaccine is given when the baby reaches 2 kg of weight)
- For HBsAg negative mother
  - Hepatitis B vaccine shall be initiated when body weight achieves 2 kg. To ensure coverage, the preterm infants shall be given the first dose prior hospital discharge.
C. Children not yet immunised with hepatitis B vaccine
   • Data on immunogenicity suggest that in any age group, interruption of the vaccination
     schedule does not require restarting the vaccine series. If the 3-dose series is interrupted
     after the first dose, the second and the third doses should be administered accordingly; if
     only the third dose is delayed, it should be administered as soon as possible.

6.2.5. Serologic testing and vaccine non-response
   A. Pre-vaccination serological testing
      ■ Generally not required for newborns or children.
      ■ All expectant mothers shall have their hepatitis B status determined. Those who are
        HBsAg positive shall be counseled for prevention of hepatitis B transmission and
        need for medical assessment and care of their chronic hepatitis B status.

   B. Post-vaccination serological testing
      ■ Not routinely recommended at public health level
      ■ Recommended for specific population groups such as health care workers and people
        with compromised immune status. Some authorities recommend post-vaccination
        serological testing in pre-term infants.
      ■ If indicated, measurement should be made at 1-4 months after the third dose.
      ■ Those who do not develop anti-HBs or adequate response to vaccination are
        considered non-responders and hypo-responders. They shall be given a second course
        of the 3-dose standard regimen.

6.2.6. Contraindication and precaution
   • Contraindication: Severe allergic reaction to yeast, any vaccine component or a prior dose
     of hepatitis B vaccine.
   • Precaution: Moderate to severe acute illness.

6.2.7. Adverse events following immunisation (AEFI)
   1. Pain at injection site has been reported in 3-9% of children.
   2. Mild systemic complaints (fatigue, headache, irritability) have been reported in 0-20%
      of children.
   3. Fever up to 37.7°C has been reported in 0.4-6.4% of children.
   4. Serious systemic reactions and allergic reactions have rarely been reported.

6.2.8. Resource of hepatitis B
   (Please refer to Annex 2 Table 60 for resource of hepatitis B.)

References
1 Viral Hepatitis Preventive Service. What is Hepatitis? Hepatitis B. [Internet] HKSAR:
2 Beasley RP. Hepatitis B virus. The major etiology of hepatocellular carcinoma. Cancer
6.3. Diphtheria, tetanus, acellular pertussis and inactivated poliovirus vaccine (DTaP-IPV)

6.3.1. Epidemiology

Diphtheria, tetanus, pertussis and poliomyelitis were all serious diseases and they had resulted in deaths, debilitations and disabilities in children in the past worldwide. With effective immunisation with diphtheria, tetanus and whole cell pertussis vaccine (DTwP) since 1956 and oral poliovirus vaccine (OPV) since 1963 in Hong Kong, the incidence of these diseases declined significantly. As shown in the local health statistics, the last case of diphtheria was reported in 1982; the last reported case of poliomyelitis due to wild virus was in 1983 and Hong Kong was declared polio-free in 2000 by the World Health Organization. The number of tetanus cases notified was less than 5 per year in recent 10 years (2006-2015). From 2010 to 2015, there have been more than 100 cases of pertussis notified, and most of them had neither received any pertussis vaccine nor completed the primary series of pertussis immunisation.

With the emergence of new technology and new evidences, the Scientific Committee on Vaccine Preventable Diseases (SCVPD) of the Department of Health advised the use of diphtheria, tetanus, acellular pertussis and inactivated poliovirus 4-in-1 vaccine (DTaP-IPV) since February 2007. From September 2008, a reduced dose formulation of the 4-in-1 vaccine (dTap-IPV) was also adopted for Primary Six students to replace the originally used reduced dose diphtheria and tetanus vaccine (dT) and OPV. These new vaccines are associated with less local and systemic adverse reactions. Moreover, IPV is not associated with vaccine-associated paralytic poliomyelitis (VAPP).
6.3.2. Vaccine characteristics

- **Type**: Diphtheria and tetanus toxoids (weakened toxins), purified proteins of *Bordetella pertussis* (acellular), and inactivated polioviruses type 1, 2 and 3.
- **DTaP-IPV** vaccine should be used for children under 10 years of age. For children aged 10 or older, dTap-IPV with a smaller dose of diphtheria toxoid and pertussis should be used.
- **Storage**: Refrigerated at +2 to +8°C. Do not freeze.
- **Route**: Intramuscular injection. (If IPV alone, it can be administered via intramuscular or subcutaneous route.) The product insert for individual vaccine should be consulted.
- Registered diphtheria, tetanus, acellular pertussis and inactivated poliovirus vaccines in Hong Kong are listed in Table 28. The information is extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 28. Diphtheria, tetanus, acellular pertussis and inactivated poliovirus vaccines registered in Hong Kong. (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFANRIX-IPV VACCINE PREFILLED SYRINGE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, neomycin, polymyxin B</td>
</tr>
<tr>
<td>QUADRACEL VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, neomycin, polymyxin B</td>
</tr>
<tr>
<td>TETRAXIM VACCINE INJ</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, neomycin, polymyxin B, streptomycin</td>
</tr>
</tbody>
</table>

**Diphtheria, tetanus, acellular pertussis (reduced dose) and inactivated poliovirus vaccines (dTap-IPV)**

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADACEL POLIO VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, neomycin, polymyxin B, streptomycin</td>
</tr>
<tr>
<td>BOOSTRIX POLIO VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, neomycin, polymyxin B</td>
</tr>
</tbody>
</table>

**Other combination vaccines (also see Chapter 6.6)**

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFANRIX HEXA VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b, Neomycin, polymyxin B</td>
</tr>
<tr>
<td>INFANRIX-IPV+HIB VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b</td>
</tr>
<tr>
<td>INFANRIX IPV-HIB VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b</td>
</tr>
<tr>
<td>HEXAXIM VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b, hepatitis B antigen</td>
</tr>
<tr>
<td>PEDIACEL VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b, Neomycin, polymyxin B, streptomycin</td>
</tr>
<tr>
<td>PENTAXIM VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poliomyelitis virus, <em>H. influenzae</em> b, Neomycin, polymyxin B, streptomycin</td>
</tr>
</tbody>
</table>
6.3.3. **Immunogenicity and efficacy**

- Efficacy of DTaP-IPV vaccine after completing the primary series:
  - 97% for diphtheria toxoid,\(^7\)
  - Virtually 100% for tetanus toxoid,\(^8\)
  - 80-85% for pertussis,\(^9\)
  - 99% for IPV\(^10\)

6.3.4. **Schedule**

Table 29. Primary schedule for infants according to Hong Kong Childhood Immunisation Programme\(^#\)

<table>
<thead>
<tr>
<th>Dose</th>
<th>Recommended age*</th>
<th>Minimum interval from previous dose</th>
<th>Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^{st}) dose</td>
<td>2 months</td>
<td>---</td>
<td>DTaP-IPV</td>
</tr>
<tr>
<td>2(^{nd}) dose</td>
<td>4 months</td>
<td>4 weeks</td>
<td>DTaP-IPV</td>
</tr>
<tr>
<td>3(^{rd}) dose</td>
<td>6 months</td>
<td>4 weeks(^#)</td>
<td>DTaP-IPV</td>
</tr>
</tbody>
</table>

* The minimum age for the first dose is 6 weeks.

\(^#\) Please refer to Chapters 4.4.3 and 4.4.4 for catch-up immunisation of DTaP-IPV and dTap-IPV.

Table 30. Timing of booster doses according to Hong Kong Childhood Immunisation Programme\(^#\)

<table>
<thead>
<tr>
<th>Time</th>
<th>Booster vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged 18 months</td>
<td>DTaP-IPV</td>
</tr>
<tr>
<td>Primary 1</td>
<td>DTaP-IPV</td>
</tr>
<tr>
<td>Primary 6</td>
<td>dTap-IPV</td>
</tr>
</tbody>
</table>

\(^#\) Please refer to Chapters 4.4.3 and 4.4.4 for catch-up immunisation of DTaP-IPV and dTap-IPV.

**Remarks:**

- Whenever possible, the same DTaP product should be used for all doses in the primary series. If the same product is not available, DTaP vaccines can be used interchangeably.\(^6\)
- For children who have started the vaccination series with one, two, three or four doses of DTwP, combined vaccines with acellular pertussis component are recommended for all remaining doses in the schedule.\(^6\)
- IPV can be given following any doses of OPV.\(^6\)
- A child below the age of 10 years is considered having completed a valid primary series if he/she has received three doses of DTaP-IPV or equivalent with at least 4 weeks in between every two doses, and the first dose is given at or after 6 weeks of age. For children aged 10 years old or above, the same applies except that at least 6 months is required between the 2nd and 3rd doses of the primary series. (information from the Department of Health)
6.3.5. **Contraindications and precautions**

**Contraindications**

1. Immediate anaphylactic reaction to any of the vaccine components (e.g. neomycin, streptomycin, polymyxin B) or following previous dose of DTwP, DTaP or DTaP-IPV.\(^\text{11}\)
2. Encephalopathy not due to another identifiable cause within 7 days following previous dose of DTaP-IPV or a pertussis-containing vaccine.\(^\text{11}\) This is a contraindication for the pertussis component. Therefore, diphtheria & tetanus vaccine (DT) or diphtheria & tetanus vaccine (reduced dose) (dT), together with IPV, should be used instead for subsequent doses.

**Precautions**

1. Moderate or severe illness at the time the shot is scheduled.\(^\text{11}\)
2. Children with underlying unstable, evolving, neurological disorder should be vaccinated after treatment initiated and condition stabilised. Children with stable/resolved neurologic condition (including seizures) unrelated to vaccination may be vaccinated as usual.\(^\text{1}\)
3. Any of these conditions within the specific time after previous dose of DTaP-IPV or a pertussis-containing vaccine: \(^\text{11}\)
   - Temperature of ≥40.5°C (≥105°F) within 48 hours, not attributable to another identifiable cause.
   - Collapse or shock-like state (hypotonic hyporesponsive episode) within 48 hours.
   - Persistent crying lasting ≥3 hours, occurring within 48 hours.
   - Convulsions with or without fever, occurring within 3 days.
4. Known or suspected neurologic condition (e.g. progressive encephalopathy, uncontrolled epilepsy) or history of Guillain-Barré syndrome within 6 weeks following a tetanus toxoid-containing vaccine.\(^\text{11}\)
5. Additional precautions to the use of dTap-IPV include history of a severe local reaction (Arthus reaction) following a prior dose of a tetanus and/or diphtheria toxoid-containing vaccine.\(^\text{11}\) Defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine.\(^\text{7}\)

6.3.6. **Adverse events following immunisation (AEFI)**

1. Local reactions (pain, redness or swelling)
   - Frequency: 20-40% after first 3 doses; more frequent after 4th and 5th doses.\(^\text{9}\)
   - Self-limiting, can be managed with symptomatic treatment.\(^\text{9}\)
   - On rare occasions, local reactions may be very exaggerated or severe. Some of these reactions, referred to as Arthus reactions, are commonly seen with diphtheria and tetanus toxoids. Arthus reactions are believed to be due to very high titers of antibody, usually caused by too many doses of toxoid.\(^\text{12}\)
2. Fever (38.3°C or higher)\(^\text{9}\)
   - Frequency: 3-5% \(^\text{9}\)
   - Self-limiting, can be managed with symptomatic treatment.
   - Low grade fever may also occur.
3. Prolonged crying for 3 or more hours\textsuperscript{13}
   - Frequency: 1\% for DTwP and significantly less with DTaP
   - Occurs within 48 hours of immunisation and is not known to be associated with sequelae.
4. Swelling of entire limb after 4th and 5th doses of DTaP
   - Frequency: 2-3\%/\textsuperscript{13}
   - Associated with pertussis containing vaccines. The pathogenesis is unknown, but the condition resolves and has no sequelae.\textsuperscript{13}
   - Extensive swelling after 4th dose is not a contraindication to 5th dose.\textsuperscript{1,13}
5. Brachial neuritis
   - Frequency: 0.001\% \textsuperscript{14}
   - Associated with tetanus toxoid. \textsuperscript{15}
   - Refer to specialist for management.
6. Hypotonic-hyporesponsive episodes (collapse or shock-like state)\textsuperscript{16}
   - Frequency: rare (1.33 cases were reported per 100,000 doses of DTaP or DTaP-HBV vaccines in Australia in 2005)\textsuperscript{16}
   - Associated with DTaP containing vaccines. Presents with pallor, limpness and unresponsiveness and lasts from a few minutes to 36 hours, occurs 1 to 48 hours after vaccination. Follow-up of children shows no long-term neurological or other sequelae and they can receive further doses of DTaP-containing vaccines\textsuperscript{16}
7. Encephalopathy
   - Frequency: rare, 0-1 out of 10 million\textsuperscript{15}
   - Refer to hospital for management

References
\textsuperscript{1} Diphtheria, tetanus, pertussis. In: The Hong Kong Paediatric Society. Guidebook on Immunization in Hong Kong. Chow CB, Chiu DCS, Chan MC eds. 1st ed. Hong Kong SAR: The Hong Kong Paediatric Foundation, 2008.
\textsuperscript{6} Scientific Committee on Vaccine Preventable Diseases. Recommendations on updated childhood immunization programme containing inactivated poliovirus and acellular pertussis vaccines. HKSAR: Department of Health, December 2006.
6.4. Measles, mumps and rubella vaccine (MMR)

6.4.1. Epidemiology

Measles, mumps and rubella are highly communicable viral infections. They occur worldwide and are associated with serious complications which can cause disabilities and mortalities. Rubella infection in pregnant women is of a particular concern since it may cause congenital anomalies in the developing foetus and even foetal death. In Hong Kong,
the introduction of a single dose measles vaccine was started since 1967. Rubella vaccination programme was introduced in 1978 to Primary Six schoolgirls, and was later expanded to cover postpartum mothers and women of child bearing age. These vaccinations evolved into the measles, mumps and rubella (MMR) vaccine since 1990, and a two-dose regime has been adopted since 1996. A supplementary immunisation was also held in the year 1997 for those who had not completed two doses of MMR before.

With effective immunisation, the annual incidence rate of measles in Hong Kong dropped from over 200 per million of population in the 1960s to around 10 per million of population in recent years.\(^1\) Statistics on communicable diseases from the Centre for Health Protection revealed the annual notification of measles had increased from eight to 12 cases during 2010 – 2012 to 38 and 50 in 2013 and 2014 respectively, and then decreased to 18 in 2015. A substantial proportion of these cases had no or uncertain history of vaccination, and a proportion were imported from the Mainland. For Mumps, an annual number of 111 to 153 cases were recorded during 2011 to 2014. Many of these patients did not complete the recommended two-dose vaccinations or were uncertain about their vaccination history. In recent years, incidence of rubella continued to decline and remained low. In 2011 to 2015, 12 to 84 rubella cases were recorded. Most of the cases had either unknown or undocumented history of rubella vaccination.

6.4.2. Vaccine characteristics

- **Type:** Live attenuated measles virus, mumps virus and rubella virus
- **Storage:** Refrigerated at +2 to +8°C. May be frozen. Diluent may be stored at refrigerator temperature or at room temperature. After reconstitution, vaccine must be stored at +2 to +8°C, protected from light and must be used within 8 hours.
- **Route:** Subcutaneous or intramuscular injection, depending on individual preparations. The product insert should be consulted.
- Registered measles, mumps and rubella (MMR) vaccines in Hong Kong are listed in Table 31. The information is extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.
Table 31. MMR vaccines registered in Hong Kong (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measles, Mumps and Rubella (MMR) vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>MMR VIRUS VACCINE LIVE</td>
<td>Measles virus, mumps virus, rubella virus, neomycin</td>
</tr>
<tr>
<td>PRIORIX POWDER FOR INJ VACCINE (LIVE)</td>
<td>Measles virus, mumps virus, rubella virus, neomycin</td>
</tr>
<tr>
<td>M-M-R II VIRUS VACCINE LIVE WITH PRE-FILLED SYRINGE OF DILUENT</td>
<td>Measles virus, mumps virus, rubella virus, neomycin</td>
</tr>
<tr>
<td><strong>Other combination vaccines (also see Chapter 6.14 for varicella vaccine)</strong></td>
<td></td>
</tr>
<tr>
<td>PRIORIX-TETRA VACCINE</td>
<td>Measles virus, mumps virus, rubella virus, varicella virus, neomycin</td>
</tr>
<tr>
<td>PROQUAD VACCINE</td>
<td>Measles virus, mumps virus, rubella virus, varicella virus, neomycin</td>
</tr>
</tbody>
</table>

6.4.3. **Immunogenicity and efficacy**

- **Measles**: Measles antibodies develop in approximately 95% of children vaccinated at 12 months of age and more than 99% of persons who receive two doses of measles vaccine (with the first dose administered no earlier than the first birthday) develop serologic evidence of measles immunity.²

- **Mumps**: Outbreak-based studies suggest that the long-term population-based effectiveness of 1 dose of mumps vaccine is approximately 60–90%.³ Protection is greater in 2-dose vaccine recipients, who have seroconversion rates of up to 100%.⁴

- **Rubella**: Over 95% of vaccines aged 12 months and older developed serologic evidence of rubella immunity after a single dose.⁵ Two doses of rubella-containing vaccine, as MMR vaccine, provide additional safeguard against primary vaccine failures.⁶

6.4.4. **Schedule**

Table 32. Recommended schedule for MMR vaccine.

<table>
<thead>
<tr>
<th>Dose</th>
<th>Recommended age</th>
<th>Minimum interval between the 1st and 2nd dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st dose</td>
<td>1 year</td>
<td>---</td>
</tr>
<tr>
<td>2nd dose</td>
<td>Primary 1</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

Remarks:

- Single measles antigen vaccine may still be used in some parts of the Mainland China.⁷
- For children who live outside Hong Kong most of the time or require frequent travel, they are recommended to follow the immunisation schedule of the places where they stay.⁸
- In Mainland, the first dose of measles vaccine is given at the age of 8 months and a second dose at 1.5 to 2 years.⁷
- Children administered MMR vaccine or other measles vaccines before their first birthday are advised to be revaccinated with another dose of MMR vaccine when the child reached 12 months old, followed by another dose at Primary One.⁸
- MMR vaccine can be administered at the same time with another live parenteral vaccine e.g. varicella vaccine at separate sites and with separate syringes. The minimum interval between two live attenuated parenteral vaccines is 4 weeks if they are not administered at the same visit. (Also see Chapter 3.2.2)
6.4.5. **Contraindications and precautions**

**Contraindications**

1. Anaphylactic reaction to vaccine dose or any of its components (e.g. gelatine, neomycin).
2. Severe immunodeficiency in recipient due to causes other than HIV.
3. Symptomatic HIV (i.e., severely immunosuppressed).
   - Female recipients of vaccine should not get pregnant within three months after vaccination because of a theoretical risk of congenital rubella syndrome in the foetus.

**Precautions**

1. Moderate or severe acute illness with or without fever.
2. Received blood transfusion or immunoglobulin within last 11 months.
3. Thrombocytopenia/thrombocytopenic purpura now or by history.
   - Persons who have a history of thrombocytopenic purpura or thrombocytopenia (low platelet count) may be at increased risk for developing clinically significant thrombocytopenia after MMR vaccination.
   - The decision to vaccinate with MMR depends on the benefits of immunity to measles, mumps, and rubella and the risks for recurrence or exacerbation of thrombocytopenia after vaccination or during natural infection with measles or rubella. The benefits of immunisation are usually greater than the potential risks, and administration of MMR vaccine is justified because of the even greater risk for thrombocytopenia after measles or rubella disease.
   - However, deferring a subsequent dose of MMR vaccine may be prudent if the previous episode of thrombocytopenia occurred within 6 weeks after the previous dose of the vaccine. Serologic evidence of immunity in such persons may be sought in lieu of MMR vaccination.
4. Received another live vaccine within last 28 days.

**Information for answering some common questions:**

- According to the Pink Book from CDC, because measles and mumps vaccine viruses are both grown in chick embryo fibroblasts, not actually in eggs, children who have a history of severe allergy to eggs rarely have reactions to MMR vaccine.²⁹ (Also refer to chapter 5.2)
- Close contact with a pregnant woman is not a contraindication to MMR vaccination of the contact.²
- Breastfeeding is not a contraindication to vaccination of either the woman or the breastfeeding child.²
- Tuberculin skin testing (TST) has no effect on the response to MMR vaccination. However, measles vaccine (and possibly mumps, rubella, and varicella vaccines) may transiently suppress the response to TST in a person infected with Mycobacterium tuberculosis.²
If TST is needed at the same time as administration of measles-containing vaccine, TST and vaccine can be administered at the same visit. Simultaneously administering TST and measles-containing vaccine does not interfere with reading the TST result at 48–72 hours and ensures that the person has received measles vaccine.\(^2\)

If the measles-containing vaccine has been administered recently, TST screening should be delayed at least 4 weeks after vaccination. A delay in administering TST will remove the concern of any theoretical suppression of TST reactivity from the vaccine. TST screening can be performed and read before administering the measles-containing vaccine. This option is the least favoured because it will delay receipt of the vaccine.\(^2\)

To date there is no convincing evidence that any vaccine including MMR vaccine causes autism or autistic spectrum disorder.\(^2\)

### 6.4.6. Adverse events following immunisation (AEFI)

1. Fever (> 39.4°C) \(^2\)
   - Frequency: 5-15%
   - Usually occurs 7-12 days after vaccination, and generally lasts 1-2 days.

2. Rash\(^2\)
   - Frequency: 5%
   - Usually mild and transient and appears 7-10 days after vaccination.

3. Arthralgia and joint symptoms
   - Frequency: <1% in children; 10-25% in adults\(^10\)
   - Associated with rubella component of the vaccine. Occur 1-3 weeks after vaccination and persist for 1 day to 3 weeks.\(^5\)

4. Thrombocytopenia
   - Frequency: <1/30,000 doses\(^2,5,10\)
   - Probably more likely to be connected to the rubella or measles component of MMR. Usually self-limiting.\(^10\)

5. Parotitis\(^2\)
   - Occurs rarely following receipt of MMR or other mumps-containing vaccine.

6. Neurological symptoms\(^10\)
   - Frequency: rare
   - Causal relationship has not been established.
References


7 中国疾病预防控制中心免疫规划中心 . 疫苗免疫程序 . [ 網上資料 ] [2012 年 9 月 27 日更新；2013 年 3 月引用 ]. 連結：http://nip.chinacdc.cn/zstd/mycx/201209/t20120927_69741.htm


6.5. Pneumococcal vaccine

6.5.1. Epidemiology

*Streptococcus pneumoniae* is a common bacterial pathogen causing pneumonia, acute otitis media, and various forms of invasive pneumococcal diseases (IPD), namely, sepsis, meningitis and bacteraemic pneumonia.

In Hong Kong, the annual incidence of IPD ranged from 1.7 to 2.9 per 100,000 from 2007 to 2015. The incidence is higher in children younger than 5 years of age and adults 65 years of age and older.¹ So far, more than 90 serotypes of the bacteria have been identified and currently no single vaccine can provide 100% protection to all serotypes.

6.5.2. Vaccine characteristics, immunogenicity

Table 33. Characteristics and immunogenicity of pneumococcal vaccines.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pneumococcal conjugate vaccine (PCV)</th>
<th>Pneumococcal polysaccharide vaccine (PPV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Inactivated</td>
<td>Inactivated</td>
</tr>
<tr>
<td></td>
<td>■ Consists of pneumococcal polysaccharides each conjugated to a carrier protein</td>
<td>■ Consists of pneumococcal polysaccharides</td>
</tr>
<tr>
<td>Capsular antigens contained</td>
<td><strong>PCV7:</strong> Serotypes 4, 6B, 9V, 14, 18C, 19F, 23F</td>
<td>Serotypes 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F and 33F.</td>
</tr>
<tr>
<td></td>
<td><strong>PCV10:</strong> Serotypes in PCV7 plus 1, 5, and 7F</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>PCV13:</strong> Serotypes in PCV10 plus 3, 6A, and 19A</td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>Intramuscular</td>
<td>Intramuscular or subcutaneous</td>
</tr>
<tr>
<td>Storage</td>
<td>+2°C to +8°C. Do not freeze</td>
<td>+2°C to +8°C. Do not freeze</td>
</tr>
</tbody>
</table>
### Vaccines registered in Hong Kong (information as at February 2015)

<table>
<thead>
<tr>
<th>PCV10:</th>
<th>PCV13:</th>
<th>PNEUMO 23 POLYVALENT PNEUMOCOCCAL VAC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYNFLORIX VACCINE</td>
<td>PREVENAR 13 VACCINE</td>
<td>PNEUMOVAX (PNEUMOCOCCAL VAC POLYVALENT)</td>
</tr>
<tr>
<td></td>
<td>PREVENAR 13 VACCINE SUSPENSION FOR INJECTION (US)</td>
<td>PNEUMOVAX 23 (PNEUMOCOCCAL VACCINE POLYVALENT PRE-FILLED SYRINGE)</td>
</tr>
</tbody>
</table>

### Immunogenicity

- For young children, researchers have demonstrated that PCV using several protein carriers are more immunogenic than 23vPPV<sup>2</sup>
- Associated with poor or absent immunogenicity in children <2 years of age<sup>3</sup>
- Failure at any age to induce an anamnestic antibody response upon revaccination<sup>3</sup>

### 6.5.3. Schedule (Adopted from SCVPD)

For children under 2 years of age, the Scientific Committee on Vaccine Preventable Diseases (SCVPD) recommends the use of 13-valent PCV in the Hong Kong Childhood Immunisation Programme (HKCIP). The standard regimen includes a primary series of 3 doses at 2, 4 and 6 months and a booster dose at 12-15 months.

The SCVPD also recommends high-risk individuals aged 2 or above to receive a single dose of PCV13, followed by a single dose of 23vPPV 1 year later. For those who have already received 23vPPV, PCV13 should be administered at least 1 year later. For those who have already received any PCV13, a single dose of 23vPPV should be administered 1 year later.

For elders 65 years of age and older, SCVPD recommends either a single dose of PCV13 or a single dose of 23vPPV.
Table 34: Recommended use of 13-valent pneumococcal conjugate vaccine (PCV13) and 23-valent pneumococcal polysaccharide vaccine (23vPPV) for personal protection in persons age 2 years or above*. (Based on SCVPD recommendation updated in July 2016)

<table>
<thead>
<tr>
<th>Risk Groups</th>
<th>Age 2 to 64 years#</th>
<th>Age 65 years and above#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without high risk conditions</td>
<td>Not recommended</td>
<td>Either a single dose of PCV13 or a single dose of 23vPPV</td>
</tr>
<tr>
<td>Individuals with high risk conditionsα who have not received any pneumococcal vaccines</td>
<td>One dose of PCV13 followed by one dose of 23vPPV 1 year after the previous PCV13 vaccination^.</td>
<td></td>
</tr>
<tr>
<td>Individuals with high risk conditionsα who have received 23vPPV</td>
<td>Single dose of PCV13 1 year after previous 23vPPV vaccination^...</td>
<td></td>
</tr>
<tr>
<td>Individuals with high risk conditionsα who have received PCV13</td>
<td>Single dose of 23vPPV at 1 year after previous PCV13 vaccination^...</td>
<td></td>
</tr>
</tbody>
</table>

*Persons age under 2 years should follow the Hong Kong Childhood Immunisation Programme to receive age-appropriate pneumococcal vaccination.

#Besides pneumococcal vaccination, individuals (except those with known contraindications) should also receive seasonal influenza vaccine. The clinical efficacy for dual vaccination in elderly in preventing hospitalization and death associated with respiratory, cardiovascular and cerebrovascular disease has been proven in local study^...

αHigh risk conditions include the following:
(a) History of invasive pneumococcal disease
(b) Immunocompromised states:
   - Asplenia, HIV/AIDS, primary immunodeficiency
   - Immunodeficiencies related to malignancy and transplantation
   - Immunodeficiencies related to use of immunosuppressive drugs / systemic steroid
(c) Chronic disease:
   - Chronic cardiac, pulmonary, liver or renal disease
   - Diabetes mellitus or CSF leakage
(d) With cochlear implants
   (Essential hypertension per se is not considered as a high risk condition)

^For individuals who have not received any pneumococcal vaccines, it is recommended to receive PCV13 before 23vPPV for better immune response. Those who previously received 23vPPV are recommended to receive PCV13 one year later to avoid hypo-responsiveness to the vaccine antigens.

6.5.4. Contraindications and precautions

Contraindications:
- Hypersensitivity or severe allergic reaction to a prior dose or any component of the vaccine.5,6
- Hypersensitivity or severe allergic reaction to diphtheria toxoid containing vaccine for PCV7, PCV10 and PCV13.
- Hypersensitivity or severe allergic reaction to tetanus toxoid and Haemophilus influenzae type b vaccine for PCV10.
Precautions: Moderate or severe acute illness.

The safety of 23vPPV and PCV13 for pregnant women has not been confirmed. Women who are at high risk of pneumococcal disease should be vaccinated before pregnancy, if possible.\(^2\)

6.5.5. Adverse events following immunisation (AEFI)

1. Local reactions\(^5\)
   - Frequency: 5-49% of PCV vaccinees
   - 30-50% of PPV vaccinees have reported local reactions, which usually persisted for less than 48 hours.

2. Fever, myalgia
   - For PCV vaccinees, 24-35% children have report fever >38°C within 7 days of any dose of the primary series\(^5\)
   - Not common in PPV vaccinees, <1%.\(^5\)

3. Severe adverse reactions are rare in both PCV and PPV vaccinees.\(^5\)

References


6.6. Combination vaccines
Combination vaccines are developed to protect against more than one infection. They may be used to describe the mixture of two separate vaccines in a single vial prior to administration or vaccines that are separately manufactured but combined into one product during the final packaging stages.¹ The efficacy and safety of most currently licensed combination vaccines are non-inferior to their equivalent vaccines administered separately. Use of combination vaccines may result in fewer shots and perhaps better compliance to the immunisation schedule. On the other hand, it can be difficult to determine which vaccine component is responsible for the allergic or adverse events if these conditions occur after administering combination vaccines.
Combination vaccines have been incorporated into routine childhood immunisation schedule in different countries. In Hong Kong, diphtheria, tetanus, acellular pertussis and inactivated poliovirus combined 4-in-1 vaccine (DTaP-IPV) was used in the Childhood Immunisation Programme (CIP) since 2007 to replace the combined 3-in-1 diphtheria, tetanus and whole cell pertussis vaccine (DTwP) and the oral poliovirus vaccine (OPV). There are other combination vaccines available in the market nowadays. Primary care providers can discuss with parents on the pros and cons of using combination vaccines that are outside CIP and help parents to make an informed choice. Primary care providers are recommended to adhere to the schedule tailor-made for the use of individual combination vaccines according to manufacturer’s recommendation or international guidelines. Vaccine combinations that require different schedules might cause confusion and uncertainty if children receive vaccinations at different primary care providers who use different combination vaccine products. Therefore, proper documentation and continuity of care are of particularly importance in the use of combination vaccines. Products that are intended for separate administration should never be combined.

The use of combination vaccine depends on the preference of parents and primary care providers, in additional to availability and affordability of the vaccines. Primary care providers should take the recommended doses and intervals of the component vaccines into consideration when incorporating combination vaccines into the childhood immunisation schedule, and in most instances, the schedule has to be individualised.

6.6.1. Schedule

The schedules of selected vaccines are listed here for reference only. Primary care provider should always refer to the product inserts and international guidelines for up-to-date information. Primary care provider should exercise their clinical judgment if he/she decides to follow certain schedule. Recommended doses and intervals of the component vaccines should be taken into consideration when incorporating combination vaccines into the childhood immunisation schedule.
Table 35. Schedule of some DTaP-IPV containing penta- and hexa-valent vaccines \textit{(the list is neither exhaustive nor exclusive)}

<table>
<thead>
<tr>
<th>Group</th>
<th>Name of Product</th>
<th>Protection against</th>
<th>Schedule according to manufacturers</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentavalent vaccine</td>
<td>Infanrix-IPV+Hib Vaccine</td>
<td>Diphtheria, Tetanus, Pertussis, Poliovirus, \textit{Haemophilus influenzae} type b</td>
<td>Primary series: 2, 4, 6 months of age (1st dose no earlier than 6 weeks)</td>
<td>At least 4 weeks between doses for primary series (Note: For Pediacel Vaccine, there should be an interval of 2 months between each primary dose)</td>
</tr>
<tr>
<td></td>
<td>Infanrix IPV-Hib Vaccine</td>
<td></td>
<td>Booster: 12-18 months of age, at least 6 months after last dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pediacel Vaccine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pentaxim Vaccine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexavalent vaccine</td>
<td>Infanrix Hexa Vaccine</td>
<td>Diphtheria, Tetanus, Pertussis, Poliovirus, \textit{Haemophilus influenzae} type b</td>
<td>Primary series: 2, 4, 6 months of age (1st dose no earlier than 6 weeks)</td>
<td>The suggested schedule of hexavalent vaccine by manufacturers differs from the recommended monovalent HBV vaccine schedule 0,1,6 months. Differing from the recommended 0, 1, 6 months schedule may not be able to offer the same level of protection. While combination vaccines offer a choice, primary care providers should discuss and explain to parents taking into account the balance between efficacy versus convenience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hepatitis B</td>
<td>Booster: 12-18 months of age</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not for use &gt;36 months of age</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hexaxim Vaccine</td>
<td></td>
<td>Primary series: 3 doses at an interval of 1 to 2 months (at least 4 weeks apart)</td>
<td>For children from 6 weeks to 24 months of age</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Booster: At least 6 months after the last dose of the primary series</td>
<td></td>
</tr>
</tbody>
</table>

\textit{(information as at June 2016)}

\textbf{References}


6.7. Seasonal influenza vaccine

Circulating seasonal influenza strains may change from time to time. The seasonal influenza vaccine composition is thus reviewed and updated every year. Primary care providers are strongly advised to check with the latest local recommendations at the website of the Centre for Health Protection (www.chp.gov.hk).

6.7.1. Epidemiology\textsuperscript{1,2}

Influenza can be caused by various types of influenza viruses. In Hong Kong, the two subtypes of influenza A virus, H1N1 and H3N2, and influenza B virus, are most commonly seen. Influenza occurs in Hong Kong throughout the year, but is usually more common in periods from January to March and from July to August. The virus mainly spreads by respiratory droplets. The disease is characterized by fever, sore throat, cough, headache, muscle aches, runny nose and general tiredness. It is usually self-limiting with recovery in two to seven days. However, it can be a serious illness to the weak and frail and elderly persons, and may be complicated by bronchitis, pneumonia or even death in the most serious cases. Serious influenza infection can occur even in healthy individuals.

Seasonal influenza refers to the viruses that circulate in the human population and cause widespread illnesses during each influenza season. Pandemic influenza occurs infrequently, when a new influenza virus emerges which is markedly different from those recently circulating in the human population. It causes disease in people and spreads easily between people because they have little or no immunity to it.

Influenza vaccination is one of the effective means in preventing influenza and its complications, as well as reduction in influenza related hospitalization and death.
6.7.2. **Vaccine characteristics** \(^1,^2\)

Commonly available seasonal influenza vaccines can be broadly classified into inactivated influenza vaccines (IIV) and live attenuated influenza vaccines (LAIV). Inactivated influenza vaccines in the form of trivalent vaccine consist of three seasonal influenza viruses, namely two different subtypes of influenza A (H1N1 and H3N2) and one influenza B strain, and have been used for over 60 years. Quadrivalent inactivated influenza vaccines include an additional influenza B strain and may potentially offer additional protection against influenza B. Live attenuated influenza vaccines, though available in previous years, is currently not registered in Hong Kong.

Most IIVs are given via the intramuscular route and are recommended for use in individuals 6 months of age or above, depending on individual brand. The seasonal influenza vaccine requires annual administration.

6.7.3. **Immunogenicity and efficacy** \(^2\)

According to the WHO, when the vaccine strains closely match the circulating influenza viruses, efficacy of IIV in individuals younger than 65 years of age typically range from 70% to 90%, whereas the efficacy of IIV to prevent influenza infection in individuals aged 65 years or above is at best modest, irrespective of setting, population and study design. Nevertheless, vaccination remains the most efficacious public health tool currently available to protect elderly individuals against influenza.
6.7.4. Schedule\(^1,2,3\)

The Scientific Committee on Vaccine Preventable Diseases (SCVPD) makes recommendations for seasonal influenza vaccinations in Hong Kong annually. Primary care providers are strongly advised to check with the latest local recommendations at the website of the Centre for Health Protection (www.chp.gov.hk).

A single intramuscular dose is the standard regimen for IIV in persons aged 9 years or above. According to Recommendations on Seasonal Influenza Vaccination for the 2016/17 Season, children below 9 years, who have received one or more doses of seasonal influenza vaccine in or before 2015/16 season are recommended to receive one dose in the 2016/17 season. For vaccine-naive children aged below 9 years, two doses with a minimum interval of 4 weeks are required. Half the adult dose is recommended for children below 3 years. As mentioned above, the seasonal influenza vaccine requires annual administration.

Given influenza vaccines with strains that closely match the circulating influenza viruses offer approximately 70-90% protection against clinical influenza and severe cases do occur in previously healthy persons, members of the public aged 6 months or above except those with known contraindications should receive seasonal influenza vaccine for personal protection.

Vaccination is especially important for people at higher risk of serious influenza complications, and for people who live with or care for high risk individuals. The WHO recommends seasonal influenza vaccination for pregnant women, children, elderly, individuals with specific chronic medical conditions and health-care workers. In addition, local situation should also be considered and it is recommended that primary care doctors should check with the latest local recommendations at the website of the Centre for Health Protection (www.chp.gov.hk).

Table 36. Schedule, number of doses of seasonal influenza vaccine for different age groups in 2016-17 influenza season

<table>
<thead>
<tr>
<th>Age group</th>
<th>Previous dose of seasonal influenza vaccine (IIV or LAIV)</th>
<th>Number of seasonal influenza vaccine doses needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 9 years</td>
<td>0</td>
<td>2 (with a minimum interval of 4 weeks)</td>
</tr>
<tr>
<td></td>
<td>≥1</td>
<td>1</td>
</tr>
<tr>
<td>9 years or above</td>
<td>Any number of doses</td>
<td>1</td>
</tr>
</tbody>
</table>

Remarks:
It is preferable to receive seasonal influenza vaccinations before the usual time of arrival of influenza seasons (see section 6.7.1) since it usually takes about 2 weeks after vaccination for antibodies and its protective effect to develop.
6.7.5. *Contraindications and precautions*¹²

**Contraindications:**
- History of hypersensitivity to components of the vaccine.

  Note: Individuals with mild egg allergy can be given IIV in primary care. Individuals with diagnosed or suspected severe egg allergy should be seen by an allergist/immunologist for evaluation of egg allergy and for administration of IIV if clinically indicated.

**Precautions:**
- If an individual suffers from fever on the day of vaccination, the vaccination should be deferred till recovery.
- As it is unknown whether influenza vaccination is causally associated with increased risk of recurrent Guillain-Barré Syndrome (GBS), precaution should be made to ascertain the temporal relationship if there is a history of GBS.

6.7.6. *Adverse events following immunisation (AEFI)*

AEFI (Note: influenza vaccinations may not necessarily have causal relations with these adverse events):
1. Local reactions (e.g. pain, swelling)
   - Frequency: 15-20%²
   - Usually self limiting
2. Systemic side effects (e.g. fever, malaise and myalgia)
   - Frequency: 1-10%²
   - Usually occur 6-12 hours after vaccination and last up to 2 days.¹
3. Guillain-Barré syndrome
   - Frequency: rare; 1 to 2 per 1 million vaccinees¹,²
4. Meningitis or encephalopathy
   - Frequency: rare; 1 in 3 million doses distributed¹,²
5. Anaphylaxis
   - Rare; 9 in 10 million doses distributed¹,²
   - Refer to hospital for further management
References


6.8. Haemophilus influenzae type b vaccine

6.8.1. Epidemiology

Invasive *Haemophilus influenzae* type b (Hib) infection can cause severe infection particularly among infants. Meningitis is one of most invasive and life-threatening infections associated with Hib infection, in which the case-fatality is 2-5% despite appropriate antimicrobial therapy, and hearing impairment or neurologic sequelae occur in 15-30% of the survivors. Hib can also cause epiglottitis, pneumonia, septic arthritis and cellulitis, and less commonly, osteomyelitis and pericarditis. Otitis media and acute bronchitis due to *H. influenzae* are generally caused by nontypeable strains. Hib strains account for only 5%-10% of *H. influenzae* causing otitis media.

The disease burden of invasive Hib is low in Hong Kong. Invasive Hib disease was made statutorily notifiable in Hong Kong in July 2008. In the last five years (2011-2015), the annual number of reported cases ranged from 0 to 6.

6.8.2. Vaccine characteristic

- **Type:** Conjugated polysaccharide vaccines.
- **Storage:** Refrigerate at +2 to +8°C. Do not freeze.
- **Route:** Intramuscular injection. The product insert for individual vaccine should be consulted.
- Registered *H. influenzae* type b vaccines in Hong Kong are listed in Table 37. The information is extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 37. Hib vaccines registered in Hong Kong (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single antigen vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>ACT-HIB VACCINE WITH DILUENT</td>
<td><em>H. influenzae</em> b</td>
</tr>
<tr>
<td>HIBERIX VACCINE</td>
<td><em>H. influenzae</em> b</td>
</tr>
<tr>
<td><strong>Combination vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>INFANRIX HEXA VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b, hepatitis B antigen, neomycin, polymyxin B</td>
</tr>
<tr>
<td>INFANRIX-IPV+HIB VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b</td>
</tr>
<tr>
<td>INFANRIX IPV-HIB VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b</td>
</tr>
<tr>
<td>HEXAXIM VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b, hepatitis B antigen</td>
</tr>
<tr>
<td>PEDIACEL VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b, neomycin, polymyxin B, streptomycin</td>
</tr>
<tr>
<td>PENTAXIM VACCINE</td>
<td>Diphtheria toxoid, tetanus toxoid, acellular pertussis toxoid, poniomyelitis virus, <em>H. influenzae</em> b, neomycin, polymyxin B, streptomycin</td>
</tr>
</tbody>
</table>
6.8.3. **Immunogenicity and efficacy**

- Highly immunogenic, more than 95% of infants develop protective antibody levels after a primary series of two or three doses.
- Hib vaccines, including combination vaccines containing Hib conjugate, should not be given to a child younger than 6 weeks of age as data suggested that Hib conjugate vaccines given before 6 weeks of age may induce immunologic tolerance and hence reduce the response to the subsequent doses of Hib vaccine.
- Invasive Hib disease in a completely vaccinated infant is uncommon.

6.8.4. **Schedule**

- There is no local recommendation on the use of Hib vaccine at the population level. Hib vaccine can be considered for personal protection. Primary care providers may provide option and information on Hib vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.
- The number of doses in the primary series depends on the type of vaccine and the age of the child including the age of the first dose.

The schedules of selected vaccines are listed here for reference only. Primary care provider should always refer to the product inserts and international guidelines for up-to-date information. Different schedules are adopted in different countries according to their local epidemiology and available vaccines which may not be applicable in other places. Primary care provider should exercise their clinical judgment if he/she decides to follow certain schedule.

**World Health Organization (WHO)**

- The WHO suggests that at least 3 doses are needed to achieve high vaccine efficacy and effectiveness. These can be administered as 3 primary doses without a booster (3p+0) or with a booster (3p+1), or 2 primary doses with a booster (2p+1).
- Because serious Hib disease occurs most commonly in children aged between 4 and 18 months, immunization should start from 6 weeks of age, or as early as possible thereafter. The interval between doses should be at least 4 weeks if 3 primary doses are given, and at least 8 weeks if 2 primary doses are given. When given, the booster dose should be administered at least 6 months after completion of the primary series.
- If the vaccination course has been interrupted, the schedule should be resumed without repeating the previous dose. Children who start vaccination late, but are aged <12 months, should complete the vaccination schedule (e.g. have 3 primary doses or 2 primary doses plus a booster). When a first dose is given to a child >12 months of age, only one dose is recommended. Hib vaccine is not required for healthy children after 5 years of age.
- The Hib conjugate vaccine is contraindicated in people with known allergies to any component of the vaccine. There are no other known contraindications or precautions.
**United Kingdom**

The recommended Hib vaccination schedule in the United Kingdom according to the Department of Health (DH):

- For children under one year of age:
  - First dose of a Hib-containing vaccine.
  - Second dose, one month after the first dose.
  - Third dose, one month after the second dose.
- For children over one year of age and under ten years of age who have either not been immunised or not completed a primary course of diphtheria, tetanus, pertussis or polio, DTaP/IPV/Hib vaccination should be used. Children over one year and under ten years of age who have completed a primary course of diphtheria, tetanus, pertussis or polio should have Hib/MenC.
- If the primary course is interrupted it should be resumed but not repeated, allowing an interval of one month between the remaining doses.
- A booster dose of Hib/MenC is recommended at 12 months for children who have received a complete primary course of three Hib-containing vaccine injections. The Hib/MenC vaccine can be given at the same time as the pneumococcal conjugate and MMR vaccines.

**United States**

- The recommended Hib vaccination schedule in the United States according to the Advisory Committee on Immunization Practices (ACIP):
  - The recommended interval between primary series doses is 8 weeks, with a minimum interval of 4 weeks. The minimum age of 1st dose is 6 weeks. The booster dose is at 12-15 months of age and at least 8 weeks after the previous dose.
  - Hib vaccination of persons older than 59 months of age is not recommended except for those are at increased risk for invasive Hib disease.

Table 38. Advisory Committee on Immunization Practices (ACIP)-recommended Hib routine vaccination schedule

<table>
<thead>
<tr>
<th>Type</th>
<th>Vaccine</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>12-15 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP-T</td>
<td>ActHIB</td>
<td>X (1st)</td>
<td>X (2nd)</td>
<td>X (3rd)</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Pentacel*</td>
<td>X (1st)</td>
<td>X (2nd)</td>
<td>X (3rd)</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Hiberix†</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>MenHibrix§</td>
<td>X (1st)</td>
<td>X (2nd)</td>
<td>X (3rd)</td>
<td>X</td>
</tr>
<tr>
<td>PRP-OMP</td>
<td>PedvaxHIB</td>
<td>X (1st)</td>
<td>X (2nd)</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>COMVAX</td>
<td>X (1st)</td>
<td>X (2nd)</td>
<td>—</td>
<td>X</td>
</tr>
</tbody>
</table>

* The recommended age for the 4th dose of Pentacel is 15-18 months, but it can be given as early as 12 months, provided at least 6 months have elapsed since the 3rd dose.
† Hiberix is approved only for the last dose of the Hib series among children 12 months of age and older.
§ The recommended age for the 4th dose of MenHibrix is 12-18 months.
### Table 39. *Haemophilus influenzae* type b vaccine detailed schedule for unvaccinated children

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age at 1st dose (months)</th>
<th>Primary series</th>
<th>Booster</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP-T*</td>
<td>2-6</td>
<td>3 doses, 2 months apart</td>
<td>12-15 months of age</td>
</tr>
<tr>
<td></td>
<td>7-11</td>
<td>2 doses, 1 month apart</td>
<td>12-15 months of age</td>
</tr>
<tr>
<td></td>
<td>12-14</td>
<td>1 dose</td>
<td>2 months later</td>
</tr>
<tr>
<td></td>
<td>15-59†</td>
<td>1 dose</td>
<td>-</td>
</tr>
<tr>
<td>PRP-OMP</td>
<td>2–6</td>
<td>2 doses, 2 months apart</td>
<td>12–15 months</td>
</tr>
<tr>
<td></td>
<td>7–11</td>
<td>2 doses, 1 month apart</td>
<td>12–15 months</td>
</tr>
<tr>
<td></td>
<td>12–14</td>
<td>1 dose</td>
<td>2 months later</td>
</tr>
<tr>
<td></td>
<td>15–59</td>
<td>1 dose</td>
<td>-</td>
</tr>
</tbody>
</table>

*Hiberix brand PRP-T vaccine is approved only for the last dose of the Hib series among children 12 months of age and older.
† MenHibrix brand PRP-T vaccine is not recommended for children 19 months of age or older.

#### 6.8.5. Contraindication and precaution

- **Contraindications:**
  - Severe allergic reaction to a vaccine component or following a prior dose.
  - Age younger than 6 weeks.
- **Precaution:** Moderate to severe acute illness

#### 6.8.6. Adverse events following immunisation (AEFI)

1. Swelling, redness or pain
   - Frequency: 5-30%
   - Usually resolves within 12-24 hours.
2. Systemic reactions (fever, irritability) are infrequent.
3. Serious adverse reactions are rare.

#### References

5. Prevention and Control of Haemophilus influenzae Type b Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). Recommendations and Reports. February 28, 2014 / 63(RR01);1-14
6.9. Hepatitis A vaccine

6.9.1. Epidemiology
Hepatitis A is transmitted via faecal-oral route and usually leads to acute hepatitis and jaundice. The illness may last for a few weeks but may rarely take months to resolve. Most patients have a complete recovery and develop lifelong immunity against the infection. There is no chronic carrier status.

Infected children under six years of age do not usually experience noticeable symptoms. Adults have signs and symptoms of illness more often than children, and the severity of disease and mortality increases in older age groups. After the outbreak in 1992 resulted in more than 3000 cases and 4 deaths, Hong Kong had a declining incidence of hepatitis A over the past decades. From 2005 to 2014, the number of hepatitis A cases remained relatively stable and the annual number of cases ranged from 43 to 76. During this period, a total of 587 cases were recorded and the cases involved 321 males and 266 females (male to female ratio = 1.2 : 1), with almost 75% of them aged below 40 years. In 2015, an increase in the number of cases was observed with a total of 138 cases recorded.

6.9.2. Vaccine characteristics

- **Type**: Inactivated vaccine.
- **Storage**: Refrigerate at +2 to +8°C. Do not freeze.
- **Route**: Intramuscular injection. The product insert for individual vaccine should be consulted.
- Registered hepatitis A vaccines in Hong Kong are listed in Table 40. The information on name of product and ingredients are extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 40. Hepatitis A vaccines registered in Hong Kong (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Ingredients</th>
<th>Volume</th>
<th>Age group (years) according to manufacturer</th>
<th>No. of doses according to manufacturer</th>
<th>Schedule according to manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single antigen vaccine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVAXIM 160U VACCINE</td>
<td>Hepatitis A antigen, neomycin</td>
<td>0.5ml</td>
<td>≥16</td>
<td>2</td>
<td>0, 6 to 12 months</td>
</tr>
<tr>
<td>AVAXIM PEDIATRIC VACCINE 80U</td>
<td>Hepatitis A antigen</td>
<td>0.5ml</td>
<td>1-15</td>
<td>2</td>
<td>0, 6 to 18 months</td>
</tr>
<tr>
<td>HAVRIX 1440 VACCINE</td>
<td>Hepatitis A antigen</td>
<td>1ml</td>
<td>≥19</td>
<td>2</td>
<td>0, 6 to 12 months</td>
</tr>
<tr>
<td>HAVRIX 720 JUNIOR VACCINE</td>
<td>Hepatitis A antigen</td>
<td>0.5ml</td>
<td>1-18</td>
<td>2</td>
<td>0, 6 to 12 months</td>
</tr>
<tr>
<td>VAQTA VAC (ADULT) 50U/ML SYRINGE</td>
<td>Hepatitis A antigen</td>
<td>1ml</td>
<td>≥18</td>
<td>2</td>
<td>0, 6 months</td>
</tr>
<tr>
<td>Name of product</td>
<td>Ingredients</td>
<td>Volume</td>
<td>Age group (years) according to manufacturer</td>
<td>No. of doses according to manufacturer</td>
<td>Schedule according to manufacturer</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>--------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>VAQTA VAC (ADULT) 50U/ML VIAL</td>
<td>Hepatitis A antigen</td>
<td>1ml</td>
<td>≥18</td>
<td>2</td>
<td>0, 6 to 18 months</td>
</tr>
<tr>
<td>VAQTA VAC (PAEDIATRIC) 25U/0.5ML SYRINGE</td>
<td>Hepatitis A antigen</td>
<td>0.5ml</td>
<td>1-17</td>
<td>2</td>
<td>0, 6 to 18 months</td>
</tr>
<tr>
<td>VAQTA VAC (PAEDIATRIC) 25U/0.5ML VIAL</td>
<td>Hepatitis A antigen</td>
<td>0.5ml</td>
<td>1-17</td>
<td>2</td>
<td>0, 6 to 18 months</td>
</tr>
</tbody>
</table>

Combined hepatitis A /hepatitis B vaccines

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Ingredients</th>
<th>Volume</th>
<th>Age group (years) according to manufacturer</th>
<th>No. of doses according to manufacturer</th>
<th>Schedule according to manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWINRIX ADULT VACCINE</td>
<td>Hepatitis A antigen, hepatitis B antigen, neomycin</td>
<td>1 ml</td>
<td>≥16</td>
<td>3</td>
<td>0, 1, 6 months</td>
</tr>
<tr>
<td>TWINRIX JUNIOR VACCINE INJ</td>
<td>Hepatitis A antigen, hepatitis B antigen, neomycin</td>
<td>0.5ml</td>
<td>1-15</td>
<td>3</td>
<td>0, 1, 6 months</td>
</tr>
</tbody>
</table>

Combined hepatitis A/ typhoid vaccine

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Ingredients</th>
<th>Volume</th>
<th>Age group (years) according to manufacturer</th>
<th>No. of doses according to manufacturer</th>
<th>Schedule according to manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIVAXIM VACCINE</td>
<td>Hepatitis A antigen, <em>Salmonella</em> Typhi Ty2</td>
<td>1ml</td>
<td>≥16</td>
<td>Please refer to product insert</td>
<td></td>
</tr>
</tbody>
</table>

6.9.3. Immunogenicity and efficacy

- Highly immunogenic and effective. For children (≥12 months) and adolescents, >97% seropositive within one month of the 1st dose and near 100% after 2 doses.³
- Clinical efficacy 94-100% in children.³
- Duration of protection is likely to be at least 20 years, and possibly lifelong.⁴

6.9.4. Schedule

- There is no local recommendation on the use of hepatitis A vaccine at the population level. Hepatitis A vaccine can be considered for personal protection. Primary care providers may provide option and information on hepatitis A vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.
- Schedule of single antigen hepatitis A vaccines consists of two doses with an interval of 6 to 18 months depending on the products. Package insert should be consulted for details.
- No hepatitis A vaccine is approved on the use of children under 1 year of age.
- Limited data indicate that vaccines from different manufacturers are interchangeable. Completion of the series with the same product is preferable. However, if the originally used product is not available or not known, vaccination with either product is acceptable.³
- The Scientific Committee on Vaccine Preventable Diseases (SCVPD) recommended hepatitis A vaccination for the following groups for personal protection in Hong Kong⁴ according to the local data:
  - Persons with chronic liver diseases (including hepatitis B or C carriers)
- Persons with clotting factors disorders receiving plasma-derived replacement clotting factors
- Travellers to endemic areas (see Annex 2 Table 61 for information of countries or areas at risk of hepatitis A)
- Protection is achieved 2–4 weeks after the first dose of vaccine. Given the relatively long incubation period of hepatitis A (average 2–4 weeks), a vaccine administered as late as the day of departure can still protect travellers. Depending on the epidemiological profile and setting of the outbreak, post-exposure prophylaxis with hepatitis A vaccine may be recommended when a hepatitis A outbreak occurs in a closed institution.

6.9.5. **Contraindication and precaution**
- Severe allergic reaction to a vaccine component or following a prior dose.
- Moderate to severe acute illness.

6.9.6. **Adverse events following immunisation (AEFI)**
1. Local reactions (pain, erythema or swelling)
   - Frequency: 20-50%
   - Symptoms are generally mild and self-limiting,
2. Systemic reactions (malaise, fatigue, low grade fever)
   - Frequency <10%
   - Usually mild

6.9.7. **Resource of hepatitis A**
(Please refer to Annex 2 Table 61 for resources of hepatitis A)

**References**

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6.10. **Human papillomavirus vaccine**

6.10.1. **Epidemiology**

Human papillomavirus (HPV) is a group of viruses consisting of more than 100 types. Among them, around 40 types infect the human genital tract. They are transmitted mainly through sexual intercourse. “Low risk HPV” types, also called “non-oncogenic” types (e.g. HPV 6 and 11) can cause genital warts, benign or low-grade cervical cell abnormalities. “High risk HPV” types or the “oncogenic types” (e.g. HPV 16, 18, 52, 58) can cause low-grade cervical cell abnormalities, high-grade cervical cell abnormalities that are precursors to cancer, cervical and anogenital cancers. HPV 16 and 18 account for about 70% of all cervical cancer and about 60% of precancerous lesion (high grade cervical intraepithelial neoplasia or CIN) worldwide. High risk HPV can be found in around 50% of atypical squamous cells of undetermined significance (ASCUS), 82-85% of low grade squamous intraepithelial lesion (LSIL) and almost 100% of cervical cancer. In addition to cervical cancer, HPV infection is also associated with anogenital cancers less common than cervical cancer, such as cancer of the vulva, vagina, penis and anus.

Studies have shown that up to 70-75% of all sexually active women are infected with HPV at some point in their lives. Approximately 90% of women infected with HPV will spontaneously regress within two years and 10% will develop persistent infection. Women with persistent high-risk types of HPV infection are at risk of developing CIN and cervical cancer.

In Hong Kong, the prevalence of HPV infection is 7-11% in those attending cervical screening services. Among those with cervical abnormalities, HPV-16 is the most commonly identified type and has been found in 33% to 70% of the subjects. Other commonly identified HPV types were 11 and 18. Infection with HPV-58 is also commonly detected in 3.8% to 31.5% of subjects, depending on the severity of the lesions. While HPV-16,18,45,31 and 33 are the five most prevalent HPV genotypes associated with cervical cancer worldwide, HPV 16,18,52 and 58 are the four most prevalent HPV genotypes in Hong Kong. In 2013, cervical cancer ranked as the 7th most common cancer of female and the 9th major cause of cancer deaths in Hong Kong females. There were 503 new cases of cervical cancer in 2013, accounting for 3.6% of all new cancer cases in females. The median age at diagnosis was 53 years old. The age-standardised incidence rate was 8.7 per 100 000 standard population.

HPV infection is a sexually transmitted disease and currently available HPV vaccines do not cover all cancer associated serotypes of HPV. Practice of safe sex and regular cervical smear examination should not be replaced by vaccination.
Recommendation on the use of HPV vaccine by advisory bodies

The SCVPHD and Scientific Committee on AIDS and Sexually Transmitted Infections discussed the use of HPV vaccine in Hong Kong in 2013. By 2016, additional studies and new evidence concerning the efficacy of HPV vaccines have become available, urging SCAS and SCVPHD to revisit the situation. To date, the scientific evidence supports that vaccination against the HPV is effective for individual protection against HPV infections, by the genotypes covered by the respective vaccine, and thence cervical cancer. It is considered that the benefits from HPV vaccination, such as prevention of cervical cancer, outweigh the risks of potential side effects. An ongoing post-marketing surveillance on safety and effectiveness of the HPV vaccines is essential. The ideal age of vaccination, if administered, should be timed before the commencement of sexual debut.

6.10.2. Vaccine characteristic

- **Type:** Recombinant vaccine of virus-like particles.
- **Storage:** Refrigerate at +2 to +8°C. Do not freeze.
- **Route:** Intramuscular injection. The product insert for individual vaccine should be consulted.
- **Registered HPV vaccines in Hong Kong are listed in Table 41. The information on name of product and ingredients are extracted from the website of Drug Ofﬁce (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>HPV types prevented by vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERVARIX VACCINE (PRE-FILLED SYRINGE)</td>
<td>Human papillomavirus</td>
<td>Types 16 and 18</td>
</tr>
<tr>
<td>GARDASIL VACCINE INJ (PRE-FILLED SYRINGE)</td>
<td>Human papillomavirus</td>
<td>Types 6, 11,16,18</td>
</tr>
<tr>
<td>GARDASIL VACCINE INJ (VIAL)</td>
<td>Human papillomavirus</td>
<td>Types 6, 11,16,18</td>
</tr>
<tr>
<td>GARDASIL 9 VACCINE INJ (PRE-FILLED SYRINGE)</td>
<td>Human papillomavirus</td>
<td>Types 6, 11, 16, 18, 31, 33, 45, 52 and 58</td>
</tr>
</tbody>
</table>

6.10.3. Immunogenicity and efficacy

- HPV naïve women against lesions caused by the types of HPV covered by the vaccine was more than 90% in various endpoints, and reached almost 100% against cervical cancer during the study period. The duration of protection is still not yet defined, but is of at least 10 years’ duration.
- The vaccine has no therapeutic effect on any existing HPV infections or diseases. Therefore, the vaccine cannot protect a vaccinee from the HPV types that have already been infected with at the time of vaccination. However, the vaccinee can still be protected from other HPV types covered by the vaccine because prior infection with one HPV type does not diminish efficacy of the vaccine against other vaccine HPV types.
- Bivalent, quadrivalent and nine-valent HPV vaccines are effective in preventing cervical cancer and its precancerous lesions (i.e. cervical intraepithelial neoplasia). Quadrivalent and nine-valent vaccines have shown to be effective in protecting against genital warts in both males and females that are caused by specific HPV types targeted by the vaccine.
• Differences among the design of individual clinical trials of the different HPV vaccines preclude direct comparison of their results from different studies. More evidence is warranted for comparing their relative clinical efficacy in long term.

6.10.4. Schedule
• There is no local recommendation on the use of HPV vaccine at the population level. HPV vaccine can be considered for personal protection. Primary care providers may provide option and information on HPV vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.

Table 42. Schedules of human papillomavirus vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Bivalent</th>
<th>Quadrivalent</th>
<th>Nine-valent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dose and Schedule</td>
<td>All *three HPV vaccines could either be given as a 2-dose or 3-dose schedule according to the age of the individuals. Primary care providers should refer to the product inserts of the three HPV vaccines for details. For further information on attribution and dosing recommendation of the vaccines, please refer to recommendation of SCVPD.</td>
<td>*Note: Currently (as of June 2016), the bivalent and quadrivalent vaccines could either be given as a 2-dose or 3-dose schedule according to the age of the individuals. Apart from the current 3-dose schedule, with effect from 31 October 2016, the nine-valent vaccine can also be administered as a 2-dose schedule according to the age of the individuals.</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
• As recommended by the SCVPD, the desirable age of vaccination is before commencement of sexual activity. The World Health Organization also recommends the primary target population of girls aged 9-10 years through 13 years. The Advisory Committee on Immunisation Practices (ACIP) of the Centers for Disease Control and Prevention recommends vaccinations in females of 11-12 years of age, and can be started as young as 9 years of age at the clinician’s discretion.

• Sexually active females who may have already been exposed to HPV can also be vaccinated. Females who have not been infected with any of the HPV vaccine types will receive full benefit from vaccination. Vaccination will still provide benefit to females if they have already been infected with one or more of the HPV vaccine types although the benefit is less compared with uninfected females.

• HPV DNA or serological test is not necessary before vaccination.

• Interchange of the three vaccines is not recommended because there is currently no data on the relevant safety or efficacy.

6.10.5. Contraindication and precaution
Contraindications:
• History of immediate hypersensitivity to yeast or any component of HPV vaccine for following a previous dose of the vaccine.

Precautions:
• Moderate or severe acute illness. Vaccination should be deferred until symptoms of the acute illness improve.

• The vaccine is not recommended for pregnant women because of a lack of safety and efficacy.
HPV vaccine may be given while lactating. In trials, 995 nursing mothers received quadrivalent vaccine or placebo, and no relation between vaccination and adverse events was observed. The effect on breastfed infants of the administration of bivalent vaccine to their mothers has not been evaluated in clinical studies. It is not known whether HPV vaccine antigens or HPV antibodies are excreted in human milk.5

6.10.6. Adverse events following immunisation (AEFI)

1. Local reactions (e.g. pain, redness or swelling)3
   - Frequency: 20-90%
   - Usually self limiting. Generally increase in frequency with increasing doses.
2. Fever3
   - Frequency: 10-13%
   - Prelicensure clinical trials reporting fever within 15 days after vaccination. A similar proportion of placebo recipients reported an elevated temperature.
3. Headache and nausea

6.10.7. Resource

(Please refer to Annex 2 Table 62 for resource of human papillomavirus and vaccine.)

References


6.11. Japanese encephalitis vaccine

6.11.1. Epidemiology

Japanese encephalitis (JE) is a mosquito-borne disease caused by the Japanese encephalitis virus. The virus is transmitted by the bite of infected mosquitoes and the principal type of mosquito that transmits the disease is Culex tritaeniorhynchus. JE is not directly transmissible from human to human. The annual reported cases ranged from zero to six cases from 2006 to 2015. The disease occurs mainly in the rural and agricultural areas of Asia and Western Pacific Region.

The risk of JE is very low for most people, but it is higher for those living or travelling for long periods in endemic areas. Mild infections may occur without apparent symptoms other than fever with headache. More severe infection is marked by quick onset of headache, high fever, neck stiffness, impaired mental state, coma, tremors, convulsions (especially in children) and paralysis. The case-fatality rate can be as high as 30% among those with symptoms. Of those who survive, 20%–30% suffer permanent intellectual, behavioural or neurological problems such as paralysis, recurrent seizures or inability to speak. Most infections are asymptomatic. There is no specific treatment for the disease and supportive therapy is indicated.

People can protect themselves against JE virus infection by taking precautionary measures such as avoiding outdoor exposure to mosquito bites from dusk till dawn especially in rural areas, wear loose, light-coloured, long-sleeved clothing, apply effective insect repellents with DEET (for children, use lower concentration of DEET — up to 10%) to exposed parts of their bodies, use mosquito screens or nets when the room is not air-conditioned and place mosquito coil or electric mosquito mat / liquid near possible entrance, such as window, to prevent mosquito bites.

6.11.2. Vaccine characteristic

- Currently, two types of Japanese encephalitis vaccines are registered in Hong Kong:
  - Inactivated JE virus vaccine (IXIARO, JE-VC)
    - Route: Intramuscular
  - Live attenuated chimeric JE virus vaccine (IMOJEV, JE-CV)
    - Route: Subcutaneous

- Registered Japanese encephalitis vaccines in Hong Kong are listed in Table 43. The information is extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.
Table 43. Japanese encephalitis vaccines registered in Hong Kong. (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMOJEV JAPANESE ENCEPHALITIS VACCINE (LIVE, ATTENUATED)</td>
<td>Japanese encephalitis vaccine</td>
</tr>
<tr>
<td>VALNEVA IIXIARO SUSPENSION FOR INJECTION</td>
<td>Japanese encephalitis vaccine</td>
</tr>
</tbody>
</table>

6.11.3. **Immunogenicity and efficacy**
- The efficacy and duration of protection for the vaccine varies among different age group and types of vaccine.  

6.11.4. **Schedule**
- There is no local recommendation on the use of JE vaccine at the population level. JE vaccine can be considered for personal protection. Primary care providers may provide option and information on JE vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.
- JE vaccination is recommended for travellers who plan to stay one month or longer in endemic areas during the JE transmission season, and for short-term (less than one month) travellers if they plan to have significant extensive outdoor or night-time exposure in rural areas during the transmission season.
- Please refer to Annex 2 Table 63 for information on countries or areas at risk of Japanese encephalitis.
- Inactivated vaccine:
  - This vaccine is registered in Hong Kong for use in adults, adolescents, children, and infants aged two months and above.
  - Adopt two-dose schedule (days 0 and 28) using JE-VC (a Vero cell culture-derived inactivated vaccine based on the SA 14-14-2 strain) for primary immunisation.
  - The immunisation should be completed at least 1 week prior to potential JE virus exposure.
- Live attenuated chimeric vaccine:
  - Currently, this vaccine is registered in Hong Kong for use in individuals from 9 months of age and above.
  - Only one dose is required for JE-CV (a live attenuated chimeric vaccine based on a YF17D backbone combined with Vero cell propagated SA14-14-2 strain) for primary immunisation.
  - Immunisation should be given at least 14 days before travel in adults and at least 28 days before travel in children.
- Please refer to the respective vaccine’s package insert for details.

6.11.5. **Contraindications and precautions**

Contraindications to inactivated vaccine and live attenuated chimeric vaccine:
- Acute infection and fever; and
- Severe allergic reactions to vaccine components or prior dose.

Contraindications to live attenuated chimeric vaccine:
- Acute infection and fever.
- Severe allergic reactions to vaccine components or prior dose.
- Congenital or acquired immune deficiency impairing cellular immunity, including immunosuppressive therapies such as chemotherapy, high doses of systemic corticosteroids given generally for ≥14 days.
- Symptomatic HIV infection or asymptomatic HIV infection when accompanied by evidence of impaired immune function.
- Pregnancy.
- Breast-feeding women.
Special precautions for inactivated vaccine:
- Persons with bleeding disorders;
- Pregnancy and breast-feeding women
- Immunocompromised
- Persons with history of any other known allergies
- Persons with any health problems after previous administration of any vaccine.

Special precautions for live attenuated chimeric vaccine:
- Persons with history of serious or severe reaction within 48 hours of a previous injection with a vaccine containing similar components.
- For patients following a treatment with high doses of systemic corticosteroids given for 14 days or more, it is advisable to wait for at least one month or more following the interruption of therapy before carrying out the vaccination until immune function has recovered.

6.11.6. Adverse events following immunisation (AEFI)\textsuperscript{10,11}

1. Pain and tenderness at injection site
2. Redness or swelling at injection site
3. Headache and myalgia
4. Influenza-like illness and fatigue
5. Severe reactions are rare

References


6.12. Meningococcal vaccine

6.12.1. Epidemiology
Meningococcal infection is caused by the bacteria Neisseria meningitidis. It is mainly transmitted by direct contact through respiratory secretions from infected persons. The clinical picture may be variable. Severe illness may result in meningococcaemia or meningococcal meningitis. Meningococcaemia is characterised by sudden onset of fever, intense headache, purpura, shock and even death in severe cases. Meningococcal meningitis is characterised by high fever, severe headache, stiff neck followed by drowsiness, vomiting, fear of bright light, or a rash; it can cause brain damage or even death. Even with appropriate antibiotic therapy, the fatality of invasive meningococcal infection is high.

Invasive meningococcal infection is a statutory notifiable disease in Hong Kong. The number of annual reported cases ranges from 0 to 8 between 2005 and 2015. The risk of acquiring meningococcal infection while travelling is low in general. Risk for travelers is highest in people visiting meningitis belt countries who have prolonged contact with local populations during an epidemic. Outside the meningitis belt, infants have the highest rates of disease.

6.12.2. Vaccine characteristics
- **Type**: Polysaccharide vaccines, conjugated or not.
- **Storage**: Refrigerate at +2 to +8°C. Do not freeze.
- **Route**: Intramuscular or subcutaneous injection. The product insert for individual vaccine should be consulted.
- Registered meningococcal vaccines in Hong Kong are listed in Table 44. The information on name of product and ingredients are extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.
Table 44. Meningococcal vaccines registered in Hong Kong. (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
<th>Type of vaccine</th>
<th>Serogroups protected against</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENACTRA VACCINE</td>
<td>Meningococcal polysaccharide</td>
<td>Conjugate quadrivalent vaccine</td>
<td>A, C, W-135, Y</td>
</tr>
<tr>
<td>MENCEVAX ACWY VACCINE</td>
<td>Meningococcal vaccine</td>
<td>Polysaccharide quadrivalent vaccine</td>
<td>A, C, W-135, Y</td>
</tr>
<tr>
<td>NIMENRIX VACCINE</td>
<td>Meningococcal vaccine</td>
<td>Conjugate quadrivalent vaccine</td>
<td>A, C, W-135, Y</td>
</tr>
<tr>
<td>MENINGOCOCCAL A+C POLYSACCHARIDE VACCINE</td>
<td>Meningococcal vaccine</td>
<td>Polysaccharide bivalent vaccine</td>
<td>A, C</td>
</tr>
</tbody>
</table>

6.12.3. Immunogenicity and efficacy

- For polysaccharide vaccine, the immunogenicity is poor in children younger than 2 years of age and generally not effective in children younger than 18 months of age.4 In school children and adults, the bivalent and quadrivalent polysaccharide vaccines appear to provide protection for at least 3 to 5 years, but in children under 4 years the levels of specific antibodies decline rapidly after 2-3 years.2

- For conjugate vaccine, T-cell-dependent immune response is achieved through conjugation of the polysaccharide to a protein carrier. Conjugate vaccines are therefore associated with an increased immunogenicity among infants and prolonged duration of protection.2

6.12.4. Schedule

- Recommendations for the use of meningococcal vaccinations (including the type of vaccines, age and characteristics of recipients, immunisation schedule and need for booster dose) differ among countries depending on the local disease patterns and availability of registered vaccines.

- In Hong Kong, the occurrence of meningococcal infections is uncommon.

- There is no local recommendation on the use of meningococcal vaccine at the population level. Meningococcal vaccine can be considered for personal protection. Primary care providers may provide option and information on meningococcal vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.

- The Scientific Committee on Vaccine Preventable Diseases (SCVPD) recommends the use of meningococcal vaccine as follows:
  - Travellers to Mecca in Saudi Arabia during the Hajj pilgrimage (quadrivalent A,C,Y, W-135 vaccine);
  - Travellers to sub-Saharan regions of mid Africa during the dry season, i.e. Dec to Jun (bivalent A & C vaccine or quadrivalent A,C,Y, W-135 vaccine) according to the risk of exposure and local ad hoc epidemic situations; and
  - Travellers to areas, apart from the above, that are known to experience epidemic meningococcal disease as announced by authorities, e.g. World Health Organization; Centers for Disease Control and Prevention, US; and Health Canada, Canada.
Sporadic cases of meningococcal disease are known to occur in some countries in schools, colleges, travel resorts, military barracks and other places where large numbers of adolescents and young adults congregate. Travellers should seek professional advice from doctors for vaccination in view of the individual’s age and health condition, and details of the journey such as place, duration and nature.

The World Health Organization recommends a one-dose regime to be taken 2 weeks before departure to high risk areas.

6.12.5. **Contraindication and precaution**

- **Contraindications**: Severe allergic reaction to a prior dose or any component of the vaccine.
- **Precautions**: People with moderate or severe acute illness should defer vaccination until their condition improves.

6.12.6. **Adverse events following immunisation (AEFI)**

1. The incidence of local reactions (such as pain and redness at the injection site) after meningococcal polysaccharide vaccines has ranged from 4% to 56% across studies. The incidence of local reactions (including pain that limited movement of the arm of injection) after conjugate vaccines are more common.
2. Fever exceeding 38.5ºC occurs in up to 2% of vaccinees of polysaccharide vaccines.
3. Severe reactions are rare.

**References**

6.13. Rotavirus vaccine

6.13.1. Epidemiology
Rotavirus is an RNA virus and its outermost layer contains two structural viral proteins: the glycoprotein (G protein) and the protease-cleaved protein (P protein). These two proteins define the serotype of the virus.\(^\text{1}\) Currently, the 5 most common G-P combinations identified are G1P[8], G2P[4], G3P[8], G4P[8] and G9P[8], accounting for around 90% of all human infections in the world, where G1P[8] is the most prevalent.\(^\text{2}\) However, the type of rotavirus does not usually correlate with the severity of the disease.\(^\text{2}\) Infection does not confer complete immunity but subsequent infection is usually less severe.\(^\text{3}\) World Health Organization (WHO) estimates that in 2008, rotavirus gastroenteritis (RVGE)-associated child deaths accounted for about 5% of all child deaths and a cause-specific mortality rate of 86 deaths per 100,000 population aged <5 years. About 90% of all rotavirus-associated fatalities occur in low income countries in Africa and Asia and are related to poor health care.\(^\text{2}\)

Rotavirus is a common cause of gastroenteritis among infants and young children resulting in hospital admissions. From 1 July 1997 to 31 March 2011 9.8% of children aged below 5 years admitted to public hospitals in Hong Kong had primary diagnosis of gastroenteritis-related disorder.\(^\text{4}\) In addition, the overall incidence rates of hospitalisation for rotavirus per 100,000 person-years was 1,071 in children below 2 years and 542 in children below 5 years.\(^\text{4}\)

Severe infection may result in dehydration, electrolyte imbalance, shock and even death. Rotavirus can also cause gastroenteritis outbreaks in institutions, such as child care centres, kindergartens, hospital wards, elderly homes and correctional facilities. The annual number of institutional acute gastroenteritis outbreaks associated with rotavirus ranged from 4 to 13 during the period of year 2011 to 2015, affecting 36–107 persons annually. About one-fifth of them took place in child care centres and kindergartens.

6.13.2. Vaccine characteristics
- **Type:** Live attenuated vaccines.
- **Route:** Oral
- Registered rotavirus vaccines in Hong Kong are listed in Table 45. The information is extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 45. Rotavirus vaccines registered in Hong Kong. (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROTARIX VACCINE ORAL SUSPENSION</td>
<td>Rotavirus</td>
</tr>
<tr>
<td>ROTATEQ ORAL VACCINE</td>
<td>Rotavirus</td>
</tr>
</tbody>
</table>

6.13.3. Immunogenicity and efficacy\(^\text{2}\)
According to the World Health Organization (WHO),
- Both rotavirus vaccines have similar efficacy against severe RVGE in countries where a high diversity of strains co-circulates. The interchangeability of the two vaccines has not been studied.
A large number of randomised controlled trials have shown that both rotavirus vaccines are 80%-90% efficacious against severe RVGE in countries with very low child and adult mortality, and 40%- 60% efficacious in countries with high child mortality and very high adult mortality. In most cases, vaccination in infancy provides protection against severe RVGE for at least 2 years.

Breastfeeding and prematurity (<37 weeks’ gestation) do not significantly impair the response to the rotavirus vaccines.

6.13.4. Schedule

There is no local recommendation on the use of rotavirus vaccine at the population level. Rotavirus vaccine can be considered for personal protection. Primary care providers may provide option and information on rotavirus vaccination, as well as to collaborate with parents to arrive at a shared decision-making on the use of vaccine.

The schedules of selected vaccines are listed here for reference only. Primary care provider should always refer to the product inserts and international guidelines for up-to-date information. Different schedules are adopted in different countries according to their local epidemiology and available vaccines which may not be applicable in other places. Primary care provider should exercise his/her clinical judgment if he/she decides to follow certain schedule.

According to the manufacturers:
- Rotarix is administered orally in a 2-dose schedule. The first dose may be administered from the age of 6 weeks. There should be an interval of at least 4 weeks between doses. The vaccination is preferably given before 16 weeks of age, and no later than by 24 weeks of age.
- RotaTeq is administered orally in a 3-dose schedule. The first dose may be administered between ages 6–12 weeks; the subsequent doses at intervals of 4–10 weeks. The third dose should not be given after 32 weeks of age.

Table 46. Schedule of rotavirus vaccines according to manufacturers

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Rotarix Vaccine Oral Suspension</th>
<th>RotaTeq Oral Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of doses in series</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Minimum age for first dose</td>
<td>6 weeks of age</td>
<td>6 weeks (up to 12 weeks of age)</td>
</tr>
<tr>
<td>Interval between doses</td>
<td>At least 4 weeks</td>
<td>4-10 weeks</td>
</tr>
<tr>
<td>Maximum age for last dose</td>
<td>24 weeks of age (preferentially before 16 weeks of age)</td>
<td>32 weeks of age</td>
</tr>
</tbody>
</table>

World Health Organization

According to WHO position paper on rotavirus vaccines published in January 2013, the first dose of either RotaTeq or Rotarix be administered as soon as possible after 6 weeks of age, along with diphtheria-tetanus-pertussis (DTP) vaccination. Because of the typical age distribution of rotavirus gastroenteritis, rotavirus vaccination of children >24 months of age is not recommended.
Rotarix and RotaTeq should be administered orally in a 2-dose and 3-dose schedule respectively, with an interval of at least 4 weeks between doses. Rotavirus vaccination can be administered simultaneously with other vaccines in the infant immunisation programme.

**Australia**

The recommended rotavirus vaccination schedule in Australia:

- Rotarix is recommended for use in a 2-dose course (at 2 and 4 months of age).
- RotaTeq is recommended for use in a 3-dose course (at 2, 4, and 6 months of age).

<table>
<thead>
<tr>
<th>Doses</th>
<th>Age of routine oral administration</th>
<th>Age limits for dosing</th>
<th>Minimum interval between doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotarix</td>
<td>2 oral doses (1.5ml/dose)</td>
<td>2 and 4 months</td>
<td>6-14* weeks</td>
</tr>
<tr>
<td>RotaTeq</td>
<td>3 oral doses (2ml/dose)</td>
<td>2, 4 and 6 months</td>
<td>6-12† weeks</td>
</tr>
</tbody>
</table>

* The upper age limit for receipt of the 1st dose of Rotarix is immediately prior to turning 15 weeks old, and the upper age limit for receipt of the 2nd dose is immediately prior to turning 25 weeks old.
† The upper age limit for receipt of the 1st dose of RotaTeq is immediately prior to turning 13 weeks old. The 2nd dose of vaccine should preferably be given by 28 weeks of age to allow for a minimum interval of 4 weeks before receipt of the 3rd dose. The upper age limit for the 3rd dose is immediately prior to turning 33 weeks old. For infants presenting for their 2nd dose after reaching 29 weeks of age, a 2nd and final dose can be given, provided the upper age limit of 32 weeks (immediately prior to turning 33 weeks old) has not been reached.

**United States**

The recommended rotavirus vaccination schedule in the United States according to the Advisory Committee on Immunization Practices (ACIP):

- The vaccine be administered as a series of either two or three oral doses, for Rotarix and RotaTeq, respectively, beginning at 2 months of age. The vaccination series for both vaccines may be started as early as 6 weeks of age. Subsequent doses in the series should be separated from the previous dose by at least 4 weeks.
- The ACIP recommendations state that the maximum age for the first dose of both vaccines is 14 weeks 6 days. This is an off-label recommendation for RotaTeq since the approved maximum age for the first dose of that vaccine is 12 weeks. The minimum interval between doses of both rotavirus vaccines is 4 weeks. The maximum age for any dose of either rotavirus vaccine is 8 months 0 days. No rotavirus vaccine should be administered to infants older than 8 months 0 days of age. This is an off-label recommendation for both vaccines, because the labelled maximum age for Rotarix is 24 weeks, and the labelled maximum age for RotaTeq is 32 weeks.

**6.13.5. Contraindication and precaution**

**Contraindication:**
- History of a severe allergic reaction following a prior dose of vaccine or to a vaccine component
- Infants with severe combined immunodeficiency syndrome
- History of intussusception
**Precautions:**

- Altered immunocompetence other than severe combined immunodeficiency syndrome
  - Limited data do not indicate a different safety profile in HIV-infected versus HIV-uninfected infants
- Acute, moderate or severe gastroenteritis or other acute illness.
- The decision to vaccinate if a precaution is present should be made on a case-by-case risk and benefit basis.

**Information for answering some common questions:**

- Infants with pre-existing gastrointestinal conditions (such as congenital malabsorption syndromes, Hirschsprung’s disease, or short-gut syndrome) who are not undergoing immunosuppressive therapy should benefit from receiving rotavirus vaccine. It was considered that the benefits outweigh the theoretic risks. However, no data is available on the safety and efficacy of rotavirus vaccine for infants with pre-existing chronic gastrointestinal conditions. The product information for Rotarix indicates that the vaccine is contraindicated in those with history of uncorrected congenital malformation of the gastrointestinal tract that would predispose to intussusception.
- No dietary restriction (including breastfeeding) is needed before or after administration of rotavirus vaccine.
- Infants living in households with pregnant women or immunocompromised people can be immunised.
- Rotavirus vaccine may be administered at any time before, concurrent with, or after administration of any blood product, including antibody-containing products. (Also see Chapter 3.2)
- It is not recommended to readminister a dose of rotavirus vaccine to an infant who regurgitates, spits out, or vomits during or after administration of vaccine. No data exist on the benefits or risks associated with readministering a dose. The infant should receive the remaining recommended doses of rotavirus vaccine following the routine schedule (with a 4-week minimum interval between doses).

6.13.6. **Adverse events following immunisation (AEFI)**

**RotaTeq**
- Diarrhoea 18.1%
- Vomiting 11.6%
- Also greater rates of otitis media, nasopharyngitis and bronchospasm

**Rotarix**
- Irritability 11.4%
- Cough or runny nose 3.6%
- Flatulence 2.2%

The Global Advisory Committee of the World Health Organization concluded that available data suggest both Rotarix and RotaTeq exhibit a good safety profile, but may be associated with an increased risk of intussusception after the first dose of vaccine in some populations.
References


6.14.1. Epidemiology
Varicella (Chickenpox) is an acute infectious disease caused by the varicella-zoster virus (VZV). For most people, infection appears to confer life-long immunity. However, the varicella-zoster virus may remain dormant and recur years later as herpes zoster (shingles).

Chickenpox is usually a mild and self-limiting disease but complications such as secondary bacterial infections of skin lesions, pneumonia and encephalitis can occur and are more likely in immunosuppressed patients, persons younger than 1 year or older than 15 years of age, and neonates born to mothers with onset of maternal varicella within 5 days before or 2 days after delivery.1 Newborn babies who contract chickenpox can result in overwhelming infection and even death. Infection during the first 20 weeks of pregnancy can cause congenital varicella infection which is associated with a variety of abnormalities in the newborn. The varicella-zoster virus may also remain dormant and recur years later as herpes zoster with or without postherpetic neuralgia.
Chickenpox is the most commonly reported notifiable disease in Hong Kong. The annual number of varicella notifications varied from about 6,700 to about 18,000 from 2000 to 2015. Notifications were usually more common in winter months. Majority of the varicella cases occurred in children aged 2 to 11, who accounted for nearly 70% of all cases over the year.

6.14.2. Vaccine characteristics

- **Type**: Live attenuated vaccine.
- **Storage**: Different varicella-containing vaccines (including monovalent varicella vaccine or combination measles, mumps, rubella and varicella vaccine) have different storage temperature requirement. They should be either refrigerated at +2 to +8°C, or freeze at -15°C or colder depending on individual vaccine. The product insert should be consulted.
- **Route**: Subcutaneously administration for most type of vaccines but some can be administered intramuscularly depending on individual preparation. The product insert should be consulted.
- Registered varicella-containing vaccines in Hong Kong are listed in Table 48. The information on name of product and ingredients are extracted from the website of Drug Office (refer to Annex 2). Primary care providers should refer to product inserts for product description, composition and other pharmaceutical particulars.

Table 48. Varicella-containing vaccines registered in Hong Kong (Information as at June 2016)

<table>
<thead>
<tr>
<th>Name of Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARILRIX VACCINE FOR INJ</td>
<td>Varicella virus, neomycin</td>
</tr>
<tr>
<td>VARIVAX VACCINE</td>
<td>Varicella virus</td>
</tr>
<tr>
<td><strong>Combination vaccine: Measles, mumps, rubella and varicella vaccine (MMRV)</strong></td>
<td></td>
</tr>
<tr>
<td>PRIORIX-TETRA VACCINE</td>
<td>Measles virus, mumps virus, rubella virus, varicella virus, neomycin</td>
</tr>
<tr>
<td>PROQUAD VACCINE</td>
<td>Measles virus, mumps virus, rubella virus, varicella virus, neomycin</td>
</tr>
</tbody>
</table>

6.14.3. Immunogenicity and efficacy

**Monovalent varicella vaccine**

- Immunity induced by one dose of monovalent varicella vaccine (mVV) appears to be long-lasting. Studies indicated that the effectiveness of one and two doses mVV in children were 80-85% and 98% against all varicella
- Studies have shown that a second dose of varicella vaccine boosts immunity and reduces breakthrough disease in children.
Breakthrough varicella infection can develop after vaccination. It is usually mild and may not associate with fever. There are fewer skin lesions, generally fewer than 50 and many of which are maculopapular rather than vesicular.\(^1\)

There are no data on interchangeability of different brands of vaccine, but it is likely that a course can be completed effectively with a different brand of vaccine.\(^5\)

**Combined measles, mumps, rubella and varicella vaccine (MMRV)**

- MMRV vaccine was licensed on the basis of equivalence of immunogenicity of the antigenic components. Clinical studies involving healthy children aged 12–23 months indicated that those who received a single dose of MMRV vaccine developed similar levels of antibody to measles, mumps, rubella and varicella as children who received MMR and varicella vaccines concomitantly as separate injections.\(^1\)
- An open, randomized, controlled multicenter study conducted in Germany and Austria showed that injection of 2 doses of the combined MMRV vaccine was as immunogenic and well-tolerated as separate injections of MMR and varicella vaccine.\(^6\)

**6.14.4. Schedule**

- The vaccination schedule recommended by the Scientific Committee of Vaccine Preventable Disease (SCVPD) consists of a 2-dose varicella-containing vaccine. To fit into the existing Childhood Immunisation Programme schedule, the SCVPD recommended the first dose of varicella-containing vaccines at 12 months of age and a second dose when these children reach primary One.\(^4\)
- Since mVV and MMRV are both effective, either MMR and mVV or MMRV may be used for the two doses. However, in view of the increased risk of febrile seizures following the first dose MMRV vaccination in young children, providers who are considering administering MMRV to children aged below 48 months should discuss the benefits and risks of both vaccination options with the parents or caregivers.\(^4\) (also see section 6.14.6)
- According to CDC, varicella vaccine has been shown to be safe and effective in healthy children when administered at the same time with MMR at separate sites and with separate syringes. If varicella-containing vaccine and another live parenteral vaccine e.g. MMR vaccine are not administered at the same visit, they should be separated by at least 28 days.\(^1\) (Also see Chapter 3.2.2)

**Post-exposure prophylaxis\(^{1,3}\)**

- Single antigen varicella vaccine can be used for post-exposure prophylaxis and chickenpox outbreak control in healthy persons if used within 3 days, and possibly up to 5 days, after exposure. If exposure to varicella does not cause infection, post-exposure vaccination should induce protection against subsequent exposure. If the exposure results in infection, there is no evidence that administration of varicella vaccine during the incubation period or prodromal stage of illness increases the risk for vaccine-associated adverse reactions.
- During a varicella outbreak, persons who have received one dose of varicella vaccine should receive a second dose, provided the appropriate vaccination interval has elapsed since the first dose.
6.14.5. **Contraindication and precaution**

- For MMRV vaccine, see below and also refer to Chapter 6.4.5.

**Contraindications:**

1. History of severe allergic reaction following a prior dose of vaccine or to a vaccine component (other than egg protein for MMRV). Monovalent varicella vaccine *does not* contain egg protein.\(^1\) For MMRV, the measles and mumps components are produced in chick embryo cell culture and may contain traces of egg protein. However, the amount of egg protein in the vaccine appears to be insufficient to cause an allergic reaction in egg-allergic individuals. Therefore, MMRV can be administered in the routine manner to people who have a history of anaphylactic hypersensitivity to eggs.\(^7\)

2. Women who are pregnant. Avoidance of pregnancy for one to three months after vaccination is recommended by different authorities.\(^1,3,4,8\) If there is doubt, it is generally recommended that pregnancy should be avoided for 3 months following last dose of varicella vaccine. Breast-feeding women can be vaccinated if indicated.\(^4\)

**Precautions: \(^1,3\)**

1. Moderate or severe acute illness.
2. Immunosuppressed patients. Seek advice from a specialist if vaccination is required.\(^4\)
3. Recent administration of blood products.
4. Untreated active tuberculosis.
5. Personal or family (i.e. sibling or parent) history of seizures of any aetiology (for MMRV vaccine only).\(^1,9\)
6. Salicylates should be avoided for 6 weeks after administration of varicella or MMRV vaccine because of the association between salicylates use and Reye syndrome following wild-type of chickenpox infection in children as recommended by the vaccine manufacturer.\(^1,3\)

7. In general, other live vaccines not administered on the same day as varicella or MMRV vaccine should be administered at least 4 weeks apart.

6.14.6. **Adverse events following immunisation (AEFI)**

**AEFI of varicella vaccine**

1. Local reactions (pain, erythema)
   - Frequency: 19% in children; 24% following 1st dose and 33% following 2nd dose in adolescents and adults.\(^1,3\)
   - Usually mild and self-limiting.\(^1\)
2. Generalised rash\(^1,3\)
   - Frequency: 4-6%
   - Most are maculopapular, occur within 3 weeks.
3. Fever\(^1\)
   - Frequency: 15% in children; 10% in adolescents and adults.
   - Occur within 42 days of vaccination. Majority have been attributed to concurrent illness rather than to the vaccine.
4. Serious adverse effects are rare\(^3\)
**AEFI of MMRV**

- Also see above.
- Post-licensure studies suggest that the use of the two MMRV (both ProQuad® and Priorix-Tetra®) among young children results in a higher risk for fever and febrile seizures during the 5-12 days after the first dose compared with the use of MMR and mVV at the same visit.\(^4\) Higher rate of fever, measles-like rash and febrile convulsion (one extra febrile convulsion for every 2 300–2 600 doses of the MMRV vaccine ProQuad®) within 5-12 days after vaccination was observed in trials of ProQuad® involving children aged 12-23 months, as compared with giving MMR and single antigen varicella vaccine at the same time but at separate sites.\(^{19}\) Both fever and rash resolved with no long-term sequelae. One study also showed a statistically non-significant increased risk of febrile seizures with the MMRV vaccine Priorix-Tetra® compared to MMR and mVV given as two separate vaccines administered concomitantly.\(^7\) Data do not suggest that children 4–6 years of age who received the second dose of MMRV vaccine had an increased risk for febrile seizures after vaccination compared with children the same age who received MMR vaccine and varicella vaccine administered as separate injections at the same visit.\(^{49}\)

**Transmission of vaccine virus and risk of herpes zoster**

- Transmission of vaccine virus from immunocompetent vaccinees to susceptible close contacts has infrequently been documented but the risk is very low.\(^{1,3,4}\)

**References**


7. Vaccine information for parents / carers

(Please refer to Annex 2 Table 64 for information of vaccines included in the Childhood Immunisation Programme and Table 65 for information of seasonal influenza vaccine and hepatitis A vaccine.)
**Haemophilus Influenzae** Type b Vaccine

*Haemophilus influenzae* type b disease
Invasive *Haemophilus influenzae* type b (Hib) infection is a disease caused by bacteria. It is transmitted through direct contact with nose and throat secretions of infected persons. Meningitis is one of the most invasive and life-threatening infections associated with Hib infection.

*Haemophilus influenzae* type b vaccine (*Hib vaccine*)

A. **Why get vaccinated?**
Hib vaccine is effective against severe *Haemophilus influenzae* type b infection. Parents can consult their primary care providers if they wish to get their children immunised for individual protection.

B. **If I decide to get my child vaccinated, what is the schedule?**
Different countries may use different schedules. Hib vaccine can be given at the same time with other childhood vaccines. Please consult your primary care provider.

C. **Some individuals should NOT get Hib vaccine or should wait**
1. Children who have ever had a life-threatening allergic reaction to a previous dose of Hib vaccine or its components should not get another dose.
2. Children less than 6 weeks of age.
3. Children who are moderately or severely ill at the time the shot is scheduled should usually wait until they recover before getting Hib vaccination.

D. **What are the possible adverse effects of Hib vaccine?**
- As with any medicine, Hib vaccine carries a small risk of adverse reaction.
- Most people have no serious reactions after receiving Hib vaccine. Occasionally there may be mild local reaction such as pain, redness or swelling around the injection site, but these will gradually subside in a few days. Systemic reactions such as fever and irritability occur infrequently.
- If the child develops breathing difficulty or coma (which are extremely rare) after vaccination, please bring him/her to the Accident & Emergency Department of hospitals for management.

If you have any query, please consult your primary care provider.
乙型流感嗜血桿菌疫苗

乙型流感嗜血桿菌感染

乙型流感嗜血桿菌感染是一種細菌性疾病，可透過直接接觸患者的口鼻分泌物的飛沫而傳播。入侵性乙型流感嗜血桿菌感染可導致腦膜炎，病情嚴重的話可導致死亡。

乙型流感嗜血桿菌疫苗

甲. 考慮接受疫苗

乙型流感嗜血桿菌疫苗能夠有效地預防嚴重的乙型流感嗜血桿菌感染。家長如希望保障子女免受感染，為他們接種這種疫苗，可先諮詢你的家庭醫生意見。

乙. 接受疫苗的時間

不同的國家可能會使用不同的接種時間表。乙型流感嗜血桿菌疫苗可與其他兒童疫苗一起接種。請諮詢你的家庭醫生。

丙. 不宜或暫時避免接受疫苗的人士

一. 接受乙型流感嗜血桿菌疫苗後或對疫苗所含的任何成份曾有嚴重的過敏反應。

二. 年齡未滿6周的嬰兒。

三. 那些在預定接種疫苗時患有中等或嚴重疾病的兒童通常應該等到痊癒後再接種。

丁. 接受疫苗後的風險

- 如同所有藥物，乙型流感嗜血桿菌疫苗可能會引起一些不良反應。

- 大多數接受乙型流感嗜血桿菌疫苗注射的人，都不會有嚴重反應。部份人注射部位會出現局部位反應如疼痛及紅腫，數天後會自然消退。其他身體上的不良反應（包括發燒及嬰兒持續哭鬧）較少發生。

- 如發現有呼吸困難、休克等（十分罕見的）情況，請即到急症室求醫。

家長如有任何疑問，請諮詢你的家庭醫生。
Human Papillomavirus Vaccine

**Human papillomavirus**

Human papillomavirus (HPV) is the name of a group of viruses that includes more than 100 types. Of these 100 subtypes, 40 can infect the urogenital tract, which are mostly transmitted during sexual contact. It is a very common infection that may affect any woman who has been sexually active. Most people who become infected with HPV will not have any symptoms and will clear the infection on their own. Some of these viruses are called “high-risk” or “oncogenic” types and persistent infection may lead to cervical and anogenital cancers. Others are called “low-risk” or “non-oncogenic” types and they may cause genital warts. HPV infection is now regarded as a necessary but not a sole factor for cervical cancer.

**Human papillomavirus vaccine (Cervical cancer vaccine)**

A. **Why get vaccinated?**

HPV vaccine is a prophylactic vaccine developed to prevent about 70-90% of cervical cancer by preventing infection by high risk HPV types. It is most effective in women who have never been exposed to HPV infections. Some vaccines also prevent infection by “low-risk” types of HPV and hence reduce the risk of genital warts. Vaccination cannot replace safe sex and cervical smear examination in women.

B. **If I decide to get my child vaccinated, what is the schedule?**

The desirable age of vaccination is before commencement of sexual activity. It consists of a series of 3 injections given within 6 months depending on the type of vaccines. Alternatively, the vaccines can be given by a series of 2 injections according to the age of the individual. Please consult your primary care provider.

C. **Some individuals should NOT get cervical vaccine or should wait**

1. Individuals who have ever had a life-threatening allergic reaction to a previous dose of HPV vaccine or its components should not get another dose.
2. Individuals who are moderately or severely ill at the time the shot is scheduled should usually wait until they recover before getting HPV vaccination.

D. **What are the possible adverse effects of HPV vaccine?**

- As with any medicine, HPV vaccine carries a small risk of adverse reaction.
- Most people have no serious reactions after receiving HPV vaccine. Occasionally there may be mild local reaction such as pain, redness or swelling around the injection site, but these will gradually subside in a few days. Systemic reactions such as fever occur less commonly.
- If the child develops breathing difficulty or coma (which are extremely rare) after vaccination, please bring him/her to the Accident & Emergency Department of hospitals for management.

If you have any query, please consult your primary care provider.
人類乳頭瘤病毒疫苗

人類乳頭瘤病毒 (HPV) 是一種包括 100 多種類型的病毒，而其中 40 種類型可透過性接觸感染泌尿生殖道。它是一種常見的傳染病，有機會影響任何有性生活的婦女。大部分受人類乳頭瘤病毒感染的患者沒有任何病徵，而且感染亦常會自然清除。有些人類乳頭瘤病毒被列為「高風險病毒類型」或「致癌病毒類型」，持續感染可以引致子宮頸和生殖器癌。其他的被稱為「低風險病毒類型」或「非致癌病毒類型」，它們與性病疣有關。現時，人類乳頭瘤病毒感染被認為是導致子宮頸癌的必需但並非唯一的原因。

人類乳頭瘤病毒疫苗（子宮頸癌疫苗）

甲. 考慮接受疫苗
人類乳頭瘤病毒疫苗是一種預防性疫苗。它能預防因高風險病毒類型 HPV 感染而引致佔總數七至九成的子宮頸癌。人類乳頭瘤病毒疫苗對從未感染人類乳頭瘤病毒的女性最為有效。部份疫苗亦會對低風險病毒類型有預防功效，從而減低染上性病疣的機會。預防疫苗並不可以取締子宮頸細胞檢驗及安全性行為。

乙. 接受疫苗的時間
人類乳頭瘤病毒疫苗最好在開始性行為之前接種。視乎所接種疫苗的種類，兒童須在六個月內接受三次疫苗注射，或可根據接受疫苗者的年齡考慮接受兩次疫苗注射，請諮詢你的家庭醫生。

丙. 不宜或暫時避免接受疫苗的人士
一. 接受人類乳頭瘤病毒疫苗後或對疫苗所含的任何成份曾有嚴重的過敏反應。
二. 那些在預定接種疫苗時患有中等或嚴重疾病的人士通常應該等到痊癒後再接種。
三. 懷孕的婦女。

丁. 接受疫苗後的風險
- 如同所有藥物，人類乳頭瘤病毒疫苗可能會引起一些不良反應。
- 大多數接受人類乳頭瘤病毒疫苗注射的人，都不會有嚴重反應。部份人注射部位會出現局部反應如疼痛及紅腫，數天後會自然消退。其他身體上的不良反應（包括發燒）較少發生。
- 如發現有呼吸困難、休克等（十分罕見的）情況，請立即到急症室求醫。

家長如有任何疑問，請諮詢你的家庭醫生。
Japanese Encephalitis Vaccine

Japanese encephalitis (JE)

Japanese encephalitis is a mosquito-borne disease caused by the Japanese encephalitis virus. Mild infections may occur without apparent symptoms other than fever with headache. Less than 1% of people infected with Japanese Encephalitis virus develop clinical disease. More severe infection is marked by quick onset of headache, high fever, neck stiffness, impaired mental state, coma, tremors, occasional convulsions (especially in children) and paralysis.

Avoiding the bite of mosquito is the first line and the best defense against contracting Japanese Encephalitis. Travellers may protect themselves by taking precautions in preventing mosquito bites, such as wearing loose light-coloured long-sleeved shirts and trousers, resting in air-conditioned or well-screened rooms, or using insect repellents containing DEET on exposed skin and clothings. The second line of defense is vaccination. Please see the details below.

Japanese encephalitis vaccine
A. Who may get vaccinated?

Japanese encephalitis vaccination is recommended for travellers who plan to stay one month or longer in Japanese encephalitis-endemic countries, particularly in rural areas, and for short-term (less than one month) travellers if they plan to have significant extensive outdoor or night-time exposure in rural areas during the transmission season. Two types of Japanese encephalitis vaccine are available –

Inactivated vaccine - the immunisation schedule for travelers aged 18 or above is 2 doses administered on days 0 and 28. The 2-dose series should be completed at least 1 week before travel.

Live attenuated vaccine - One dose for individuals 12 months of age and over. The vaccine generally starts to be protective 14 days after administration for adult populations while 28 days after administration for paediatric populations.

Traveller travelling to areas with high risk of infection should contact the Travel Health Centres of Department of Health (www.travelhealth.gov.hk) or family doctor providing travel health service for further recommendation of travel health measures required at least 6 weeks before departure.
B. Some individuals should NOT get JE vaccine or should wait

- Acute infection and fever
- Severe allergic reactions to vaccine components or prior dose Congenital or acquired immune deficiency
- Pregnancy / breast-feeding women
- Persons with a history of allergic disorders
- (For live attenuated vaccine) Previous treatment with high doses of systemic corticosteroids given for 14 days or more
- (For live attenuated vaccine) Received another live vaccine in previous 4 weeks

C. What are the possible adverse effects of JE vaccine?

As with any medicine, JE vaccine carries a small risk of adverse reaction.

Most people have no serious reactions after receiving JE vaccine. Occasionally there may be mild local reaction such as pain, redness or swelling around the injection site. Systemic reactions such as chills, headache and fever are also possible.

If the individual develops breathing difficulty or coma (which are extremely rare) after vaccination, please bring him/her to the Accident & Emergency Department of hospitals for management.

If you have any query, please consult your primary care provider or Travel Health Service, Department of Health.
日本腦炎

日本腦炎是由蚊傳播的日本腦炎病毒所引起的疾病。病情輕微者除發燒及頭痛外，一般不會有其他顯著病徵。受日本腦炎病毒感染者少於 1% 的人會有發燒。病情嚴重者發病較快，並出現頭痛、發高燒、頸部僵硬、神志不清、昏迷、震顫、抽搐（尤其是兒童）及癱瘓等症狀。

要預防日本腦炎，最重要及最佳的方法是避免被蚊子叮咬。以下是一些旅行者應採取的預防措施：時常穿著寬鬆、淺色的長袖上衣及長褲，住宿於有空調或裝有防蚊網的地方，或於外露的皮膚及衣服上塗上含有避蚊胺（即 DEET）驅蚊劑。

第二個預防方法是接受預防疫苗，下文會作詳細介紹。

日本腦炎疫苗

甲．哪些人士需要接種日本腦炎疫苗？

打算前往日本腦炎流行國家的旅客，特別是計劃在郊區逗留一個月或以上的人士便應接種日本腦炎疫苗。短期旅遊（不足一個月）的旅客，如果計劃於傳播季節在郊區進行長時間戶外或夜間活動，亦應接種疫苗。

現時有兩種預防疫苗，分別為滅活和減活疫苗。

滅活疫苗——十八歲或以上的旅客應於 0 及 28 天注射共兩針的日本腦炎疫苗，並要在出發前最少一星期注射完畢。

減活疫苗——年齡十二個月或以上人士可接受注射。成人一般於接種疫苗後 14 天獲得合適的保護，而兒童一般需要 28 天。

旅客如需到訪疫區，可在出發前最少六星期向衞生署的旅遊健康中心或有提供旅遊健康服務的家庭醫生作出進一步的查詢。

乙．不宜或暫時避免接受疫苗的人士

- 有急性感染及發燒的人士
- 對日本腦炎疫苗或疫苗所含的任何成份曾出現嚴重過敏反應的人士
- 免疫系統減弱的人士懷孕或餵哺母乳的婦女
- 過去曾有過敏病症的人士
- (特別就滅活日本腦炎疫苗而言) 過去曾接受連續十四天或以上的高劑量類固醇治療
- (特別就滅活日本腦炎疫苗而言) 過去四星期曾接種其他活性病毒疫苗
丙．副作用

如同所有藥物，日本腦炎疫苗可能會引起一些不良反應。大多數接受日本腦炎疫苗注射的人士，都不會有嚴重反應。部份人士注射部位會出現不同程度的紅腫和疼痛，也可能有發冷、頭痛及發燒等情況。

如發現有呼吸困難、休克等（十分罕見的）情況，請即到急症室求醫。

家 長 如 有 任 何 疑 問 ，
請 諮 詢 你 的 家 庭 醫 生或 衛 生 署 旅 遊 健 康 中 心 。“
Meningococcal Vaccine

Meningococcal disease
Meningococcal infection is an illness caused by bacteria. It can be transmitted by direct contact through droplets of respiratory secretions from infected persons. The bacteria can cause septicaemia (a form of blood poisoning), meningitis, and even death. Invasive meningococcal disease is uncommon in Hong Kong. The risk of acquiring meningococcal infection while travelling is low in general and the incidence is highest in the sub-Saharan Africa during the dry season (December to June). The risk of meningococcal infection can be minimised by maintaining personal hygiene and avoiding crowded places and contact with infected patients.

Meningococcal vaccine
A. Who may get vaccinated?
Meningococcal vaccine is recommended for those who travel to high risk areas. Please consult Travel Health Centre of Department of Health (www.travelhealth.gov.hk) or family doctor providing travel health service for further recommendation of travel health measures required.

B. Some individuals should NOT get meningococcal vaccine or should wait
1. Individual who have ever had a life-threatening allergic reaction to a previous dose of meningococcal vaccine or its components should not get another dose.
2. Individual who are moderately or severely ill at the time the shot is scheduled should usually wait until they recover before getting meningococcal vaccination.

C. What are the possible adverse effects of meningococcal vaccine?
- As with any medicine, meningococcal vaccine carries a small risk of adverse reaction.
- Most people have no serious reactions after receiving meningococcal vaccine. Occasionally there may be mild local reaction such as pain, redness or swelling around the injection site, but these will gradually subside in a few days. Systemic reactions such as mild fever can also occur.
- If the individual develops breathing difficulty or coma (which are extremely rare) after vaccination, please bring him/her to the Accident & Emergency Department of hospitals for management.

If you have any query, please consult your primary care provider or Travel Health Service, Department of Health.
腦膜炎雙球菌疫苗

腦膜炎雙球菌感染是一種經由直接接觸感染者口鼻分泌物飛沫而傳播的細菌性疾病，可導致敗血症及腦膜炎，嚴重者可以致命。腦膜炎雙球菌感染在本港並不常見。一般而言，在旅途中感染腦膜炎雙球菌的風險很低。但在旱季（十二月至六月）前往非洲撒哈拉沙漠以南的旅遊人士，感染此病的機會較高。注意個人衛生和避免到人多擠迫的地方或接觸病人能減低染上流行性腦膜炎的機會。

腦膜炎雙球菌疫苗

甲．考慮接受疫苗

旅客如需到訪腦膜炎雙球菌感染疫區，可在出發前向衛生署的旅遊健康中心或有提供旅遊健康服務的家庭醫生作出進一步的查詢。

乙．不宜或暫時避免接受疫苗的人士

一．接受腦膜炎雙球菌疫苗後或對疫苗所含的任何成份曾有嚴重的過敏反應。

二．那些在預定接種疫苗時患有中等或嚴重疾病的人士通常應該等到痊癒後再接種。

丙．接受疫苗後的風險

・如同所有藥物，腦膜炎雙球菌疫苗可能會引起一些不良反應。

・大多數接受腦膜炎雙球菌疫苗注射的人，都不會有嚴重反應。

・部份人注射部位會出現局部反應如疼痛及紅腫，數天後會自然消退。其他身體上的不良反應（包括輕度發燒）亦有可能發生。

・如發現有呼吸困難、休克等（十分罕見的）情況，請即到急症室求醫。

家長如有任何疑問，
請諮詢你的家庭醫生或衛生署旅遊健康中心。
Rotavirus Vaccine

Rotavirus gastroenteritis
Rotavirus is one of the most common causes of diarrhoea among children worldwide. Transmission can occur through ingestion of contaminated water or food and contact with contaminated surfaces. The disease is characterised by vomiting and watery diarrhoea, often with fever and abdominal pain. It is usually a self-limiting illness, but can occasionally associate with severe complications and dehydration especially in young children. Observation of good personal, food and environmental hygiene is an effective method for preventing rotavirus infection.

Rotavirus vaccine
A. Why get vaccinated?
The currently registered rotavirus vaccines are oral (swallowed) vaccines and they are effective in preventing severe rotavirus disease. Parents should consult doctors before getting their children immunised for individual protection.

B. If I decide to get my child vaccinated, what is the schedule?
Rotavirus vaccine can be given at the same time with other childhood vaccines. Please consult your primary care provider.

C. Some individuals should NOT get rotavirus vaccine or should wait
1. Children who have ever had a life-threatening allergic reaction to a previous dose of rotavirus vaccine or its components should not get another dose.
2. Children with “severe combined immunodeficiency syndrome” (SCID).
3. Altered immunocompetence other than SCID. Check with your doctor for precaution of vaccinations if your child’s immune system is weakened.
4. Children who has ever had intussusception (a type of bowel blockage disease)
5. Children who are suffering from acute, moderate or severe gastroenteritis or other acute illness should usually wait until they recover before getting rotavirus vaccine.

D. What are the possible adverse effects of rotavirus vaccine?
● As with any medicine, rotavirus vaccine carries a small risk of adverse reaction.
● Most children have no serious reactions after receiving rotavirus vaccine. Occasionally there may be mild and temporary diarrhoea, vomiting, irritability or fever after vaccinations.
● Available data suggests that rotavirus vaccines exhibit a good safety profile, but may be associated with an increased risk of intussusception after the first dose of vaccine in some populations.
● If the child develops breathing difficulty or coma (which are extremely rare) after vaccination, please bring him/her to the Accident & Emergency Department of hospitals for management.

If you have any query, please consult your primary care provider.
輪狀病毒感染

輪狀病毒是全球引致兒童腹瀉的最常見病因之一。病毒主要透過口鼻途徑傳播，可經飲用或進食受污染的食物。輪狀病毒的主要症狀以嘔吐及水狀腹瀉為主，並經常有發燒及腹痛等症狀。身體健康的人感染了輪狀病毒，病徵一般會自行消退，但幼童偶爾會出現嚴重脫水的情況。保持良好的個人、食物及環境衛生是預防輪狀病毒感染的有效方法。

輪狀病毒疫苗

甲、考慮接種疫苗
目前註冊的輪狀病毒疫苗是口服（吞嚥）疫苗，它們都能有效地預防嚴重的輪狀病毒感染。家長如希望保障子女免受感染，為他們接種這種疫苗，可先諮詢你的家庭醫生意見。

乙、接種疫苗的時間
輪狀病毒疫苗可與其他兒童疫苗一起接種。請諮詢你的家庭醫生。

丙、不宜或暫時避免接種疫苗的人士
一。接種輪狀病毒疫苗後或對疫苗所含的任何成份曾有嚴重的過敏反應。
二。患有「嚴重複合免疫缺乏症」(SCID) 的嬰兒。
三。患有 SCID 以外的免疫系統疾病。如孩子的免疫系統減弱，請向醫生洽詢你的孩子是否適合接種疫苗。
四。曾經有過腸套疊 (一種腸道阻塞疾病) 的孩子。
五。那些在預定接種疫苗時患有中等或嚴重胃腸炎或其他疾病的孩子通常應該等到痊癒後再接種。

丁。接種疫苗後的風險
• 如同所有藥物，輪狀病毒疫苗可能會引起一些不良反應。
• 大多數接種輪狀病毒疫苗的兒童都不會有嚴重反應。
• 部份兒童在接種後可能會出現輕微短暫性的腹瀉、嘔吐、發燒或哭鬧。
• 跟據現有的數據，輪狀病毒疫苗附合安全標準，但對於某些兒童在接種第一劑疫苗後，可能有增加腸套疊的風險。如發現有呼吸困難、休克等 (十分罕見的) 情況，請即到急症室求醫。

家長如有任何疑問，請諮詢你的家庭醫生。
8. Opportunistic preventive care in primary care setting

Primary care is the first point of contact in the health care system and serves an important role in preventive care for children. Every encounter with children or their parents / caregivers can be an opportunity of offering age-appropriate disease prevention and health promotion service, as well as identifying high risk individuals proactively.

Ideally, primary care providers should provide opportunistic preventive care in every patient visit. When a child attends a clinic for vaccinations or any other issues, it provides a good opportunity for primary care providers to give anticipatory or preventive care in accordance to child’s life stage. Primary care providers should check the child’s current vaccination status and work out a catch-up schedule if there is any missed or delayed vaccination. Barriers or reasons of missed or delayed vaccination should be explored. Information on vaccines and reminder of adherence to the immunisation schedule should be given accordingly. Growth monitoring and developmental surveillance can be incorporated in immunisation visits. Any concerns or problems arise should be addressed promptly and appropriately. Advice and guidance on nutrition, physical activities, parenting, mental and psychological health can also be provided opportunistically.

The following tables can be used as checklists for immunisation and opportunistic preventive care that can be provided by primary care provider during encounter.
### Table 49. Immunisation and opportunistic care for children from birth through 6 months old

<table>
<thead>
<tr>
<th>Age-appropriate Immunisations</th>
<th>Birth</th>
<th>1 month</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCG*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTaP-IPV*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Schedule recommended by the Scientific Committee of Vaccine Preventable Diseases**

<table>
<thead>
<tr>
<th>Development</th>
<th>Birth</th>
<th>1 month</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross and fine motor</td>
<td>Spontaneous and symmetrical movements of 4 limbs</td>
<td>Hip examination</td>
<td>Keep head in midline when lie supine</td>
<td>Opens hands occasionally</td>
</tr>
<tr>
<td>1</td>
<td>Communication/language Social behavior</td>
<td>Cries to indicate needs</td>
<td>Responsive to calming actions when upset</td>
<td>Brief eye contact</td>
<td>Social responsive smile</td>
</tr>
<tr>
<td>3</td>
<td>Hearing Vision</td>
<td>Screen for red reflex</td>
<td>Weight / percentile</td>
<td>Length / percentile</td>
<td>Head circumference</td>
</tr>
<tr>
<td>5</td>
<td>Opportunistic guidance and advice</td>
<td>Promote exclusive breastfeeding</td>
<td>Advise on oral and dental care</td>
<td>Advise on measures to prevent sudden infant death syndrome and injuries</td>
<td>Encourage and assist parents who smoke to quit smoking</td>
</tr>
</tbody>
</table>

**2-dose regimen separated by at least 28 days for vaccine naïve children below 9 years. Children below 9 years who have properly received one or more doses of seasonal influenza vaccine in any previous season are recommended to receive one dose in the current season.**

**The Government is providing subsidised seasonal influenza vaccination under the Childhood Influenza Vaccination Subsidy Scheme to Hong Kong children aged between 6 months and less than 6 years or those attending a kindergarten or child care centre in Hong Kong. Some children may also be eligible for free seasonal influenza vaccination under Government Vaccination Programme.**

†Reference from the Developmental Surveillance Scheme of the Family Health Service, Department of Health.
### Table 50: Immunisation and opportunistic care for children from 12 months through 6 years old

<table>
<thead>
<tr>
<th>Immunisations (* schedule recommended by the Scientific Committee of Vaccine Preventable Diseases)</th>
<th>12 months</th>
<th>15 months</th>
<th>18 months</th>
<th>19-23 months</th>
<th>2-3 years</th>
<th>4-6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Booster PCV*</td>
<td>□ Booster DTaP-IPV*</td>
<td>□ 2nd MMR* (Primary 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ 1st MMR*</td>
<td>□ Booster DTaP-IPV*</td>
<td>□ 2nd varicella vaccine* (Primary 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ 1st Varicella vaccine*</td>
<td>□ DTaP-IPV*</td>
<td>□ Booster DTaP-IPV*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Government is providing subsidised seasonal influenza vaccination under the Childhood Influenza Vaccination Subsidy Scheme to Hong Kong children aged between 6 months and less than 6 years or those attending a kindergarten or child care centre in Hong Kong. Some children may also be eligible for free seasonal influenza vaccination under Government Vaccination Programme.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other immunisations**

**Development?**

| 1 Gross and fine motor | □ Cruises along furnitures | □ Holds crayons to make some strokes | □ Walks fast with crayons | □ Walks up and down stairs with simple shapes |
| 2 Communication/language | □ Points for needs | □ Says at least 6 words with meaning | □ Says more single words | □ Uses short phrases/sentences |
| Social behavior | □ Says “dada” and “mama” | □ Shows pretend play e.g. with tea-set or doll | □ Shows tantrums | □ Asks many questions |

| 4 Cognitive | □ Find hidden toys | □ Starts to know sorting objects by size and shape | □ Sort shapes and size | □ Understands “big” and “small” |
| 5 Hearing and vision | □ Any parental concerns | □ Any parental concerns | □ Any parental concerns | □ Any parental concern |
| 6 Self care | □ Drinks from trainer cup | □ Drinks from a cup | □ Feeds self with spoon | □ Feeds self independently |
| 7 Specific parental concern | □ Finger feeds | □ Feeding self with spoon | □ Indicates toilet | □ Dry by day |

**Growth**

<table>
<thead>
<tr>
<th></th>
<th>Weight/percentile</th>
<th>Weight/percentile</th>
<th>Weight/percentile</th>
<th>Weight / percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-23 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Nutrition and feeding**

<table>
<thead>
<tr>
<th></th>
<th>Feeding history:</th>
<th>Feeding history:</th>
<th>Feeding history:</th>
<th>Diet history:</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-23 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Opportunistic guidance and advice**

<table>
<thead>
<tr>
<th></th>
<th>□ Promote continuation of breastfeeding</th>
<th>□ Give advice on healthy balanced diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-23 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Visit date**

---

**Notes:**

- **The Government is providing subsidised seasonal influenza vaccination under the Childhood Influenza Vaccination Subsidy Scheme to Hong Kong children aged between 6 months and less than 6 years or those attending a kindergarten or child care centre in Hong Kong. Some children may also be eligible for free seasonal influenza vaccination under Government Vaccination Programme.**

- **Reference from the Developmental Surveillance Scheme of the Family Health Service, Department of Health**
Table 51. Immunisation and opportunistic care for children from 7 years through 12 years old

<table>
<thead>
<tr>
<th>7 years</th>
<th>8 years</th>
<th>9 years</th>
<th>10 years</th>
<th>11 years</th>
<th>12 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other immunisations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Immunisation:** A 2-dose regimen separated by at least 28 days for vaccine naïve children below 9 years. Children below 9 years who have properly received one or more doses of seasonal influenza vaccine in any previous season are recommended to receive one dose in the current season.

  - For persons aged 9 years or above, one dose is recommended.

- **Growth:**
  - **Weight / Height:**
    - 7y
    - 8y
    - 9y
    - 10y
    - 11y
    - 12y

- **BMI / Percentile:**
  - 7y
  - 8y
  - 9y
  - 10y
  - 11y
  - 12y

- **Opportunistic guidance and advice:**
  - 7y
  - 8y
  - 9y
  - 10y
  - 11y
  - 12y

- **Visit date:**
  - 7y
  - 8y
  - 9y
  - 10y
  - 11y
  - 12y

  - **Advise on healthy balanced diet:**
  - **Encourage physical activities:**
  - **Advise on oral and dental care:**
  - **Deliver injury prevention advice:**
  - **Provide a safe, secure and loving environment:**
  - **Encourage and assist parents who smoke to quit smoking:**
  - **Encourage development of positive psychological and emotional style and promote essential social and emotional life skills:**
  - **Promote age-appropriate positive parenting practices:**
  - **Encourage parents to play with their children, be involved with their child’s school and get to know their child’s friends:**
  - **Assess mental and psychosocial well-being of parents and offer help if necessary:**
  - **Ask about progress at school:**
  - **Elicit parents’ concern about their child’s development:**
  - **Elicit parents’ concern about emerging behavioural or emotional problems in their child:**
  - **Advise on sexual health issues:**
  - **Advise to abstain from smoking, alcohol and illicit drug use:**
9. Consideration for referral

Individuals who have special vaccination requirements would warrant advice and care from appropriate specialists. Children with special conditions who may need referrals will be discussed below.

9.1. Children who have had a serious adverse event following immunisation (AEFI)

- All vaccines are contraindicated in those who have had a confirmed anaphylactic reaction to a previous dose of vaccine containing the same antigen or vaccine components.\(^2\)
- Children who have had a serious AEFI other than a contraindication (such as anaphylaxis) may be subsequently vaccinated under close medical supervision after being reviewed by relevant experts such as paediatrician or infectious disease specialist.\(^1\)

9.2. Preterm babies

- Despite their immunological immaturity, they generally respond well to vaccines. They should be vaccinated according to the recommended schedule at the usual chronological age unless contraindicated.
- The occurrence of apnoea following vaccination is especially increased in infants who were born very prematurely.\(^3\)
- As the benefit of vaccination is high in preterm infants, vaccination should not be withheld or delayed.\(^3\)
- Very premature infants (born ≤ 28 weeks of gestation) who are in hospital should have respiratory monitoring for 48-72 hours when given their first immunisation, particularly those with a previous history of respiratory immaturity. If the child has apnoea, bradycardia or desaturation after the first immunisation, the second immunisation should also be given in hospital, with respiratory monitoring for 48-72 hours.\(^3\)

9.3. Children with impaired immunity due to disease or treatment

- The immune response to vaccines in children with impaired immune system may be inadequate and there is a risk that some live attenuated vaccines may cause progressive infection.\(^1\) When considering a vaccination schedule, the degree of impaired immunity should be taken into account, as should the risk of acquiring the vaccine-preventable diseases.\(^1\)
- Primary care providers may refer to Chapter 3.1.1 regarding the categories of patients considered to be immunosuppressed.
9.4. Children with special medical conditions

- Some medical conditions increase the risk of complications from specific infectious diseases.\(^3\) Examples of vulnerable groups indicated for immunisation:
  - Asplenia or splenic dysfunction
  - Cochlear implants
  - Complement deficiency
  - Haemodialysis
  - Haemophilia
  - Chronic medical conditions (respiratory, heart, kidney and liver disease and diabetes)

9.5. Children with bleeding disorders

- Intramuscular (IM) injection may lead to haematoma formation or other complications in children with bleeding disorders. The subcutaneous route could be considered as an alternative in these children.\(^1\) Expert advice (e.g. haematologist) should be sought in providing immunisation for children with the following disorders:
  - Disorders of haemostasis
  - Severe coagulopathies
  - On warfarin
  - Thrombocytopenia with platelet counts of less than 50 x 10^9/L

9.6. Children travelling overseas

- All children travelling overseas should be up-to-date with the Childhood Immunisation Programme in Hong Kong.
- Travel related health risk should be considered individually for each traveller, in the context of the specific itinerary.
- Travel vaccines should be considered according to risk. Priority should be given to vaccines for diseases that are common and of significant impact (such as hepatitis A), and to those diseases which, although less common, have severe potential adverse outcomes (such as Japanese encephalitis).\(^4\)
- Children with immune deficiency, diabetes, serious handicaps and conditions which require frequent blood transfusion should discuss with primary care providers or specialists before travelling to developing countries.
- Ideally the vaccinations should be started early enough to allow sufficient time for adequate immunity to develop and to minimise any adverse events around the time of departure.\(^5\)
- Further information can be sought from Travel Health Service, Department of Health (http://www.travelhealth.gov.hk).
References

10. Other issues

10.1. Updating

The contents of the module on immunisation will be updated regularly, in order to provide the latest evidence-based recommendations for healthcare professionals. However, they are subject to updates and not considered exhaustive. Concerted efforts from experts in various fields are vital.

Readers may wish to note that major updates have been made to the epidemiological information and vaccine characteristics in this edition (ie the 2017 version).

10.2. Interface between different service providers

It is common nowadays for children to receive vaccinations both from public and private sector, as well as both from local and non-local service providers. In the mean time, health records (personal and practice records) play an important role for communication between different service providers. In order to ensure that the child has received all vaccinations that are due, all healthcare professionals should recognise the importance of good record keeping and sharing. Parents and carers should be educated to make sure that all vaccinations received are well-recorded and that such records are well-kept.

The Government’s Electronic Health Record Sharing System (eHRSS) provides a platform for health record sharing between public and private healthcare providers with patients’ consent. By sharing electronic health record with eHRSS, doctors would help building up a lifelong, comprehensive, timely and accurate immunisation and other health record for children, which is always readily accessible by other public and private healthcare providers. For more information or to join eHRSS, please visit http://www.ehealth.gov.hk.
Annex 1: Sample of written protocol for vaccine ordering, receiving, stock rotation and disposal

Name of principal responsible staff: ________________________________

Name of back-up staff: __________________________________________

Vaccine ordering and receiving
1. Contact vaccine suppliers for vaccine with written orders.
2. Avoid overstocking.
3. Vaccines must only be received by the designated staff.
4. Check that the consignment is correct against the delivery invoice and that the vaccines are packed appropriately.
5. Vaccine types, brands, quantities, batch numbers and expiry dates should be recorded with the date, time and the staff involved at which the vaccines were received.
6. Unpack the vaccine as soon as possible. If applicable, check temperature indicators to ensure vaccines have maintained within safe temperature ranges.
7. Transfer vaccines to the refrigerator immediately, minimising the time that the refrigerator door is open. Fresh vaccines should be placed to the rear of the current stock.
8. If you have any concerns about your vaccine delivery, isolate the vaccines in the vaccine refrigerator and contact the supplier as soon as possible after receiving your delivery.

Stock rotation and disposal
1. Perform monthly vaccine stock take, ensure vaccines with the shortest expiry date are stored at the front of the refrigerator.
2. Any expired vaccine should be labelled clearly and removed from the refrigerator immediately.
3. Expired vaccines should be disposed according to guideline from the Environmental Protection Department. Refer to the website:
附錄 1：疫苗訂購、接收、存貨周轉和棄置指引樣本

主要負責人姓名：

後備負責人姓名：

**疫苗的訂購和接收**
1. 以書面訂單和疫苗供應商訂購疫苗。
2. 避免囤積過量疫苗。
3. 只有特定的工作人員可以接收已訂購疫苗。
4. 接收疫苗時，要核對清楚所訂的疫苗是否和發票上所標示的相同，並且檢查放置在運載器具內的疫苗有沒有異常。
5. 記錄已接收疫苗資料，包括種類、生產商、數量、批號和有效日期，和接收疫苗的日期、時間和有關職員名稱。
6. 儘快把疫苗由運載器具裡移至冰箱。如果運載器具裡附有溫度指標，應先檢查其顯示，以確保疫苗保持在適當溫度範圍內。
7. 疫苗移至冰箱時，應減少打開冰箱門的時間。新來貨的疫苗應放置在現有疫苗的後方。
8. 如有任何懷疑，應把有關疫苗隔離而繼續儲存在冰箱內，並儘快聯絡供應商。

**存貨周轉和棄置**
1. 每月 進行盤點，以確保最近有效日期的疫苗儲放在冰箱內較前位置。
2. 清楚標示過期的疫苗，並立即從冰箱內取出。
3. 應根據環境保護署的指引棄置過期疫苗。參閱以下網址：
   
Annex 2: Websites providing practical information related to immunization


Table 52. Resource for vaccine preparation

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Resource</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunization Branch, California Department of Public Health</td>
<td>Preparing Reconstituted Vaccine</td>
<td><a href="http://www.eziz.org/assets/docs/IMM-897.pdf">http://www.eziz.org/assets/docs/IMM-897.pdf</a></td>
</tr>
</tbody>
</table>

Table 53. Resources for route and site of vaccine administration

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Resource</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Identifying the injection site</td>
<td></td>
</tr>
</tbody>
</table>
Table 54. Resource information related to BCG vaccination and chest clinics.

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Resources</th>
<th>Website</th>
</tr>
</thead>
</table>

Table 55. Resource of hepatitis B

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Hepatitis Preventive Service, Department of Health</td>
<td><a href="http://www.info.gov.hk/hepatitis">http://www.info.gov.hk/hepatitis</a></td>
</tr>
<tr>
<td>衛生署病毒性肝炎預防服務</td>
<td></td>
</tr>
</tbody>
</table>

Table 56. Resource of hepatitis A

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Hepatitis Preventive Service, Department of Health</td>
<td><a href="http://www.info.gov.hk/hepatitis">http://www.info.gov.hk/hepatitis</a></td>
</tr>
<tr>
<td>衛生署旅遊健康服務</td>
<td></td>
</tr>
</tbody>
</table>

Table 57. Resource of human papillomavirus and vaccine

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Screening Programme, Department of Health</td>
<td><a href="http://www.cervicalscreening.gov.hk/english/hum/hum.html">http://www.cervicalscreening.gov.hk/english/hum/hum.html</a></td>
</tr>
<tr>
<td>衛生署子宮頸普查計劃</td>
<td></td>
</tr>
</tbody>
</table>

Table 58. Information on countries or areas at risk of Japanese encephalitis

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website</th>
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</thead>
</table>
Table 59. Information of vaccines included in the Childhood Immunisation Programme.

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Vaccine</th>
<th>Links</th>
</tr>
</thead>
</table>
| Family Health Service, Department of Health 衛生署家庭健康服務 | Bacillus Calmette-Guérin (BCG) 卡介苗 | http://www.fhs.gov.hk/english/health_info/child/481.pdf (English)  
| | Hepatitis B (HBV) 乙型肝炎疫苗 | http://www.fhs.gov.hk/english/health_info/child/482.pdf (English)  
| | Diphtheria, tetanus, acellular pertussis and inactivated poliovirus vaccine (DTaP-IPV) 白喉、破傷風、細胞型百日咳及活小兒麻痺混合苗 | http://www.fhs.gov.hk/english/health_info/child/485.pdf (English)  
| | Measles, mumps and rubella vaccine (MMR) 麻疹、流行性腮腺炎及德國麻疹疫苗 | http://www.fhs.gov.hk/english/health_info/child/486.pdf (English)  
| | Pneumococcal conjugate vaccine (PCV) 肺炎球菌結合疫苗 | http://www.fhs.gov.hk/english/health_info/child/480.pdf (English)  
| | Varicella Vaccine 水痘疫苗 | http://www.fhs.gov.hk/english/health_info/child/30004.pdf (English)  

Table 60. Information of some of the vaccines not included in the Childhood Immunisation Programme.

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Vaccine</th>
<th>Links</th>
</tr>
</thead>
</table>
| Centre for Health Protection, Department of Health 衛生署衞生防護中心 | Seasonal influenza vaccine 季節性流行性感冒疫苗 | http://www.chp.gov.hk/files/pdf/sivp_en.pdf (English)  
| Viral Hepatitis Preventive Service, Department of Health 衛生署病毒性肝炎預防服務 | Hepatitis A vaccine 甲型肝炎疫苗 | http://www.info.gov.hk/hepatitis/english/leaflet2009.htm (English)  
Annex 3: Interpretation of tuberculin skin test (TST)

TST is performed by intradermal injection of tuberculin test material that contains purified protein derivative (PPD). In Hong Kong, PPD-RT23 has been the only available PPD, with 2TU (tuberculin unit) of PPD-RT23 (in 0.1ml) as the recommended dose, for TST, since 2000. A detailed explanation on tuberculin skin test (TST) can be found in the TB Manual issued by TB and Chest Service.

These are the essential points in interpreting TST:
- The role of TST in the diagnosis of active TB disease is limited. False positive and false negative results are common. In the interpretation of TST, it is important to consider the overall clinical situation.
- There is no single cut-off value for positivity ideally suited for all clinical situations. Some examples are as follows:
  - ≥5 mm: immunocompetent household contacts aged below 1, HIV infected persons;
  - ≥10 mm: patients with silicosis, patients receiving anti-TNF therapy
  - ≥15 mm: immunocompetent household contacts aged 1 to 34
  - A higher cut-off value, with higher specificity, should generally be considered for BCG vaccinated subjects living in areas endemic for mycobacteria other than TB. A reading of 15mm or more in the local setting is suggestive of infection by *Mycobacterium tuberculosis* than false positive effect of past BCG vaccination, especially if the BCG vaccination was given more than 15 years previously.
- Patients with active TB may fail to yield a positive reaction to TST. Active TB cannot be excluded simply by a negative TST result.
- Boosting, conversion and reversion should be recognised in the interpretation of TST results. Boosting is best distinguished from conversion on clinical grounds, taking also into account the absolute size and size increment of the TST reading. An increase of 10 mm is a useful guide for diagnosing conversion.

Acknowledgments

This Module on Immunisation was first developed in 2013 with the active support and invaluable contribution of the Members of the Sub-group on Immunisation, under the Clinical Advisory Group on Reference Framework for Preventive Care for Children in Primary Care Setting.

Members of the Sub-group on Immunisation (2013)

<table>
<thead>
<tr>
<th>Convenor</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Consultant, UMP Healthcare Group; Honorary Consultant in Paediatrics, Pamela Youde Nethersole Eastern Hospital</td>
</tr>
<tr>
<td>Dr Henry AU YEUNG Cheuk-lun</td>
<td>Director, UMP Healthcare Group</td>
</tr>
<tr>
<td>Dr CHAN Yee-shing</td>
<td>Vice President, The Hong Kong Medical Association</td>
</tr>
<tr>
<td>Dr CHEN Hong</td>
<td>Fellow of Hong Kong College of Community Medicine; Associate Consultant, Infectious Control Training Centre, Hospital Authority</td>
</tr>
<tr>
<td>Dr CHENG Chun-fai</td>
<td>Council Member, Hong Kong College of Paediatricians</td>
</tr>
<tr>
<td>Dr. Daniel CHIU Cheung-shing</td>
<td>President, The Hong Kong Paediatric Society</td>
</tr>
<tr>
<td>Dr CHOW Chun-bong</td>
<td>Specialist in Paediatrics</td>
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<tr>
<td>Dr LAM Wing-wo</td>
<td>Private General Practitioner</td>
</tr>
<tr>
<td>Professor Tony NELSON</td>
<td>Professor in Paediatrics, Department of Paediatrics, The Chinese University of Hong Kong</td>
</tr>
<tr>
<td>Dr TONG Kai-sing</td>
<td>Representative of The Association of Licentiates of Medical Council of Hong Kong; Private Pediatrician</td>
</tr>
<tr>
<td>Dr YEUNG Chiu-fat</td>
<td>President, Hong Kong Doctors Union</td>
</tr>
</tbody>
</table>

The following service units of the Department of Health:
- Communicable Disease Division, Surveillance and Epidemiology Branch, Centre for Health Protection
- Family Health Service
- Student Health Service