**Adverse Event**

**Diphtheria vaccine (WHO position paper)**

In most cases, diphtheria toxoid is administered in fixed combination with other vaccines. For childhood vaccination, DTwP or DTaP is generally used, often in combination with other antigens administered at the same time, such as Haemophilus influenzae type b, poliomyelitis, and hepatitis B vaccines, in order to reduce the number of injections. This is a positive development as long as adverse events remain infrequent and the immunogenicity of the individual components is ensured.

**BCG**

**BCG vaccine (WHO position paper)**

WHO recommends intradermal application of the (BCG) vaccine, preferably on the deltoid region of the arm using syringe and needle, although other application methods such as the multiple puncture technique are practised in some countries. Newborn vaccinees normally receive half the dose given to older children. BCG vaccine can be given simultaneously with other childhood vaccines.

**DPT**

**Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services**

Hib conjugate vaccine is administered by intramuscular or subcutaneous injection in the anterolateral aspect of the thigh (infants) or the deltoid muscle (older children). If given as a combination with DTP in the same syringe, it should be given intramuscularly.

**Diphtheria vaccine (WHO position paper)**

In most cases, diphtheria toxoid is administered in fixed combination with other vaccines. For childhood vaccination, DTwP or DTaP is generally used, often in combination with other antigens administered at the same time, such as Haemophilus influenzae type b, poliomyelitis, and hepatitis B vaccines, in order to reduce the number of injections. This is a positive development as long as adverse events remain infrequent and the immunogenicity of the individual components is ensured.
**Diphtheria**

### Diphtheria vaccine (WHO position paper)

In most cases, diphtheria toxoid is administered in fixed combination with other vaccines. For childhood vaccination, DTwP or DTaP is generally used, often in combination with other antigens administered at the same time, such as Haemophilus influenzae type b, poliomyelitis, and hepatitis B vaccines, in order to reduce the number of injections. This is a positive development as long as adverse events remain infrequent and the immunogenicity of the individual components is ensured.

### Diphtheria vaccine (WHO position paper)

(Vaccines containing diphtheria toxoid should be administered) by intramuscular injection only.

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**General**

### Introducing hepatitis B vaccine into national immunization services

HepB vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children). If HepB vaccine is given on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs.

### Introducing hepatitis B vaccine into national immunization services

HepB vaccine can safely be given at the same time as other vaccines (e.g. DTP, Hib, measles, OPV, BCG, and yellow fever).

### Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

Hib conjugate vaccine is administered by intramuscular or subcutaneous injection in the anterolateral aspect of the thigh (infants) or the deltoid muscle (older children). If given as a combination with DTP in the same syringe, it should be given intramuscularly.

### Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

Hib conjugate vaccine can be given safely at the same time as other vaccines such as DTP, polio, hepatitis B, measles, BCG, and yellow fever vaccines.
Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

The injection equipment for Hib conjugate vaccine is the same type as that for DTP or hepatitis B:
- 0.5 ml (auto-disable), 1.0ml or 2.0ml syringe
- 25mm, 22 or 23 gauge needle
Sterile auto-disable (AD) injection devices are recommended.
The standard paediatric dose is 0.5 ml.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

Hib vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children).
- The interval between (Hib vaccine) doses is not less than one month.
- The size of a dose is 0.5 ml.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

The (Hib) vaccine may be given at the same time as DTP, OPV, and (if applicable) HepB vaccines. It can be given at the same time as DTP, OPV, IPV, and HepB vaccines without ill effect. However, if used as a monovalent vaccine, it should not be injected in the same limb at the same time as other vaccines.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

Types and formulations of Hib vaccines can be interchanged, so vaccines from different manufacturers can be used for each dose that a child receives.

Diluents, both in saline form and made from other vaccines, are produced to go with specific Hib vaccines and are not interchangeable.

Measles vaccines (WHO position paper)

Administration of immunoglobulins or other antibody-containing blood products may interfere with the immune response to the vaccine. Vaccination should be delayed for 3-11 months after administration of blood or blood products, depending on the dose of measles antibody. Following measles vaccination, administration of such blood products should be avoided for 2 weeks, if possible.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

Injection equipment for Hib vaccine and for reconstitution are indicated in Appendix 15_17.
BCG vaccine (WHO position paper)

WHO recommends intradermal application of the (BCG) vaccine, preferably on the deltoid region of the arm using syringe and needle, although other application methods such as the multiple puncture technique are practised in some countries. Newborn vaccinees normally receive half the dose given to older children. BCG vaccine can be given simultaneously with other childhood vaccines.

Hepatitis B vaccines (WHO position paper)

The recommended dose (of hepatitis B vaccine) varies by product and with the age of the recipient. In most cases, infants and adolescents receive 50% of the adult dose.

The vaccine is administered by intramuscular injection in the anterolateral aspect of the thigh (infants and children aged <2 years) or in the deltoid muscle (older children and adults). Administration in the buttock is not recommended because this route of administration has been associated with decreased protective antibody levels as well as injury to the sciatic nerve. Intradermal administration is not recommended because the immune response is less reliable, particularly in children.

The hepatitis B vaccine does not interfere with the immune response to any other vaccine, and vice versa. Specifically, the birth-dose of hepatitis B can be given safely together with bacillus Calmette-Gurin (BCG) vaccine; BCG does not interfere negatively with the response to hepatitis B vaccine. However, unless formulated as fixed combinations, hepatitis B vaccine and other vaccines administered during the same visit should be given at different injection sites.

Hepatitis B vaccines (WHO position paper)

Testing to determine antibody responses is not necessary after routine vaccination (with hepatitis B vaccine.) However, when feasible, knowledge of response to vaccination is important in the following groups: (i) persons at risk of occupationally acquired infection; (ii) infants born to HBsAg-positive mothers; (iii) immunocompromised persons; and (iv) sexual partners of HBsAg-positive persons.

Testing for anti-HBs should be performed by a method that allows determination of whether the anti-HBs concentration is protective (>10 mIU per ml). Adults should be tested 1-2 months after completion of the vaccination series. In settings where resources are available, infants born to HBsAg-positive mothers should be tested at 8-15 months of age, after completion of the vaccination series. Persons found to be antibody-negative after the primary series should be referred for appropriate follow-up.

Hepatitis B vaccines (WHO position paper)

Generally, it is easier to deliver hepatitis B vaccine at birth to infants who are born in health facilities. However, availability of monovalent hepatitis B vaccine in pre-filled single-dose injection devices facilitates the administration of the vaccine by health care workers and birth attendants to infants born at home.
Influenza vaccines (WHO position paper)

TIVs (trivalent, inactivated influenza vaccines) are injected into the deltoid muscle (vaccinees aged >1 year) or the antero-lateral aspect of the thigh (vaccines aged between 6 and 12 months). Inactivated influenza vaccines will not interfere with concomitantly administered diphtheria/tetanus/pertussis (DTP) or other childhood vaccines.

Measles vaccines (WHO position paper)

The live, attenuated measles vaccines that are now internationally available are safe, effective and relatively inexpensive and may be used interchangeably in immunization programmes.

Measles vaccines (WHO position paper)

Measles vaccine is generally injected subcutaneously but is also effective when administered intramuscularly.

Rubella vaccines (WHO position paper)

As there is no harm in vaccinating already immune individuals, serological testing before (rubella) immunization is not necessary.

Rubella vaccines (WHO position paper)

Each dose of this (RA27/3 rubella) vaccine, which is given by the subcutaneous route, contains a defined number of active virus particles (>1,000 TCID 50).

Rubella antibodies present in blood products may interfere with rubella vaccination. Therefore, persons who received blood products should wait at least 3 months before vaccination and if possible, blood products should be avoided for up to 2 weeks postvaccination.

Yellow fever vaccine (WHO position paper)

For convenience and improved coverage, the YF vaccine should be administered simultaneously with the measles vaccine at approximately 9-12 months of age, but in a separate syringe and at a different injection site.

The YF (yellow fever) vaccine is given as a single subcutaneous or intramuscular injection (0.5 ml per dose), although the subcutaneous route is preferred.
**Yellow fever vaccine (WHO position paper)**

Since there is no interference between YF (yellow fever) vaccine and other vaccines, YF vaccine may be administered simultaneously, but in different syringes and at different sites, with the following vaccines: measles, polio (oral polio vaccine), diphtheria-tetanus-pertussis, hepatitis B, hepatitis A, oral cholera and oral or parenteral typhoid. When not given simultaneously, live vaccines should be administered at least one month before or one month after the YF vaccination. This recommendation is based on the assumption that interferon released in response to the first vaccine may have a temporary inhibitory effect on other live virus vaccines.

**Typhoid vaccines (WHO position paper)**

The Vi polysaccharide vaccine is administered subcutaneously or intramuscularly as 1 dose of 25 mg to individuals aged > 2 years. The vaccine confers protection 7 days after injection.

**Typhoid vaccines (WHO position paper)**

The (Ty21a typhoid) vaccine is usually administrated orally as entericcoated capsules and is registered for use from 6 years of age.

A liquid formulation of the Ty21a (Ty21a typhoid) vaccine can be taken by children as young as 2 years and has proved more immunogenic than the capsular formulation.

**Typhoid vaccines (WHO position paper)**

Ty21a (Ty21a typhoid) is remarkably well tolerated. The vaccine may be given simultaneously with other vaccines, including live vaccines against polio, cholera and yellow fever, or the measles, mumps and rubella (MMR) combination. Proguanil or antibiotics should be avoided during the 3 days before and after vaccination.

**Diphtheria vaccine (WHO position paper)**

In most cases, diphtheria toxoid is administered in fixed combination with other vaccines. For childhood vaccination, DTwP or DTaP is generally used, often in combination with other antigens administered at the same time, such as Haemophilus influenzae type b, poliomyelitis, and hepatitis B vaccines, in order to reduce the number of injections. This is a positive development as long as adverse events remain infrequent and the immunogenicity of the individual components is ensured.
Vaccine Administration

Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents

If hepatitis B vaccine is administered on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs. If more than one injection has to be given in the same limb, the thigh is the preferred site of injection because of the greater muscle mass, and the injection sites should be 2.5 cm to 5 cm apart so that any local reactions are unlikely to overlap.

Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents

Hepatitis B vaccine SHOULD NOT be given in the buttock as this route of administration has been associated with decreased protective antibody levels, probably because of inadvertent subcutaneous injection or injection into deep fat tissue. In addition there may be a risk of injury to the sciatic nerve.

Hepatitis B vaccine SHOULD NOT be administered intradermally because this route of administration does not produce an adequate antibody response in children.

Hepatitis B vaccine SHOULD NOT be mixed in the same syringe with other vaccines unless specifically recommended by the manufacturer. (Note: pentavalent DTP-HepB+Hib vaccine is supplied in two separate vials, one containing DTP-HepB vaccine (liquid), the other containing Hib vaccine (lyophilized). The manufacturer recommends mixing the contents of the two vials and giving DTP-HepB+Hib vaccine in the same syringe.)

Hepatitis B vaccines (WHO position paper)

Two types of hepatitis B vaccines are available: plasmaderived vaccines and recombinant vaccines. The two vaccines show no differences in terms of reactogenicity, efficacy or duration of protection. The two types of hepatitis B vaccine can be used interchangeably

Typhoid vaccines (WHO position paper)

(The Vi polysaccharide typhoid vaccine) can be given simultaneously with other vaccines relevant for international travelers such as the vaccines against yellow fever and hepatitis A.

Diphtheria vaccine (WHO position paper)

(Vaccines containing diphtheria toxoid should be administered) by intramuscular injection only.

Hepatitis A vaccines (WHO position paper)

Hepatitis A vaccine may be administered with all other vaccines included in the Expanded Programme on Immunization and with vaccines commonly given for travel. Concurrent administration of immune serum globulin does not appear to influence significantly the formation of protective antibodies.
**Mumps virus vaccines (WHO position paper)**

Assumed susceptible persons may be vaccinated (with mumps vaccine) without prior laboratory testing.

**Mumps virus vaccines (WHO position paper)**

Primary mumps vaccination, especially in the recommended combination with rubella and measles vaccines, is easily adapted to the national vaccination programmes and does not interfere significantly with simultaneously-administered vaccines.

**Introducing hepatitis B vaccine into national immunization services**

For administering HepB vaccine:
- A 25 mm, 22 or 23 gauge needle is recommended.
- The standard paediatric dose is 0.5 ml.

**Tetanus vaccine (WHO position paper)**

Administration of adsorbed tetanus toxoid is by intramuscular injection.

**State of the art of new vaccines: research and development**

Of importance for the supply of rabies vaccine is the use of the intradermal route schedule which reduces the number of vaccine vials and thereby the cost of PEP by up to 80% (US$ 5-10 for vaccine alone).

**Conclusions and recommendations from the meeting of the immunization Strategic Advisory Group of Experts (SAGE) - November 2006**

Consistent with WHO's position on new vaccines, PCV-7 (7-serotype conjugate pneumococcal vaccine) can be easily integrated into routine vaccination schedules, and it may be administered at the same time, though at a different site, as other vaccines in infant immunization programmes, including DTP, hepatitis B, Hib and polio vaccines. Routine immunization with PCV-7 should be initiated before the age of 6 months to maximize the benefits of the vaccine and may start as early as 6 weeks of age.
**Pneumococcal conjugate vaccine for childhood immunization (WHO position paper)**

PCV-7 should not be mixed in the same syringe with other vaccines.

The vaccine may be administered concomitantly with other vaccines in the Expanded Programme on Immunization provided that separate syringes and sites of injection are used.

(Page 103) - (PCV-7) may be administered concurrently with, though at a different site from, other vaccines in infant immunization programmes, including DTP, hepatitis B, H. influenzae type b and polio vaccines.

**Rabies vaccines (WHO position paper)**

Following exposure to a suspected rabid animal, prevention of human rabies consists of prompt wound cleansing and administration of a modern CCV and, in cases of severe (category III) exposure, of rabies immunoglobulin (RIG).

**Rabies vaccines (WHO position paper)**

it is strongly recommended that the production and use of NTVs for humans be discontinued and replaced by modern CCVs as soon as possible.

**Rabies vaccines (WHO position paper)**

Pre-exposure immunization is recommended for anyone at increased risk of exposure to rabies virus, either by nature of their residence or occupation, or when travelling.

**Rabies vaccines (WHO position paper)**

Countries are encouraged to implement control programmes to ensure coordination between all public sectors involved in rabies control.

**Rabies vaccines (WHO position paper)**

Pre-exposure vaccination using any of the modern CCVs is recommended for anyone at increased risk of exposure to rabies virus. This recommendation includes laboratory staff, veterinarians, animal handlers, wildlife officers with frequent exposure to potentially infected animals, as well as visitors to areas with high risk of rabies.
Rabies vaccines (WHO position paper)

For adults, the vaccine should always be administered in the deltoid area of the arm; for children aged <2 years, the anterolateral area of the thigh is recommended. Rabies vaccine should not be administered in the gluteal area, where the induction of an adequate immune response may be less reliable.

Rabies vaccines (WHO position paper)

ID administration of 0.1 ml volumes on days 0, 7, and 28 (day 28 preferable, but administration may be advanced towards day 21 if time is limited) is an acceptable alternative to the standard IM route. However, ID administration is technically more demanding and requires appropriate staff training and qualified supervision.

Rabies vaccines (WHO position paper)

Periodic booster injections are recommended only for people whose occupation puts them at continuous or frequent risk of rabies exposure. In such cases, a booster dose should be given at intervals ideally dictated by regular testing for antirabies antibodies. Potential laboratory exposures to high concentrations of rabies virus motivates testing as often as every 6 months; VNA titres of at least 0.5 IU/ml indicate protection. Where serological testing is unavailable, booster vaccination every 5 years may be an acceptable alternative.

Rabies vaccines (WHO position paper)

The indication for post-exposure prophylaxis with or without RIG depends on the type of contact with the suspected rabid animal: - Category I: touching or feeding animals, licks on the skin (i.e. no exposure); - Category II: nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin; - Category III: single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks, exposures to bats.

For category I exposures, no prophylaxis is required; whereas for category II, immediate vaccination, and for category III, immediate vaccination and administration of RIG are recommended. For categories II and III, thorough (for ~15 minutes) washing and flushing with soap/detergent and copious amounts of water of all bite wounds and scratches should be done immediately, or as early as possible.
Post-exposure prophylaxis can be discontinued if the suspect animal is proved by appropriate laboratory examination to be free of rabies, or, in the case of domestic dogs or cats, the animal remains healthy throughout a 10-day observation period. Factors that should be taken into consideration when deciding whether or not to initiate post-exposure prophylaxis include the likelihood of the concerned animal being rabid, category of exposure (III), clinical features of the animal, as well as its availability for observation and laboratory testing. In most situations in developing countries, the vaccination status of the offending animal should not be taken into consideration to withhold prophylaxis.

Intramuscular administration
The post-exposure vaccination schedule is based on IM doses of 1 ml or 0.5 ml, depending on the manufacturer. The recommended regimen consists of either a 5-dose or a 4-dose schedule.
(i) The 5-dose regimen prescribes 1 dose injected into the deltoid muscle (or anterolateral thigh in children aged <2 years) on each of days 0, 3, 7, 14 and 28.
(ii) The 4-dose regimen prescribes 2 doses on day 0 (1 in each of the 2 deltoid/thigh sites) followed by 1 dose on each of days 7 and 21.

Intradermal administration
Either the 8-site or the 2-site regimen should be used, as recommended by the respective vaccine manufacturer.
(i) The 8-site ID regimen prescribes on day 0, injections of 0.1 ml given at 8 sites (1 in each upper arm, 1 in each lateral thigh, 1 on each side of the suprascapular region, and 1 on each side of the lower quadrant region of the abdomen); on day 7, 1 injection in each upper arm and each lateral thigh; and on each of days 30 and 90, 1 injection in one upper arm. The 1 dose on day 90 may be replaced by 2 ID injections on day 30.
(ii) The 2-site ID regimen prescribes 1 injection of 0.1 ml at 2 sites on days 0, 3, 7 and 28.

For rabies-exposed patients who have previously undergone complete pre-exposure vaccination or postexposure prophylaxis with a CCV, 2 IM or ID doses of such a vaccine administered on days 0 and 3 are sufficient. RIG is not necessary in such cases. The same rules apply to people vaccinated against rabies who have demonstrated VNA titres of at least 0.5 IU/ml. Vaccination cards carefully recording previous immunizations are invaluable for correct decision-making.
**Rabies vaccines (WHO position paper)**

Rabies immunoglobulin for passive immunization

RIG should be administered in all category III exposures and in category II exposures involving immunodeficient individuals. Given its relatively slow clearance, human rabies immunoglobulin (HRIG) is the preferred product, particularly in cases of multiple severe exposures. However, HRIG is in short supply and available mainly in industrialized countries. Where HRIG is not available or affordable, purified equine immunoglobulin (ERIG) or F(ab)2 products of ERIG should be used. Most of the new ERIG preparations are potent, highly purified, safe and considerably less expensive than HRIG. However, they are of heterologous origin and carry a small risk of hypersensitivity reactions. There are no scientific grounds for performing a skin test prior to administration of ERIG because testing does not predict reactions, and ERIG should be given whatever the result of the test. RIG for passive immunization should not be injected later than 7 days after the initiation of post-exposure vaccination. The dose for HRIG is 20 IU/kg body weight, and for ERIG and F(ab)2 products 40 IU/kg body weight. All of the RIG, or as much as anatomically possible (cave compartment syndrome), should be administered into or around the wound site(s). Any remaining RIG should be injected IM at a site distant from the site of vaccine administration.

**Typhoid vaccines: WHO position paper**

In view of the continued high burden of typhoid fever and increasing antibiotic resistance, and given the safety, efficacy, feasibility and affordability of 2 licensed vaccines (Vi and Ty21a), countries should consider the programmatic use of typhoid vaccines for controlling endemic disease. In most countries, the control of the disease will require vaccination only of high-risk groups and populations. Given the epidemic potential of typhoid fever, and observations on the effectiveness of vaccination in interrupting outbreaks, typhoid fever vaccination is recommended also for outbreak control.

**Typhoid vaccines: WHO position paper**

Decisions on whether or not to initiate programmatic use of typhoid vaccines should be based on knowledge of the local epidemiological situation. Important information includes data on subpopulations at particular risk and age-specific incidence rates, as well as on the sensitivity of the prevailing S. Typhi strains to relevant antimicrobial drugs. Ideally, cost-effectiveness analyses should be part of the planning process.
Typhoid vaccines: WHO position paper

Immunization of school-age and/or preschool-age children is recommended in areas where typhoid fever in these age groups is shown to be a significant public health problem, particularly where antibiotic-resistant S. Typhi is prevalent. The selection of delivery strategy (school or community-based vaccination) depends on factors such as the age-specific incidence of disease, subgroups at particular risk and school enrolment rates, and should be decided by the concerned countries.

Typhoid vaccines: WHO position paper

Typhoid fever vaccination may be offered to travellers to destinations where the risk of typhoid fever is high, especially to those staying in endemic areas for >1 month and/or in locations where antibiotic resistant strains of S. Typhi are prevalent.

Typhoid vaccines: WHO position paper

All typhoid fever vaccination programmes should be implemented in the context of other efforts to control the disease, including health education, water quality and sanitation improvements, and training of health professionals in diagnosis and treatment.

Typhoid vaccines: WHO position paper

The Ty21a vaccine:

The capsules are licensed for use in individuals aged >5 years; the liquid vaccine can be administered from the age of 2 years. Both versions of the vaccine are administered every other day; a 3-dose or, in Canada and USA, a 4-dose regimen is recommended for the capsules, whereas the liquid form requires 3 doses. The Ty21a vaccine may be given simultaneously with other vaccines, including live vaccines against polio, cholera, and yellow fever, or the measles, mumps and rubella (MMR) combination.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Given the high burden of pneumococcal disease in children and adults, WHO considers the prevention of pneumococcal disease to be a high priority in both industrialized and developing countries.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Many industrialized countries recommend PPV23 immunization of their elderly and other high-risk groups. In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7. Countries considering introducing PPV23 to elderly or other high-risk populations will need to develop strategies for reaching these target populations.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Because of the low level of evidence for benefit, routine PPV23 vaccination of HIV-infected adults is not recommended in resource-limited settings. In low-income countries, WHO recommends the use of other measures that directly or indirectly may help prevent pneumococcal disease, such as trimethoprim-sulfamethoxazole chemoprophylaxis and antiretroviral therapy.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

PPV23 has not been shown to reduce the risk of CAP associated with seasonal or pandemic influenza. However, in countries using PPV23, high levels of vaccine uptake in at-risk populations may help reduce the incidence of pneumococcal bacteraemia during an influenza epidemic or pandemic. Nevertheless, in countries that do not routinely administer PPV23 to high-risk populations, data are insufficient to recommend introducing this vaccine to reduce the morbidity and mortality associated with pandemic influenza.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Insufficient evidence of a beneficial effect precludes recommending routine PPV23 vaccination of pregnant or breastfeeding women in order to prevent pneumococcal disease in infants during the first few months of life. In view of the strong herd immunity effect of routine infant immunization with PCV7 and the indirect protection of infants too young to receive conjugated pneumococcal vaccine, emphasis should be placed on ensuring high coverage of PCV7 (or an equivalent conjugated pneumococcal vaccine) in national immunization programmes.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

defered during pregnancy, particularly during the first trimester, because their effect on the fetus has not been fully evaluated. However, no adverse consequences have been reported among newborns whose mothers were given PPV23 during pregnancy. In countries that routinely administer PCV23 to individuals with identified risk factors for pneumococcal disease (see above), women considered to be in urgent need of this vaccine may be vaccinated even during pregnancy.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Primary immunization with PPV23 consists of a single intramuscular or subcutaneous dose. The intramuscular route may be preferred because of the lower rate of reactions at the injection site. The optimal timing, frequency and clinical effectiveness of additional doses of PPV23 are poorly defined, and national recommendations regarding revaccination vary. However, on the basis of the data on the duration of vaccine-induced protection, WHO suggests one single revaccination >5 years after a first vaccination.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Additional data are needed on the possible induction of hyporesponsiveness following repeated doses of pneumococcal polysaccharide vaccine. Further studies are also required to make recommendations on the possible use of PPV23 to extend the serotype coverage in individuals who have previously received PCV7.49

HIV/AIDS and immunosuppression

Hepatitis B vaccines (WHO position paper)

Testing to determine antibody responses is not necessary after routine vaccination (with hepatitis B vaccine.) However, when feasible, knowledge of response to vaccination is important in the following groups: (i) persons at risk of occupationally acquired infection; (ii) infants born to HBsAg-positive mothers; (iii) immunocompromised persons; and (iv) sexual partners of HBsAg-positive persons.

Testing for anti-HBs should be performed by a method that allows determination of whether the anti-HBs concentration is protective (>10 mIU per ml). Adults should be tested 1-2 months after completion of the vaccination series. In settings where resources are available, infants born to HBsAg-positive mothers should be tested at 8-15 months of age, after completion of the vaccination series. Persons found to be antibody-negative after the primary series should be referred for appropriate follow-up.

Hepatitis A

Hepatitis A vaccines (WHO position paper)

Hepatitis A vaccine may be administered with all other vaccines included in the Expanded Programme on Immunization and with vaccines commonly given for travel. Concurrent administration of immune serum globulin does not appear to influence significantly the formation of protective antibodies.
Hepatitis B

Introducing hepatitis B vaccine into national immunization services

HepB vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children). If HepB vaccine is given on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs.

WHO/V&B/01.28 page 2

Introducing hepatitis B vaccine into national immunization services

HepB vaccine can safely be given at the same time as other vaccines (e.g. DTP, Hib, measles, OPV, BCG, and yellow fever).

WHO/V&B/01.28 page 2

Hepatitis B vaccines (WHO position paper)

The recommended dose (of hepatitis B vaccine) varies by product and with the age of the recipient. In most cases, infants and adolescents receive 50% of the adult dose. The vaccine is administered by intramuscular injection in the anterolateral aspect of the thigh (infants and children aged <2 years) or in the deltoid muscle (older children and adults). Administration in the buttock is not recommended because this route of administration has been associated with decreased protective antibody levels as well as injury to the sciatic nerve. Intradermal administration is not recommended because the immune response is less reliable, particularly in children.

The hepatitis B vaccine does not interfere with the immune response to any other vaccine, and vice versa. Specifically, the birth-dose of hepatitis B can be given safely together with bacillus Calmette-Gurin (BCG) vaccine; BCG does not interfere negatively with the response to hepatitis B vaccine. However, unless formulated as fixed combinations, hepatitis B vaccine and other vaccines administered during the same visit should be given at different injection sites.

Hepatitis B vaccines (WHO position paper)

Testing to determine antibody responses is not necessary after routine vaccination (with hepatitis B vaccine.) However, when feasible, knowledge of response to vaccination is important in the following groups: (i) persons at risk of occupationally acquired infection; (ii) infants born to HBsAg-positive mothers; (iii) immunocompromised persons; and (iv) sexual partners of HBsAg-positive persons.

Testing for anti-HBs should be performed by a method that allows determination of whether the anti-HBs concentration is protective (>10 mIU per ml). Adults should be tested 1-2 months after completion of the vaccination series. In settings where resources are available, infants born to HBsAg-positive mothers should be tested at 8-15 months of age, after completion of the vaccination series. Persons found to be antibody-negative after the primary series should be referred for appropriate follow-up.

Hepatitis B vaccines (WHO position paper)

Generally, it is easier to deliver hepatitis B vaccine at birth to infants who are born in health facilities. However, availability of monovalent hepatitis B vaccine in pre-filled single-dose injection devices facilitates the administration of the vaccine by health care workers and birth attendants to infants born at home.

Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents

If hepatitis B vaccine is administered on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs. If more than one injection has to be given in the same limb, the thigh is the preferred site of injection because of the greater muscle mass, and the injection sites should be 2.5 cm to 5 cm apart so that any local reactions are unlikely to overlap.

Hepatitis B vaccines (WHO position paper)

Two types of hepatitis B vaccines are available: plasmaderived vaccines and recombinant vaccines. The two vaccines show no differences in terms of reactogenicity, efficacy or duration of protection. The two types of hepatitis B vaccine can be used interchangeably

Introducing hepatitis B vaccine into national immunization services

For administering HepB vaccine:
_ A 25 mm, 22 or 23 gauge needle is recommended.
_ The standard paediatric dose is 0.5 ml.
Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

Hib conjugate vaccine is administered by intramuscular or subcutaneous injection in the anterolateral aspect of the thigh (infants) or the deltoid muscle (older children). If given as a combination with DTP in the same syringe, it should be given intramuscularly.

Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

Hib conjugate vaccine can be given safely at the same time as other vaccines such as DTP, polio, hepatitis B, measles, BCG, and yellow fever vaccines.

Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services

The injection equipment for Hib conjugate vaccine is the same type as that for DTP or hepatitis B:
- 0.5 ml (auto-disable), 1.0ml or 2.0ml syringe
- 25mm, 22 or 23 gauge needle
Sterile auto-disable (AD) injection devices are recommended.
The standard paediatric dose is 0.5 ml.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

Hib vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children).

- The interval between (Hib vaccine) doses is not less than one month.
- The size of a dose is 0.5 ml.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

The (Hib) vaccine may be given at the same time as DTP, OPV, and (if applicable) HepB vaccines. It can be given at the same time as DTP, OPV, IPV, and HepB vaccines without ill effect. However, if used as a monovalent vaccine, it should not be injected in the same limb at the same time as other vaccines.
**Vaccine Administration**

**Introduction of Haemophilus influenzae type b vaccine into immunization programmes**

Types and formulations of Hib vaccines can be interchanged, so vaccines from different manufacturers can be used for each dose that a child receives.

Diluents, both in saline form and made from other vaccines, are produced to go with specific Hib vaccines and are not interchangeable.

**Introduction of Haemophilus influenzae type b vaccine into immunization programmes**

Injection equipment for Hib vaccine and for reconstitution are indicated in Appendix 15_17.

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**Influenza**

**Influenza vaccines (WHO position paper)**

TIVs (trivalent, inactivated influenza vaccines) are injected into the deltoid muscle (vaccinees aged >1 year) or the antero-lateral aspect of the thigh (vaccines aged between 6 and 12 months). Inactivated influenza vaccines will not interfere with concomitantly administered diphtheria/tetanus/pertussis (DTP) or other childhood vaccines.

**MMR**

**Mumps virus vaccines (WHO position paper)**

Primary mumps vaccination, especially in the recommended combination with rubella and measles vaccines, is easily adapted to the national vaccination programmes and does not interfere significantly with simultaneously-administered vaccines.

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**Measles**

**Measles vaccines (WHO position paper)**

Administration of immunoglobulins or other antibody-containing blood products may interfere with the immune response to the vaccine. Vaccination should be delayed for 3-11 months after administration of blood or blood products, depending on the dose of measles antibody. Following measles vaccination, administration of such blood products should be avoided for 2 weeks, if possible.

**Measles vaccines (WHO position paper)**

The live, attenuated measles vaccines that are now internationally available are safe, effective and relatively inexpensive and may be used interchangeably in immunization programmes.
**Measles vaccines (WHO position paper)**

Measles vaccine is generally injected subcutaneously but is also effective when administered intramuscularly.

**Mumps**

**Mumps virus vaccines (WHO position paper)**

Assumed susceptible persons may be vaccinated (with mumps vaccine) without prior laboratory testing.

**Mumps virus vaccines (WHO position paper)**

Primary mumps vaccination, especially in the recommended combination with rubella and measles vaccines, is easily adapted to the national vaccination programmes and does not interfere significantly with simultaneously-administered vaccines.

**Pentavalent**

**Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents**

Hepatitis B vaccine SHOULD NOT be given in the buttock as this route of administration has been associated with decreased protective antibody levels, probably because of inadvertent subcutaneous injection or injection into deep fat tissue. In addition there may be a risk of injury to the sciatic nerve.

Hepatitis B vaccine SHOULD NOT be administered intradermally because this route of administration does not produce an adequate antibody response in children.

Hepatitis B vaccine SHOULD NOT be mixed in the same syringe with other vaccines unless specifically recommended by the manufacturer. (Note: pentavalent DTP-HepB+Hib vaccine is supplied in two separate vials, one containing DTP-HepB vaccine (liquid), the other containing Hib vaccine (lyophilized). The manufacturer recommends mixing the contents of the two vials and giving DTP-HepB+Hib vaccine in the same syringe.)
Pneumococcal

Conclusions and recommendations from the meeting of the immunization Strategic Advisory Group of Experts (SAGE) - November 2006

Consistent with WHO's position on new vaccines, PCV-7 (7-serotype conjugate pneumococcal vaccine) can be easily integrated into routine vaccination schedules, and it may be administered at the same time, though at a different site, as other vaccines in infant immunization programmes, including DTP, hepatitis B, Hib and polio vaccines. Routine immunization with PCV-7 should be initiated before the age of 6 months to maximize the benefits of the vaccine and may start as early as 6 weeks of age.

Pneumococcal conjugate vaccine for childhood immunization (WHO position paper)

PCV-7 should not be mixed in the same syringe with other vaccines.

The vaccine may be administered concomitantly with other vaccines in the Expanded Programme on Immunization provided that separate syringes and sites of injection are used.

(Page 103) - (PCV-7) may be administered concurrently with, though at a different site from, other vaccines in infant immunization programmes, including DTP, hepatitis B, H. influenzae type b and polio vaccines.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Given the high burden of pneumococcal disease in children and adults, WHO considers the prevention of pneumococcal disease to be a high priority in both industrialized and developing countries.
Many industrialized countries recommend PPV23 immunization of their elderly and other high-risk groups. In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7. Countries considering introducing PPV23 to elderly or other high-risk populations will need to develop strategies for reaching these target populations.

Because of the low level of evidence for benefit, routine PPV23 vaccination of HIV-infected adults is not recommended in resource-limited settings. In low-income countries, WHO recommends the use of other measures that directly or indirectly may help prevent pneumococcal disease, such as trimethoprim-sulfamethoxazole chemoprophylaxis and antiretroviral therapy.

PPV23 has not been shown to reduce the risk of CAP associated with seasonal or pandemic influenza. However, in countries using PPV23, high levels of vaccine uptake in at-risk populations may help reduce the incidence of pneumococcal bacteraemia during an influenza epidemic or pandemic. Nevertheless, in countries that do not routinely administer PPV23 to high-risk populations, data are insufficient to recommend introducing this vaccine to reduce the morbidity and mortality associated with pandemic influenza.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Insufficient evidence of a beneficial effect precludes recommending routine PPV23 vaccination of pregnant or breastfeeding women in order to prevent pneumococcal disease in infants during the first few months of life. In view of the strong herd immunity effect of routine infant immunization with PCV7 and the indirect protection of infants too young to receive conjugated pneumococcal vaccine, emphasis should be placed on ensuring high coverage of PCV7 (or an equivalent conjugated pneumococcal vaccine) in national immunization programmes.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

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during pregnancy, particularly during the first trimester, because their effect on the fetus has not been fully evaluated. However, no adverse consequences have been reported among newborns whose mothers were given PPV23 during pregnancy. In countries that routinely administer PCV23 to individuals with identified risk factors for pneumococcal disease (see above), women considered to be in urgent need of this vaccine may be vaccinated even during pregnancy.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Primary immunization with PPV23 consists of a single intramuscular or subcutaneous dose. The intramuscular route may be preferred because of the lower rate of reactions at the injection site. The optimal timing, frequency and clinical effectiveness of additional doses of PPV23 are poorly defined, and national recommendations regarding revaccination vary. However, on the basis of the data on the duration of vaccine-induced protection, WHO suggests one single revaccination >5 years after a first vaccination. 48

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Additional data are needed on the possible induction of hyporesponsiveness following repeated doses of pneumococcal polysaccharide vaccine. Further studies are also required to make recommendations on the possible use of PPV23 to extend the serotype coverage in individuals who have previously received PCV7.49
**Policy**

**Introducing hepatitis B vaccine into national immunization services**

HepB vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children). If HepB vaccine is given on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs.

**Introducing hepatitis B vaccine into national immunization services**

HepB vaccine can safely be given at the same time as other vaccines (e.g. DTP, Hib, measles, OPV, BCG, and yellow fever).

**Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services**

Hib conjugate vaccine is administered by intramuscular or subcutaneous injection in the anterolateral aspect of the thigh (infants) or the deltoid muscle (older children). If given as a combination with DTP in the same syringe, it should be given intramuscularly.

**Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services**

Hib conjugate vaccine can be given safely at the same time as other vaccines such as DTP, polio, hepatitis B, measles, BCG, and yellow fever vaccines.

**Introducing Haemophilus influenzae type b (Hib) conjugate vaccine into national immunization services**

The injection equipment for Hib conjugate vaccine is the same type as that for DTP or hepatitis B:
- 0.5 ml (auto-disable), 1.0ml or 2.0ml syringe
- 25mm, 22 or 23 gauge needle

Sterile auto-disable (AD) injection devices are recommended.
The standard paediatric dose is 0.5 ml.

**Introduction of Haemophilus influenzae type b vaccine into immunization programmes**

Hib vaccine is given by intramuscular injection in the anterolateral aspect of the thigh (infants) or deltoid muscle (older children).

- The interval between (Hib vaccine) doses is not less than one month.
- The size of a dose is 0.5 ml.
Introduction of Haemophilus influenzae type b vaccine into immunization programmes

The (Hib) vaccine may be given at the same time as DTP, OPV, and (if applicable) HepB vaccines. It can be given at the same time as DTP, OPV, IPV, and HepB vaccines without ill effect. However, if used as a monovalent vaccine, it should not be injected in the same limb at the same time as other vaccines.

Types and formulations of Hib vaccines can be interchanged, so vaccines from different manufacturers can be used for each dose that a child receives.

Diluents, both in saline form and made from other vaccines, are produced to go with specific Hib vaccines and are not interchangeable.

Measles vaccines (WHO position paper)

Administration of immunoglobulins or other antibody-containing blood products may interfere with the immune response to the vaccine. Vaccination should be delayed for 3-11 months after administration of blood or blood products, depending on the dose of measles antibody. Following measles vaccination, administration of such blood products should be avoided for 2 weeks, if possible.

Introduction of Haemophilus influenzae type b vaccine into immunization programmes

Injection equipment for Hib vaccine and for reconstitution are indicated in Appendix 15_17.

BCG vaccine (WHO position paper)

WHO recommends intradermal application of the (BCG) vaccine, preferably on the deltoid region of the arm using syringe and needle, although other application methods such as the multiple puncture technique are practised in some countries. Newborn vaccinees normally receive half the dose given to older children. BCG vaccine can be given simultaneously with other childhood vaccines.
**Hepatitis B vaccines (WHO position paper)**

The recommended dose (of hepatitis B vaccine) varies by product and with the age of the recipient. In most cases, infants and adolescents receive 50% of the adult dose. The vaccine is administered by intramuscular injection in the anterolateral aspect of the thigh (infants and children aged <2 years) or in the deltoid muscle (older children and adults). Administration in the buttock is not recommended because this route of administration has been associated with decreased protective antibody levels as well as injury to the sciatic nerve. Intradermal administration is not recommended because the immune response is less reliable, particularly in children.

The hepatitis B vaccine does not interfere with the immune response to any other vaccine, and vice versa. Specifically, the birth-dose of hepatitis B can be given safely together with bacillus Calmette-Gurin (BCG) vaccine; BCG does not interfere negatively with the response to hepatitis B vaccine. However, unless formulated as fixed combinations, hepatitis B vaccine and other vaccines administered during the same visit should be given at different injection sites.

**Hepatitis B vaccines (WHO position paper)**

Testing to determine antibody responses is not necessary after routine vaccination (with hepatitis B vaccine.) However, when feasible, knowledge of response to vaccination is important in the following groups: (i) persons at risk of occupationally acquired infection; (ii) infants born to HBsAg-positive mothers; (iii) immunocompromised persons; and (iv) sexual partners of HBsAg-positive persons. Testing for anti-HBs should be performed by a method that allows determination of whether the anti-HBs concentration is protective (>10 mIU per ml). Adults should be tested 1-2 months after completion of the vaccination series. In settings where resources are available, infants born to HBsAg-positive mothers should be tested at 8-15 months of age, after completion of the vaccination series. Persons found to be antibody-negative after the primary series should be referred for appropriate follow-up.

**Hepatitis B vaccines (WHO position paper)**

Generally, it is easier to deliver hepatitis B vaccine at birth to infants who are born in health facilities. However, availability of monovalent hepatitis B vaccine in pre-filled singledose injection devices facilitates the administration of the vaccine by health care workers and birth attendants to infants born at home.

**Influenza vaccines (WHO position paper)**

TIVs (trivalent, inactivated influenza vaccines) are injected into the deltoid muscle (vaccinees aged >1 year) or the antero-lateral aspect of the thigh (vaccines aged between 6 and 12 months). Inactivated influenza vaccines will not interfere with concomitantly administered diphtheria/tetanus/pertussis (DTP) or other childhood vaccines.
Measles vaccines (WHO position paper)

The live, attenuated measles vaccines that are now internationally available are safe, effective and relatively inexpensive and may be used interchangeably in immunization programmes.

Measles vaccines (WHO position paper)

Measles vaccine is generally injected subcutaneously but is also effective when administered intramuscularly.

Rubella vaccines (WHO position paper)

As there is no harm in vaccinating already immune individuals, serological testing before (rubella) immunization is not necessary.

Rubella vaccines (WHO position paper)

Each dose of this (RA27/3 rubella) vaccine, which is given by the subcutaneous route, contains a defined number of active virus particles (>1 000 TCID 50).

Rubella antibodies present in blood products may interfere with rubella vaccination. Therefore, persons who received blood products should wait at least 3 months before vaccination and if possible, blood products should be avoided for up to 2 weeks postvaccination.

Yellow fever vaccine (WHO position paper)

For convenience and improved coverage, the YF vaccine should be administered simultaneously with the measles vaccine at approximately 9-12 months of age, but in a separate syringe and at a different injection site.

The YF (yellow fever) vaccine is given as a single subcutaneous or intramuscular injection (0.5 ml per dose), although the subcutaneous route is preferred.

Yellow fever vaccine (WHO position paper)

Since there is no interference between YF (yellow fever) vaccine and other vaccines, YF vaccine may be administered simultaneously, but in different syringes and at different sites, with the following vaccines: measles, polio (oral polio vaccine), diphtheria-tetanus-pertussis, hepatitis B, hepatitis A, oral cholera and oral or parenteral typhoid. When not given simultaneously, live vaccines should be administered at least one month before or one month after the YF vaccination. This recommendation is based on the assumption that interferon released in response to the first vaccine may have a temporary inhibitory effect on other live virus vaccines.
Typhoid vaccines (WHO position paper)

The Vi polysaccharide vaccine is administered subcutaneously or intramuscularly as 1 dose of 25 mg to individuals aged > 2 years. The vaccine confers protection 7 days after injection.

Typhoid vaccines (WHO position paper)

The (Ty21a typhoid) vaccine is usually administrated orally as entericcoated capsules and is registered for use from 6 years of age.

A liquid formulation of the Ty21a (Ty21a typhoid) vaccine can be taken by children as young as 2 years and has proved more immunogenic than the capsular formulation.

Typhoid vaccines (WHO position paper)

Ty21a (Ty21a typhoid) is remarkably well tolerated. The vaccine may be given simultaneously with other vaccines, including live vaccines against polio, cholera and yellow fever, or the measles, mumps and rubella (MMR) combination. Proguanil or antibiotics should be avoided during the 3 days before and after vaccination.

Diphtheria vaccine (WHO position paper)

In most cases, diphtheria toxoid is administered in fixed combination with other vaccines. For childhood vaccination, DTwP or DTaP is generally used, often in combination with other antigens administered at the same time, such as Haemophilus influenzae type b, poliomyelitis, and hepatitis B vaccines, in order to reduce the number of injections. This is a positive development as long as adverse events remain infrequent and the immunogenicity of the individual components is ensured.

Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents

If hepatitis B vaccine is administered on the same day as another injectable vaccine, it is preferable to give the two vaccines in different limbs. If more than one injection has to be given in the same limb, the thigh is the preferred site of injection because of the greater muscle mass, and the injection sites should be 2.5 cm to 5 cm apart so that any local reactions are unlikely to overlap.
Introduction of hepatitis B vaccine into childhood immunization services. Management guidelines, including information for health workers and parents

Hepatitis B vaccine SHOULD NOT be given in the buttock as this route of administration has been associated with decreased protective antibody levels, probably because of inadvertent subcutaneous injection or injection into deep fat tissue. In addition there may be a risk of injury to the sciatic nerve.

Hepatitis B vaccine SHOULD NOT be administered intradermally because this route of administration does not produce an adequate antibody response in children.

Hepatitis B vaccine SHOULD NOT be mixed in the same syringe with other vaccines unless specifically recommended by the manufacturer. (Note: pentavalent DTP-HepB+Hib vaccine is supplied in two separate vials, one containing DTP-HepB vaccine (liquid), the other containing Hib vaccine (lyophilized). The manufacturer recommends mixing the contents of the two vials and giving DTP-HepB+Hib vaccine in the same syringe.)

Hepatitis B vaccines (WHO position paper)

Two types of hepatitis B vaccines are available: plasmaderived vaccines and recombinant vaccines. The two vaccines show no differences in terms of reactogenicity, efficacy or duration of protection. The two types of hepatitis B vaccine can be used interchangeably.

Typhoid vaccines (WHO position paper)

(The Vi polysaccharide typhoid vaccine) can be given simultaneously with other vaccines relevant for international travelers such as the vaccines against yellow fever and hepatitis A.

Diphtheria vaccine (WHO position paper)

(Vaccines containing diphtheria toxoid should be administered) by intramuscular injection only.

Hepatitis A vaccines (WHO position paper)

Hepatitis A vaccine may be administered with all other vaccines included in the Expanded Programme on Immunization and with vaccines commonly given for travel. Concurrent administration of immune serum globulin does not appear to influence significantly the formation of protective antibodies.

Mumps virus vaccines (WHO position paper)

Assumed susceptible persons may be vaccinated (with mumps vaccine) without prior laboratory testing.
**Mumps virus vaccines (WHO position paper)**

Primary mumps vaccination, especially in the recommended combination with rubella and measles vaccines, is easily adapted to the national vaccination programmes and does not interfere significantly with simultaneously-administered vaccines.

**Introducing hepatitis B vaccine into national immunization services**

For administer HepB vaccine:
- A 25 mm, 22 or 23 gauge needle is recommended.
- The standard paediatric dose is 0.5 ml.

**Tetanus vaccine (WHO position paper)**

Administration of adsorbed tetanus toxoid is by intramuscular injection.

**State of the art of new vaccines: research and development**

Of importance for the supply of rabies vaccine is the use of the intradermal route schedule which reduces the number of vaccine vials and thereby the cost of PEP by up to 80% (US$ 5-10 for vaccine alone).

**Pneumococcal conjugate vaccine for childhood immunization (WHO position paper)**

PCV-7 should not be mixed in the same syringe with other vaccines.

The vaccine may be administered concomitantly with other vaccines in the Expanded Programme on Immunization provided that separate syringes and sites of injection are used.

(Page 103) - (PCV-7) may be administered concurrently with, though at a different site from, other vaccines in infant immunization programmes, including DTP, hepatitis B, H. influenzae type b and polio vaccines.

**Rabies vaccines (WHO position paper)**

Following exposure to a suspected rabid animal, prevention of human rabies consists of prompt wound cleansing and administration of a modern CCV and, in cases of severe (category III) exposure, of rabies immunoglobulin (RIG).

**Rabies vaccines (WHO position paper)**

it is strongly recommended that the production and use of NTVs for humans be discontinued and replaced by modern CCVs as soon as possible.
Rabies vaccines (WHO position paper)

Pre-exposure immunization is recommended for anyone at increased risk of exposure to rabies virus, either by nature of their residence or occupation, or when travelling.

Rabies vaccines (WHO position paper)

Countries are encouraged to implement control programmes to ensure coordination between all public sectors involved in rabies control.

Rabies vaccines (WHO position paper)

Pre-exposure vaccination using any of the modern CCVs is recommended for anyone at increased risk of exposure to rabies virus. This recommendation includes laboratory staff, veterinarians, animal handlers, wildlife officers with frequent exposure to potentially infected animals, as well as visitors to areas with high risk of rabies.

Rabies vaccines (WHO position paper)

For adults, the vaccine should always be administered in the deltoid area of the arm; for children aged <2 years, the anterolateral area of the thigh is recommended. Rabies vaccine should not be administered in the gluteal area, where the induction of an adequate immune response may be less reliable.

Rabies vaccines (WHO position paper)

ID administration of 0.1 ml volumes on days 0, 7, and 28 (day 28 preferable, but administration may be advanced towards day 21 if time is limited) is an acceptable alternative to the standard IM route. However, ID administration is technically more demanding and requires appropriate staff training and qualified supervision.
Rabies vaccines (WHO position paper)

Periodic booster injections are recommended only for people whose occupation puts them at continuous or frequent risk of rabies exposure. In such cases, a booster dose should be given at intervals ideally dictated by regular testing for antirabies antibodies. Potential laboratory exposures to high concentrations of rabies virus motivates testing as often as every 6 months; VNA titres of at least 0.5 IU/ml indicate protection. Where serological testing is unavailable, booster vaccination every 5 years may be an acceptable alternative.

Rabies vaccines (WHO position paper)

The indication for post-exposure prophylaxis with or without RIG depends on the type of contact with the suspected rabid animal:- Category I touching or feeding animals, licks on the skin (i.e. no exposure);
- Category II nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin;
- Category III single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks, exposures to bats.
For category I exposures, no prophylaxis is required; whereas for category II, immediate vaccination, and for category III, immediate vaccination and administration of RIG are recommended. For categories II and III, thorough (for ~15 minutes) washing and flushing with soap/detergent and copious amounts of water of all bite wounds and scratches should be done immediately, or as early as possible.

Rabies vaccines (WHO position paper)

Post-exposure prophylaxis can be discontinued if the suspect animal is proved by appropriate laboratory examination to be free of rabies, or, in the case of domestic dogs or cats, the animal remains healthy throughout a 10-day observation period. Factors that should be taken into consideration when deciding whether or not to initiate post-exposure prophylaxis include the likelihood of the concerned animal being rabid, category of exposure (IIII), clinical features of the animal, as well as its availability for observation and laboratory testing. In most situations in developing countries, the vaccination status of the offending animal should not be taken into consideration to withhold prophylaxis.
Rabies vaccines (WHO position paper)

Intramuscular administration
The post-exposure vaccination schedule is based on IM doses of 1 ml or 0.5 ml, depending on the manufacturer. The recommended regimen consists of either a 5-dose or a 4-dose schedule.
(i) The 5-dose regimen prescribes 1 dose injected into the deltoid muscle (or anterolateral thigh in children aged <2years) on each of days 0, 3, 7, 14 and 28.
(ii) The 4-dose regimen prescribes 2 doses on day 0 (1 in each of the 2 deltoid/thigh sites) followed by 1 dose on each of days 7 and 21.

Intradermal administration
Either the 8-site or the 2-site regimen should be used, as recommended by the respective vaccine manufacturer.
(i) The 8-site ID regimen prescribes on day 0, injections of 0.1 ml given at 8 sites (1 in each upper arm, 1 in each lateral thigh, 1 on each side of the suprascapular region, and 1 on each side of the lower quadrant region of the abdomen); on day 7, 1 injection in each upper arm and each lateral thigh; and on each of days 30 and 90, 1 injection in one upper arm.8 The 1 dose on day 90 may be replaced by 2 ID injections on day 30.
(ii) The 2-site ID regimen9 prescribes 1 injection of 0.1 ml at 2 sites on days 0, 3, 7 and 28.

For rabies-exposed patients who have previously undergone complete pre-exposure vaccination or postexposure prophylaxis with a CCV, 2 IM or ID doses of such a vaccine administered on days 0 and 3 are sufficient. RIG is not necessary in such cases. The same rules apply to people vaccinated against rabies who have demonstrated VNA titres of at least 0.5 IU/ml. Vaccination cards carefully recording previous immunizations are invaluable for correct decision-making.
Rabies vaccines (WHO position paper)

Rabies immunoglobulin for passive immunization
RIG should be administered in all category III exposures and in category II exposures involving immunodeficient individuals. Given its relatively slow clearance, human rabies immunoglobulin (HRIG) is the preferred product, particularly in cases of multiple severe exposures. However, HRIG is in short supply and available mainly in industrialized countries. Where HRIG is not available or affordable, purified equine immunoglobulin (ERIG) or F(ab)2 products of ERIG should be used. Most of the new ERIG preparations are potent, highly purified, safe and considerably less expensive than HRIG. However, they are of heterologous origin and carry a small risk of hypersensitivity reactions. There are no scientific grounds for performing a skin test prior to administration of ERIG because testing does not predict reactions, and ERIG should be given whatever the result of the test. RIG for passive immunization should not be injected later than 7 days after the initiation of post-exposure vaccination. The dose for HRIG is 20 IU/kg body weight, and for ERIG and F(ab)2 products 40 IU/kg body weight. All of the RIG, or as much as anatomically possible (cave compartment syndrome), should be administered into or around the wound site(s). Any remaining RIG should be injected IM at a site distant from the site of vaccine administration.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Given the high burden of pneumococcal disease in children and adults, WHO considers the prevention of pneumococcal disease to be a high priority in both industrialized and developing countries.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Many industrialized countries recommend PPV23 immunization of their elderly and other high-risk groups. In resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Given the substantial effects of herd immunity in adult age groups following routine infant immunization with PCV7, a higher priority should be given to introducing and maintaining high coverage of infants with PCV7. Countries considering introducing PPV23 to elderly or other high-risk populations will need to develop strategies for reaching these target populations.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Because of the low level of evidence for benefit, routine PPV23 vaccination of HIV-infected adults is not recommended in resource-limited settings. In low-income countries, WHO recommends the use of other measures that directly or indirectly may help prevent pneumococcal disease, such as trimethoprim-sulfamethoxazole chemoprophylaxis and antiretroviral therapy.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

PPV23 has not been shown to reduce the risk of CAP associated with seasonal or pandemic influenza. However, in countries using PPV23, high levels of vaccine uptake in at-risk populations may help reduce the incidence of pneumococcal bacteraemia during an influenza epidemic or pandemic. Nevertheless, in countries that do not routinely administer PPV23 to high-risk populations, data are insufficient to recommend introducing this vaccine to reduce the morbidity and mortality associated with pandemic influenza.
23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Insufficient evidence of a beneficial effect precludes recommending routine PPV23 vaccination of pregnant or breastfeeding women in order to prevent pneumococcal disease in infants during the first few months of life. In view of the strong herd immunity effect of routine infant immunization with PCV7 and the indirect protection of infants too young to receive conjugated pneumococcal vaccine, emphasis should be placed on ensuring high coverage of PCV7 (or an equivalent conjugated pneumococcal vaccine) in national immunization programmes.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

deferred during pregnancy, particularly during the first trimester, because their effect on the fetus has not been fully evaluated. However, no adverse consequences have been reported among newborns whose mothers were given PPV23 during pregnancy. In countries that routinely administer PCV23 to individuals with identified risk factors for pneumococcal disease (see above), women considered to be in urgent need of this vaccine may be vaccinated even during pregnancy.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Primary immunization with PPV23 consists of a single intramuscular or subcutaneous dose. The intramuscular route may be preferred because of the lower rate of reactions at the injection site. The optimal timing, frequency and clinical effectiveness of additional doses of PPV23 are poorly defined, and national recommendations regarding revaccination vary. However, on the basis of the data on the duration of vaccine-induced protection, WHO suggests one single revaccination >5 years after a first vaccination. 48

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Additional data are needed on the possible induction of hyporesponsiveness following repeated doses of pneumococcal polysaccharide vaccine. Further studies are also required to make recommendations on the possible use of PPV23 to extend the serotype coverage in individuals who have previously received PCV7. 49
Pregnant Women

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Insufficient evidence of a beneficial effect precludes recommending routine PPV23 vaccination of pregnant or breastfeeding women in order to prevent pneumococcal disease in infants during the first few months of life. In view of the strong herd immunity effect of routine infant immunization with PCV7 and the indirect protection of infants too young to receive conjugated pneumococcal vaccine, emphasis should be placed on ensuring high coverage of PCV7 (or an equivalent conjugated pneumococcal vaccine) in national immunization programmes.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

deferred during pregnancy, particularly during the first trimester, because their effect on the fetus has not been fully evaluated. However, no adverse consequences have been reported among newborns whose mothers were given PPV23 during pregnancy. In countries that routinely administer PCV23 to individuals with identified risk factors for pneumococcal disease (see above), women considered to be in urgent need of this vaccine may be vaccinated even during pregnancy.

Program Management

State of the art of new vaccines: research and development

Of importance for the supply of rabies vaccine is the use of the intradermal route schedule which reduces the number of vaccine vials and thereby the cost of PEP by up to 80% (US$ 5-10 for vaccine alone).

Rabies

State of the art of new vaccines: research and development

Of importance for the supply of rabies vaccine is the use of the intradermal route schedule which reduces the number of vaccine vials and thereby the cost of PEP by up to 80% (US$ 5-10 for vaccine alone).
Rabies vaccines (WHO position paper)

Following exposure to a suspected rabid animal, prevention of human rabies consists of prompt wound cleansing and administration of a modern CCV and, in cases of severe (category III) exposure, of rabies immunoglobulin (RIG).

Rabies vaccines (WHO position paper)

it is strongly recommended that the production and use of NTVs for humans be discontinued and replaced by modern CCVs as soon as possible.

Rabies vaccines (WHO position paper)

Pre-exposure immunization is recommended for anyone at increased risk of exposure to rabies virus, either by nature of their residence or occupation, or when travelling.

Rabies vaccines (WHO position paper)

Countries are encouraged to implement control programmes to ensure coordination between all public sectors involved in rabies control.

Rabies vaccines (WHO position paper)

Pre-exposure vaccination using any of the modern CCVs is recommended for anyone at increased risk of exposure to rabies virus. This recommendation includes laboratory staff, veterinarians, animal handlers, wildlife officers with frequent exposure to potentially infected animals, as well as visitors to areas with high risk of rabies.

Rabies vaccines (WHO position paper)

For adults, the vaccine should always be administered in the deltoid area of the arm; for children aged <2 years, the anterolateral area of the thigh is recommended. Rabies vaccine should not be administered in the gluteal area, where the induction of an adequate immune response may be less reliable.
Rabies vaccines (WHO position paper)

ID administration of 0.1 ml volumes on days 0, 7, and 28 (day 28 preferable, but administration may be advanced towards day 21 if time is limited) is an acceptable alternative to the standard IM route. However, ID administration is technically more demanding and requires appropriate staff training and qualified supervision.

Rabies vaccines (WHO position paper)

Periodic booster injections are recommended only for people whose occupation puts them at continuous or frequent risk of rabies exposure. In such cases, a booster dose should be given at intervals ideally dictated by regular testing for antirabies antibodies. Potential laboratory exposures to high concentrations of rabies virus motivates testing as often as every 6 months; VNA titres of at least 0.5 IU/ml indicate protection. Where serological testing is unavailable, booster vaccination every 5 years may be an acceptable alternative.

Rabies vaccines (WHO position paper)

The indication for post-exposure prophylaxis with or without RIG depends on the type of contact with the suspected rabid animal: - Category I: touching or feeding animals, licks on the skin (i.e. no exposure); - Category II: nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin; - Category III: single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks, exposures to bats.

For category I exposures, no prophylaxis is required; whereas for category II, immediate vaccination, and for category III, immediate vaccination and administration of RIG are recommended. For categories II and III, thorough (for ~15 minutes) washing and flushing with soap/detergent and copious amounts of water of all bite wounds and scratches should be done immediately, or as early as possible.
Rabies vaccines (WHO position paper)

Post-exposure prophylaxis can be discontinued if the suspect animal is proved by appropriate laboratory examination to be free of rabies, or, in the case of domestic dogs or cats, the animal remains healthy throughout a 10-day observation period. Factors that should be taken into consideration when deciding whether or not to initiate post-exposure prophylaxis include the likelihood of the concerned animal being rabid, category of exposure (IIII), clinical features of the animal, as well as its availability for observation and laboratory testing. In most situations in developing countries, the vaccination status of the offending animal should not be taken into consideration to withhold prophylaxis.

Rabies vaccines (WHO position paper)

Intramuscular administration
The post-exposure vaccination schedule is based on IM doses of 1 ml or 0.5 ml, depending on the manufacturer. The recommended regimen consists of either a 5-dose or a 4-dose schedule.
(i) The 5-dose regimen prescribes 1 dose injected into the deltoid muscle (or anterolateral thigh in children aged <2 years) on each of days 0, 3, 7, 14 and 28.
(ii) The 4-dose regimen prescribes 2 doses on day 0 (1 in each of the 2 deltoid/thigh sites) followed by 1 dose on each of days 7 and 21.

Intradermal administration
Either the 8-site or the 2-site regimen should be used, as recommended by the respective vaccine manufacturer.
(i) The 8-site ID regimen prescribes on day 0, injections of 0.1 ml given at 8 sites (1 in each upper arm, 1 in each lateral thigh, 1 on each side of the suprascapular region, and 1 on each side of the lower quadrant region of the abdomen); on day 7, 1 injection in each upper arm and each lateral thigh; and on each of days 30 and 90, 1 injection in one upper arm. The 1 dose on day 90 may be replaced by 2 ID injections on day 30.
(ii) The 2-site ID regimen prescribes 1 injection of 0.1 ml at 2 sites on days 0, 3, 7 and 28.

For rabies-exposed patients who have previously undergone complete pre-exposure vaccination or postexposure prophylaxis with a CCV, 2 IM or ID doses of such a vaccine administered on days 0 and 3 are sufficient. RIG is not necessary in such cases. The same rules apply to people vaccinated against rabies who have demonstrated VNA titres of at least 0.5 IU/ml. Vaccination cards carefully recording previous immunizations are invaluable for correct decision-making.
**Rabies vaccines (WHO position paper)**

Rabies immunoglobulin for passive immunization
RIG should be administered in all category III exposures and in category II exposures involving immunodeficient individuals. Given its relatively slow clearance, human rabies immunoglobulin (HRIG) is the preferred product, particularly in cases of multiple severe exposures. However, HRIG is in short supply and available mainly in industrialized countries. Where HRIG is not available or affordable, purified equine immunoglobulin (ERIG) or F(ab)2 products of ERIG should be used. Most of the new ERIG preparations are potent, highly purified, safe and considerably less expensive than HRIG. However, they are of heterologous origin and carry a small risk of hypersensitivity reactions.10 There are no scientific grounds for performing a skin test prior to administration of ERIG because testing does not predict reactions, and ERIG should be given whatever the result of the test. RIG for passive immunization should not be injected later than 7 days after the initiation of post-exposure vaccination. The dose for HRIG is 20 IU/kg body weight, and for ERIG and F(ab)2 products 40 IU/kg body weight. All of the RIG, or as much as anatomically possible (cave compartment syndrome), should be administered into or around the wound site(s). Any remaining RIG should be injected IM at a site distant from the site of vaccine administration.

**Rubella**

**Rubella vaccines (WHO position paper)**

As there is no harm in vaccinating already immune individuals, serological testing before (rubella) immunization is not necessary.

**Rubella vaccines (WHO position paper)**

Each dose of this (RA27/3 rubella) vaccine, which is given by the subcutaneous route, contains a defined number of active virus particles (>1000 TCID 50).

Rubella antibodies present in blood products may interfere with rubella vaccination. Therefore, persons who received blood products should wait at least 3 months before vaccination and if possible, blood products should be avoided for up to 2 weeks postvaccination.
Schedule

Typhoid vaccines (WHO position paper)

The (Ty21a typhoid) vaccine is usually administrated orally as enteric-coated capsules and is registered for use from 6 years of age.

A liquid formulation of the Ty21a (Ty21a typhoid) vaccine can be taken by children as young as 2 years and has proved more immunogenic than the capsular formulation.

Conclusions and recommendations from the meeting of the immunization Strategic Advisory Group of Experts (SAGE) - November 2006

Consistent with WHO's position on new vaccines, PCV-7 (7-serotype conjugate pneumococcal vaccine) can be easily integrated into routine vaccination schedules, and it may be administered at the same time, though at a different site, as other vaccines in infant immunization programmes, including DTP, hepatitis B, Hib and polio vaccines. Routine immunization with PCV-7 should be initiated before the age of 6 months to maximize the benefits of the vaccine and may start as early as 6 weeks of age.

23-valent pneumococcal polysaccharide vaccine (WHO position paper)

Primary immunization with PPV23 consists of a single intramuscular or subcutaneous dose. The intramuscular route may be preferred because of the lower rate of reactions at the injection site. The optimal timing, frequency and clinical effectiveness of additional doses of PPV23 are poorly defined, and national recommendations regarding revaccination vary. However, on the basis of the data on the duration of vaccine-induced protection, WHO suggests one single revaccination >5 years after a first vaccination.

Tetanus

Tetanus vaccine (WHO position paper)

Administration of adsorbed tetanus toxoid is by intramuscular injection.

Travellers

Typhoid vaccines (WHO position paper)

(The Vi polysaccharide typhoid vaccine) can be given simultaneously with other vaccines relevant for international travelers such as the vaccines against yellow fever and hepatitis A.
Rabies vaccines (WHO position paper)

Pre-exposure immunization is recommended for anyone at increased risk of exposure to rabies virus, either by nature of their residence or occupation, or when travelling.

Wer 2007, vol. 82, 49/50, pp 425-436
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Typhoid vaccines: WHO position paper

Typhoid fever vaccination may be offered to travellers to destinations where the risk of typhoid fever is high, especially to those staying in endemic areas for >1 month and/or in locations where antibiotic resistant strains of S. Typhi are prevalent.

Wer 2008, vol. 83, 6, pp 49-60
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Typhoid

Typhoid vaccines (WHO position paper)

The Vi polysaccharide vaccine is administered subcutaneously or intramuscularly as 1 dose of 25 mg to individuals aged > 2 years. The vaccine confers protection 7 days after injection.

Wer 2000, vol. 75, 32, pp 257-264
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Typhoid vaccines (WHO position paper)

The (Ty21a typhoid) vaccine is usually administrated orally as entericcoated capsules and is registered for use from 6 years of age.

A liquid formulation of the Ty21a (Ty21a typhoid) vaccine can be taken by children as young as 2 years and has proved more immunogenic than the capsular formulation.

Wer 2000, vol. 75, 32, pp 257-264
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Typhoid vaccines (WHO position paper)

Ty21a (Ty21a typhoid) is remarkably well tolerated. The vaccine may be given simultaneously with other vaccines, including live vaccines against polio, cholera and yellow fever, or the measles, mumps and rubella (MMR) combination. Proguanil or antibiotics should be avoided during the 3 days before and after vaccination.

Wer 2000, vol. 75, 32, pp 257-264
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Typhoid vaccines (WHO position paper)

(The Vi polysaccharide typhoid vaccine) can be given simultaneously with other vaccines relevant for international travelers such as the vaccines against yellow fever and hepatitis A.
Typhoid vaccines: WHO position paper

In view of the continued high burden of typhoid fever and increasing antibiotic resistance, and given the safety, efficacy, feasibility and affordability of 2 licensed vaccines (Vi and Ty21a), countries should consider the programmatic use of typhoid vaccines for controlling endemic disease. In most countries, the control of the disease will require vaccination only of high-risk groups and populations. Given the epidemic potential of typhoid fever, and observations on the effectiveness of vaccination in interrupting outbreaks, typhoid fever vaccination is recommended also for outbreak control.

Typhoid vaccines: WHO position paper

Decisions on whether or not to initiate programmatic use of typhoid vaccines should be based on knowledge of the local epidemiological situation. Important information includes data on subpopulations at particular risk and age-specific incidence rates, as well as on the sensitivity of the prevailing S. Typhi strains to relevant antimicrobial drugs. Ideally, cost-effectiveness analyses should be part of the planning process.

Typhoid vaccines: WHO position paper

Immunization of school-age and/or preschool-age children is recommended in areas where typhoid fever in these age groups is shown to be a significant public health problem, particularly where antibiotic-resistant S. Typhi is prevalent. The selection of delivery strategy (school or community-based vaccination) depends on factors such as the age-specific incidence of disease, subgroups at particular risk and school enrolment rates, and should be decided by the concerned countries.

Typhoid vaccines: WHO position paper

Typhoid fever vaccination may be offered to travellers to destinations where the risk of typhoid fever is high, especially to those staying in endemic areas for >1 month and/or in locations where antibiotic resistant strains of S. Typhi are prevalent.

Typhoid vaccines: WHO position paper

All typhoid fever vaccination programmes should be implemented in the context of other efforts to control the disease, including health education, water quality and sanitation improvements, and training of health professionals in diagnosis and treatment.
**Typhoid vaccines: WHO position paper**

The Ty21a vaccine:
The capsules are licensed for use in individuals aged >5 years; the liquid vaccine can be administered from the age of 2 years. Both versions of the vaccine are administered every other day; a 3-dose or, in Canada and USA, a 4-dose regimen is recommended for the capsules, whereas the liquid form requires 3 doses. The Ty21a vaccine may be given simultaneously with other vaccines, including live vaccines against polio, cholera, and yellow fever, or the measles, mumps and rubella (MMR) combination.

**Vaccine Handling**

**Introduction of Haemophilus influenzae type b vaccine into immunization programmes**

Types and formulations of Hib vaccines can be interchanged, so vaccines from different manufacturers can be used for each dose that a child receives.

Diluents, both in saline form and made from other vaccines, are produced to go with specific Hib vaccines and are not interchangeable.

**Yellow Fever**

**Yellow fever vaccine (WHO position paper)**

For convenience and improved coverage, the YF vaccine should be administered simultaneously with the measles vaccine at approximately 9-12 months of age, but in a separate syringe and at a different injection site.

The YF (yellow fever) vaccine is given as a single subcutaneous or intramuscular injection (0.5 ml per dose), although the subcutaneous route is preferred.

**Yellow fever vaccine (WHO position paper)**

Since there is no interference between YF (yellow fever) vaccine and other vaccines, YF vaccine may be administered simultaneously, but in different syringes and at different sites, with the following vaccines: measles, polio (oral polio vaccine), diphtheria-tetanus-pertussis, hepatitis B, hepatitis A, oral cholera and oral or parenteral typhoid. When not given simultaneously, live vaccines should be administered at least one month before or one month after the YF vaccination. This recommendation is based on the assumption that interferon released in response to the first vaccine may have a temporary inhibitory effect on other live virus vaccines.