**BCG**

**Immunization in practice: a practical resource guide for Health workers 2004 update Module 3: The cold chain**

BCG, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15oC and -25oC. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15oC to -25oC if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2oC and +8oC. All other vaccines should be stored at between +2oC and +8oC at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

**Contraindications**

**Rubella vaccines (WHO position paper)**

Rubella vaccination should be avoided in pregnancy because of the theoretical, but never demonstrated, teratogenic risk. No cases of CRS have been reported in more than 1 000 susceptible pregnant women who inadvertently received a rubella vaccine in early pregnancy. Consequently, there is no need to screen women for pregnancy before rubella vaccination. If pregnancy is being planned, then an interval of 1 month should be observed after rubella immunization. Rubella vaccination during pregnancy is not an indication for abortion.
DPT

Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 8_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Diphtheria

Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 8_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

General

Thermostability of vaccines

The WHO thermostability requirements for mumps and rubella vaccines are similar to those for measles vaccine. At least three containers of monovalent or MMR vaccine are tested by incubation at 37°C for seven days, at the end of which each monovalent vaccine or individual vaccine component is titrated in PFUs or CCID50 after selective neutralization, as necessary, of the other components. The geometric mean infectious virus titre must equal or exceed the required minimum number of infective units per human dose (3 log10), and the geometric mean virus titre must not have decreased by more than 1 log10 infective units during incubation.

Rubella
Immunization in practice: a practical resource guide for Health workers 2004 update Module 1: Target diseases

For prevention of CRS, women of childbearing age are the primary target group for rubella immunization. Immunizing women between the ages of 15 and 40 will rapidly reduce the incidence of CRS without affecting childhood transmission of the rubella virus.

WHO-UNICEF joint statement on strategies to reduce measles mortality worldwide

Measles immunization provides an opportunity to reach children with other measures that improve overall child health, including:
- supplemental vitamin A doses;
- rubella immunization and surveillance activities.

Measles vaccines (WHO position paper)

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.

Rubella vaccines (WHO position paper)

The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection including CRS.

Rubella vaccines (WHO position paper)

The global burden of CRS (congenital rubella syndrome) has been sufficiently characterized to justify advocating for its control and prevention. However, additional disease burden studies are required to further refine estimates at national and regional levels, particularly in developing countries. Such studies will facilitate comparison between rubella control efforts and other health priorities, and make cost-effectiveness assessments more precise.

Rubella vaccines (WHO position paper)

Rubella vaccination of adults will not alter the transmission dynamics of the virus, whereas inadequately implemented childhood vaccination may result in an increased number of susceptibles among women of childbearing age, and thereby increased risk of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage. Unless high coverage (>80%) can be achieved, large-scale childhood vaccination programmes against rubella are not recommended.
Rubella vaccines (WHO position paper)

Extensive private-sector provision of rubella vaccines for childhood immunization can affect transmission dynamics and increase susceptibility in women of childbearing age. Therefore, the degree and impact of rubella vaccination in the private sector should be assessed.

Rubella vaccines (WHO position paper)

Countries aiming at rubella and CRS elimination through large-scale childhood vaccination programmes should ensure that women of childbearing age are immune. Regular serological screening for rubella antibodies among representative samples of young women is recommended as a sensitive tool to monitor the risk for CRS in a population.

Rubella vaccines (WHO position paper)

Appropriate methods for CRS surveillance include hospital record review, deaf/blind surveys, clinician reporting, and active searches for CRS cases after outbreaks of acquired rubella. Where therapeutic abortions are available, the numbers undertaken because of rubella infection may be a sensitive indicator of the impact of a rubella immunization programme. If resources permit, longitudinal serological surveillance monitors the impact of the immunization programme, especially through collection of samples among women attending antenatal clinics. Monitoring changes in age- and sex-specific seroprevalence provides data for identification of necessary modifications to the immunization strategy. Integrating rubella laboratory investigation with activities to strengthen measles and dengue surveillance will allow the detection of circulation of rubella, and confirm clinically suspected cases.

Rubella vaccines (WHO position paper)

The (rubella) vaccine should be stored at 2C-8 C and protected from light.

Rubella vaccines (WHO position paper)

Rubella vaccine is usually administered at age 12-15 months, but can also be administered to children as young as 9 months of age. In most countries, the vaccine is given as MR or MMR, and the age of administration is chosen based on the appropriate age for measles vaccination. It may also be administered to older children, adolescents, students, child care personnel, health care workers, military personnel and adult men in contact with women of childbearing age.
Rubella vaccines (WHO position paper)

Rubella vaccination should be avoided in pregnancy because of the theoretical, but never demonstrated, teratogenic risk. No cases of CRS have been reported in more than 1,000 susceptible pregnant women who inadvertently received a rubella vaccine in early pregnancy. Consequently, there is no need to screen women for pregnancy before rubella vaccination. If pregnancy is being planned, then an interval of 1 month should be observed after rubella immunization. Rubella vaccination during pregnancy is not an indication for abortion.

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)

WHO recommends the use of rubella vaccine in all countries with well-functioning childhood immunization programmes where reduction or elimination of CRS is considered a public health priority, and where resources may be mobilized to assure implementation of an appropriate strategy.

Rubella vaccines (WHO position paper)

Although detailed surveillance and cost-benefit studies are not needed in every country before implementing rubella vaccination, the choice of policy in this regard requires some baseline information on the susceptibility profile of women of childbearing age (e.g. through serological studies of women attending antenatal services). Also, surveillance for CRS (as outlined in WHO guidelines) should be initiated.

Rubella vaccines (WHO position paper)

Some countries with limited resources and documented very low susceptibility rates amongst their young females, as also reflected in low incidence of CRS, may be well advised not to start on any large-scale vaccination against rubella.

Rubella vaccines (WHO position paper)

For countries wishing to prevent the occurrence of congenital rubella infection including CRS, 2 approaches are recommended: (a) prevention of CRS only, through immunization of adolescent girls and/or women of childbearing age; or (b) elimination of rubella as well as CRS through universal vaccination of infants, surveillance and assuring immunity in women of childbearing age. Decisions on which approach is taken should be based on the level of susceptibility in women of childbearing age, the burden of disease due to CRS, strength of the basic immunization programme as indicated by routine measles coverage, infrastructure and resources for child and adult immunization programmes, assurance of injection safety, and other disease priorities.
Rubella vaccines (WHO position paper)

Countries wishing to prevent CRS should immunize adolescent girls and/or women of childbearing age. The precise target population addressed will depend on susceptibility profile, cultural acceptability and operational feasibility. The most rapid impact would be achieved by mass campaigns for women of childbearing age (and men preferably). For increased impact even men should be vaccinated. Vaccination through routine services could ultimately achieve the same protection, but after a delay during which CRS cases will still occur.

Rubella vaccines (WHO position paper)

A policy of rubella vaccination of adults is essentially free of risks of altering rubella transmission dynamics, whereas inadequately implemented childhood vaccination runs the risk of increasing the number of susceptibles among adults, including women of childbearing age, and the possibility of increased numbers of cases of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage.

Rubella vaccines (WHO position paper)

Following the introduction of large-scale rubella vaccination, coverage should be measured by age and locality. Measuring coverage in infants and young children can be done through routine systems, but extra efforts are needed to routinely assess levels of coverage in adult groups. This will enable the monitoring of programme impact over time and guide future programme activities.

All countries undertaking rubella elimination should ensure that women of childbearing age are immune and that routine coverage in children is sustained >80%.

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.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

All countries that include rubella vaccine in their immunization services should conduct surveillance for CRS (congenital rubella syndrome) and rubella. In the CRS prevention stage, disease surveillance should focus on detecting cases of CRS. In the CRS/rubella elimination phase (usually conducted in conjunction with measles elimination), case-based surveillance of febrile rash illness is necessary.
Recommended types of surveillance for rubella and congenital rubella syndrome (CRS):

1. CRS prevention stage - minimum requirements:
   A. Routine monthly reporting of the number of suspected CRS cases; zero reporting should be required. All suspected CRS cases in infants aged under 1 year should be investigated. The investigation should include clinical and laboratory analysis.
   B. Routine monthly reporting of the number of suspected rubella cases.
   C. All febrile rash illnesses in pregnant women should be investigated.
   D. If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.

2. CRS/rubella elimination stage - minimum requirements:
   A. Same as CRS prevention stage, plus
   B. Routine monthly reporting of the number of confirmed rubella cases; zero reporting should be required.
   C. All febrile rash cases, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.
   D. Regardless of the type of surveillance, designated reporting sites at all levels should report at a specified frequency (e.g. weekly or monthly) even if there are zero cases (often referred to as zero reporting).

Infants with CRS (congenital rubella syndrome) are likely to be seen at specialty facilities that do not normally participate in the immunization service or the routine communicable disease surveillance system, e.g. eye hospitals and hospitals specializing in cardiac surgery. For comprehensive CRS surveillance these facilities should be included in CRS detection, investigation and reporting activities.

Serological monitoring of rubella susceptibility in women attending selected antenatal clinics can be used to monitor the performance of rubella immunization services. However, serological monitoring requires a different laboratory test, e.g. rubella-specific IgG. If serological screening is conducted, arrangements should be made to provide postpartum rubella vaccination to women found to be seronegative.
RCV, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.

**Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation**

While many countries have readily replaced single-antigen measles vaccine with measlesmumpsrubella (MMR) or measlesrubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.
Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8C for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8C. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.

Measles vaccines (WHO position paper)

When affordable, the MR combination should be considered in countries with a persistently high (>80%) routine measles vaccination coverage, where prevention of congenital rubella syndrome is a public health priority and where an immunization programme has been established for women of childbearing age.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

For rubella and congenital rubella syndrome (CRS):
1. CRS prevention stage - minimum requirements:
   _ If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.

2. CRS/rubella elimination stage - minimum requirements:
   _ All febrile rash cases, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.

Immunization in practice: a practical resource guide for Health workers 2004 update Module 1: Target diseases

It is important to ensure that coverage (with rubella vaccine) in infants is sustained at over 80% to avoid shifting of rubella transmission to older age groups.
**Hepatitis B**

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15oC and -25oC. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15oC to -25oC if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2oC and +8oC. All other vaccines should be stored at between +2oC and +8oC at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

**Hib**

**Temperature sensitivity of vaccines**

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**Immunization Coverage**

**Rubella vaccines (WHO position paper)**

Rubella vaccination of adults will not alter the transmission dynamics of the virus, whereas inadequately implemented childhood vaccination may result in an increased number of susceptibles among women of childbearing age, and thereby increased risk of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage. Unless high coverage (>80%) can be achieved, large-scale childhood vaccination programmes against rubella are not recommended.

**Rubella vaccines (WHO position paper)**

Extensive private-sector provision of rubella vaccines for childhood immunization can affect transmission dynamics and increase susceptibility in women of childbearing age. Therefore, the degree and impact of rubella vaccination in the private sector should be assessed.
rubella vaccines (WHO position paper)

Countries aiming at rubella and CRS elimination through large-scale childhood vaccination programmes should ensure that women of childbearing age are immune. Regular serological screening for rubella antibodies among representative samples of young women is recommended as a sensitive tool to monitor the risk for CRS in a population.

rubella vaccines (WHO position paper)

A policy of rubella vaccination of adults is essentially free of risks of altering rubella transmission dynamics, whereas inadequately implemented childhood vaccination runs the risk of increasing the number of susceptibles among adults, including women of childbearing age, and the possibility of increased numbers of cases of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage.

rubella vaccines (WHO position paper)

Following the introduction of large-scale rubella vaccination, coverage should be measured by age and locality. Measuring coverage in infants and young children can be done through routine systems, but extra efforts are needed to routinely assess levels of coverage in adult groups. This will enable the monitoring of programme impact over time and guide future programme activities.

All countries undertaking rubella elimination should ensure that women of childbearing age are immune and that routine coverage in children is sustained >80%.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

Serological monitoring of rubella susceptibility in women attending selected antenatal clinics can be used to monitor the performance of rubella immunization services. However, serological monitoring requires a different laboratory test, e.g. rubella-specific IgG. If serological screening is conducted, arrangements should be made to provide postpartum rubella vaccination to women found to be seronegative.

Immunization in practice: a practical resource guide for Health workers 2004 update Module 1: Target diseases

It is important to ensure that coverage (with rubella vaccine) in infants is sustained at over 80% to avoid shifting of rubella transmission to older age groups.
**MMR**

**Measles vaccines (WHO position paper)**

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.

**Rubella vaccines (WHO position paper)**

Rubella vaccine is usually administered at age 12-15 months, but can also be administered to children as young as 9 months of age. In most countries, the vaccine is given as MR or MMR, and the age of administration is chosen based on the appropriate age for measles vaccination. It may also be administered to older children, adolescents, students, child care personnel, health care workers, military personnel and adult men in contact with women of childbearing age.

**Immunization in practice: a practical resource guide for Health workers 2004 update Module 3: The cold chain**

BCG, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.

**Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation**

While many countries have readily replaced single-antigen measles vaccine with measlesmumpsrubella (MMR) or measlesrubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.
Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15oC and -25oC. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15oC to -25oC if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2oC and +8oC. All other vaccines should be stored at between +2oC and +8oC at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8C for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8C. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.

Measles vaccines (WHO position paper)

(W)hen affordable, the MR combination should be considered in countries with a persistently high (>80%) routine measles vaccination coverage, where prevention of congenital rubella syndrome is a public health priority and where an immunization programme has been established for women of childbearing age.

Measles

WHO-UNICEF joint statement on strategies to reduce measles mortality worldwide

Measles immunization provides an opportunity to reach children with other measures that improve overall child health, including:
_ supplemental vitamin A doses;
_ rubella immunization and surveillance activities.
Measles vaccines (WHO position paper)

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.

Immunization in practice: a practical resource guide for Health workers 2004 update Module 3: The cold chain

BCG, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.

Temperature sensitivity of vaccines

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Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8C for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8C. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.
Measles vaccines (WHO position paper)

When affordable, the MR combination should be considered in countries with a persistently high (>80%) routine measles vaccination coverage, where prevention of congenital rubella syndrome is a public health priority and where an immunization programme has been established for women of childbearing age.

Meningococcal

Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Mumps

Thermostability of vaccines

The WHO thermostability requirements for mumps and rubella vaccines are similar to those for measles vaccine. At least three containers of monovalent or MMR vaccine are tested by incubation at 37°C for seven days, at the end of which each monovalent vaccine or individual vaccine component is titrated in PFUs or CCID50 after selective neutralization, as necessary, of the other components. The geometric mean infectious virus titre must equal or exceed the required minimum number of infective units per human dose (3 log10), and the geometric mean virus titre must not have decreased by more than 1 log10 infective units during incubation.

Measles vaccines (WHO position paper)

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.
Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81.1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15oC and -25oC. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15oC to -25oC if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2oC and +8oC. All other vaccines should be stored at between +2oC and +8oC at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8oC for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8oC. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.

New Vaccines

Measles vaccines (WHO position paper)

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.

Rubella vaccines (WHO position paper)

Rubella vaccination of adults will not alter the transmission dynamics of the virus, whereas inadequately implemented childhood vaccination may result in an increased number of susceptibles among women of childbearing age, and thereby increased risk of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage. Unless high coverage (>80%) can be achieved, large-scale childhood vaccination programmes against rubella are not recommended.
Rubella vaccines (WHO position paper)

WHO recommends the use of rubella vaccine in all countries with well-functioning childhood immunization programmes where reduction or elimination of CRS is considered a public health priority, and where resources may be mobilized to assure implementation of an appropriate strategy.

Rubella vaccines (WHO position paper)

Some countries with limited resources and documented very low susceptibility rates amongst their young females, as also reflected in low incidence of CRS, may be well advised not to start on any large-scale vaccination against rubella.

Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation

While many countries have readily replaced single-antigen measles vaccine with measlesmumpsrubella (MMR) or measlesrubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.

Measles vaccines (WHO position paper)

(When) affordable, the MR combination should be considered in countries with a persistently high (>80%) routine measles vaccination coverage, where prevention of congenital rubella syndrome is a public health priority and where an immunization programme has been established for women of childbearing age.
Outbreak Control

Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation  

While many countries have readily replaced single-antigen measles vaccine with measlesmumpsrubella (MMR) or measlesrubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

For rubella and congenital rubella syndrome (CRS):

1. CRS prevention stage - minimum requirements:
   _ If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.

2. CRS/rubella elimination stage - minimum requirements:
   _ All febrile rash cases, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.
**Pentavalent**

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

**Policy**

**Thermostability of vaccines**

The WHO thermostability requirements for mumps and rubella vaccines are similar to those for measles vaccine. At least three containers of monovalent or MMR vaccine are tested by incubation at 37°C for seven days, at the end of which each monovalent vaccine or individual vaccine component is titrated in PFUs or CCID50 after selective neutralization, as necessary, of the other components. The geometric mean infectious virus titre must equal or exceed the required minimum number of infective units per human dose (3 log10), and the geometric mean virus titre must not have decreased by more than 1 log10 infective units during incubation.

**Immunization in practice: a practical resource guide for Health workers 2004 update_____Module 1: Target diseases**

For prevention of CRS, women of childbearing age are the primary target group for rubella immunization. Immunizing women between the ages of 15 and 40 will rapidly reduce the incidence of CRS without affecting childhood transmission of the rubella virus.

**WHO-UNICEF joint statement on strategies to reduce measles mortality worldwide**

Measles immunization provides an opportunity to reach children with other measures that improve overall child health, including:

- supplemental vitamin A doses;
- rubella immunization and surveillance activities.
Measles vaccines (WHO position paper)

Where measles vaccine has been combined with rubella vaccine (MR) or mumps and rubella vaccine (MMR), the protective immune response to the individual components remains unchanged. The use of such combined vaccines is logistically and programmatically sound and is recommended in areas where the disease burden of mumps and rubella disease burden is high, when the vaccine is affordable and, in the case of rubella, where vaccine coverage rates can be sustained at >80%.

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Rubella vaccines (WHO position paper)

The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection including CRS.

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Rubella vaccines (WHO position paper)

The global burden of CRS (congenital rubella syndrome) has been sufficiently characterized to justify advocating for its control and prevention. However, additional disease burden studies are required to further refine estimates at national and regional levels, particularly in developing countries. Such studies will facilitate comparison between rubella control efforts and other health priorities, and make cost-effectiveness assessments more precise.

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Rubella vaccines (WHO position paper)

Rubella vaccination of adults will not alter the transmission dynamics of the virus, whereas inadequately implemented childhood vaccination may result in an increased number of susceptibles among women of childbearing age, and thereby increased risk of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage. Unless high coverage (>80%) can be achieved, large-scale childhood vaccination programmes against rubella are not recommended.

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Rubella vaccines (WHO position paper)

Extensive private-sector provision of rubella vaccines for childhood immunization can affect transmission dynamics and increase susceptibility in women of childbearing age. Therefore, the degree and impact of rubella vaccination in the private sector should be assessed.

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Rubella vaccines (WHO position paper)

Countries aiming at rubella and CRS elimination through large-scale childhood vaccination programmes should ensure that women of childbearing age are immune. Regular serological screening for rubella antibodies among representative samples of young women is recommended as a sensitive tool to monitor the risk for CRS in a population.

page 162
Rubella vaccines (WHO position paper)

Appropriate methods for CRS surveillance include hospital record review, deaf/blind surveys, clinician reporting, and active searches for CRS cases after outbreaks of acquired rubella. Where therapeutic abortions are available, the numbers undertaken because of rubella infection may be a sensitive indicator of the impact of a rubella immunization programme. If resources permit, longitudinal serological surveillance monitors the impact of the immunization programme, especially through collection of samples among women attending antenatal clinics. Monitoring changes in age- and sex-specific seroprevalence provides data for identification of necessary modifications to the immunization strategy. Integrating rubella laboratory investigation with activities to strengthen measles and dengue surveillance will allow the detection of circulation of rubella, and confirm clinically suspected cases.

Rubella vaccines (WHO position paper)

The (rubella) vaccine should be stored at 2C-8 C and protected from light.

Rubella vaccines (WHO position paper)

Rubella vaccine is usually administered at age 12-15 months, but can also be administered to children as young as 9 months of age. In most countries, the vaccine is given as MR or MMR, and the age of administration is chosen based on the appropriate age for measles vaccination. It may also be administered to older children, adolescents, students, child care personnel, health care workers, military personnel and adult men in contact with women of childbearing age.

Rubella vaccines (WHO position paper)

Rubella vaccination should be avoided in pregnancy because of the theoretical, but never demonstrated, teratogenic risk. No cases of CRS have been reported in more than 1 000 susceptible pregnant women who inadvertently received a rubella vaccine in early pregnancy. Consequently, there is no need to screen women for pregnancy before rubella vaccination. If pregnancy is being planned, then an interval of 1 month should be observed after rubella immunization. Rubella vaccination during pregnancy is not an indication for abortion.

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)

WHO recommends the use of rubella vaccine in all countries with well-functioning childhood immunization programmes where reduction or elimination of CRS is considered a public health priority, and where resources may be mobilized to assure implementation of an appropriate strategy.
Rubella vaccines (WHO position paper)

Although detailed surveillance and cost-benefit studies are not needed in every country before implementing rubella vaccination, the choice of policy in this regard requires some baseline information on the susceptibility profile of women of childbearing age (e.g. through serological studies of women attending antenatal services). Also, surveillance for CRS (as outlined in WHO guidelines) should be initiated.

Rubella vaccines (WHO position paper)

Some countries with limited resources and documented very low susceptibility rates amongst their young females, as also reflected in low incidence of CRS, may be well advised not to start on any large-scale vaccination against rubella.

Rubella vaccines (WHO position paper)

For countries wishing to prevent the occurrence of congenital rubella infection including CRS, 2 approaches are recommended: (a) prevention of CRS only, through immunization of adolescent girls and/or women of childbearing age; or (b) elimination of rubella as well as CRS through universal vaccination of infants, surveillance and assuring immunity in women of childbearing age. Decisions on which approach is taken should be based on the level of susceptibility in women of childbearing age, the burden of disease due to CRS, strength of the basic immunization programme as indicated by routine measles coverage, infrastructure and resources for child and adult immunization programmes, assurance of injection safety, and other disease priorities.

Rubella vaccines (WHO position paper)

Countries wishing to prevent CRS should immunize adolescent girls and/or women of childbearing age. The precise target population addressed will depend on susceptibility profile, cultural acceptability and operational feasibility. The most rapid impact would be achieved by mass campaigns for women of childbearing age (and men preferably). For increased impact even men should be vaccinated. Vaccination through routine services could ultimately achieve the same protection, but after a delay during which CRS cases will still occur.

Rubella vaccines (WHO position paper)

A policy of rubella vaccination of adults is essentially free of risks of altering rubella transmission dynamics, whereas inadequately implemented childhood vaccination runs the risk of increasing the number of susceptibles among adults, including women of childbearing age, and the possibility of increased numbers of cases of CRS. Consequently, it is essential that childhood vaccination programmes achieve and maintain high levels of coverage.
Rubella vaccines (WHO position paper)

Following the introduction of large-scale rubella vaccination, coverage should be measured by age and locality. Measuring coverage in infants and young children can be done through routine systems, but extra efforts are needed to routinely assess levels of coverage in adult groups. This will enable the monitoring of programme impact over time and guide future programme activities.

All countries undertaking rubella elimination should ensure that women of childbearing age are immune and that routine coverage in children is sustained >80%.

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.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

All countries that include rubella vaccine in their immunization services should conduct surveillance for CRS (congenital rubella syndrome) and rubella. In the CRS prevention stage, disease surveillance should focus on detecting cases of CRS. In the CRS/rubella elimination phase (usually conducted in conjunction with measles elimination), case-based surveillance of febrile rash illness is necessary.
WHO recommended standards for surveillance of selected vaccine-preventable diseases

Recommended types of surveillance for rubella and congenital rubella syndrome (CRS):
1. CRS prevention stage - minimum requirements:
   A. Routine monthly reporting of the number of suspected CRS cases; zero reporting should be required. All suspected CRS cases in infants aged under 1 year should be investigated. The investigation should include clinical and laboratory analysis.
   B. Routine monthly reporting of the number of suspected rubella cases.
   C. All febrile rash illnesses in pregnant women should be investigated.
   D. If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.
2. CRS/rubella elimination stage - minimum requirements:
   A. Same as CRS prevention stage, plus
   B. Routine monthly reporting of the number of confirmed rubella cases; zero reporting should be required.
   C. All febrile rash cases, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.
   D. Regardless of the type of surveillance, designated reporting sites at all levels should report at a specified frequency (e.g. weekly or monthly) even if there are zero cases (often referred to as zero reporting).

WHO recommended standards for surveillance of selected vaccine-preventable diseases

Infants with CRS (congenital rubella syndrome) are likely to be seen at specialty facilities that do not normally participate in the immunization service or the routine communicable disease surveillance system, e.g. eye hospitals and hospitals specializing in cardiac surgery. For comprehensive CRS surveillance these facilities should be included in CRS detection, investigation and reporting activities.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

Serological monitoring of rubella susceptibility in women attending selected antenatal clinics can be used to monitor the performance of rubella immunization services. However, serological monitoring requires a different laboratory test, e.g. rubella-specific IgG. If serological screening is conducted, arrangements should be made to provide postpartum rubella vaccination to women found to be seronegative.
BCG, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.

**Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation**

While many countries have readily replaced single-antigen measles vaccine with measlesmumpsrubella (MMR) or measlesrubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.
Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8°C for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8°C. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.

Measles vaccines (WHO position paper)

(When) affordable, the MR combination should be considered in countries with a persistently high (>80%) routine measles vaccination coverage, where prevention of congenital rubella syndrome is a public health priority and where an immunization programme has been established for women of childbearing age.

WHO recommended standards for surveillance of selected vaccine-preventable diseases

For rubella and congenital rubella syndrome (CRS):
1. CRS prevention stage - minimum requirements:
   _ If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.

2. CRS/rubella elimination stage - minimum requirements:
   _ All febrile rash cases, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.

Immunization in practice: a practical resource guide for Health workers 2004 update Module 1: Target diseases

(I)t is important to ensure that coverage (with rubella vaccine) in infants is sustained at over 80% to avoid shifting of rubella transmission to older age groups.
Polio

Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Pregnant Women

Rubella vaccines (WHO position paper)

Rubella vaccination should be avoided in pregnancy because of the theoretical, but never demonstrated, teratogenic risk. No cases of CRS have been reported in more than 1 000 susceptible pregnant women who inadvertently received a rubella vaccine in early pregnancy. Consequently, there is no need to screen women for pregnancy before rubella vaccination. If pregnancy is being planned, then an interval of 1 month should be observed after rubella immunization. Rubella vaccination during pregnancy is not an indication for abortion.

Program Management

WHO-UNICEF joint statement on strategies to reduce measles mortality worldwide

Measles immunization provides an opportunity to reach children with other measures that improve overall child health, including:
- supplemental vitamin A doses;
- rubella immunization and surveillance activities.

Rubella vaccines (WHO position paper)

The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection including CRS.
Rubella vaccines (WHO position paper)

For countries wishing to prevent the occurrence of congenital rubella infection including CRS, 2 approaches are recommended: (a) prevention of CRS only, through immunization of adolescent girls and/or women of childbearing age; or (b) elimination of rubella as well as CRS through universal vaccination of infants, surveillance and assuring immunity in women of childbearing age. Decisions on which approach is taken should be based on the level of susceptibility in women of childbearing age, the burden of disease due to CRS, strength of the basic immunization programme as indicated by routine measles coverage, infrastructure and resources for child and adult immunization programmes, assurance of injection safety, and other disease priorities.

Rubella vaccines (WHO position paper)

Countries wishing to prevent CRS should immunize adolescent girls and/or women of childbearing age. The precise target population addressed will depend on susceptibility profile, cultural acceptability and operational feasibility. The most rapid impact would be achieved by mass campaigns for women of childbearing age (and men preferably). For increased impact even men should be vaccinated. Vaccination through routine services could ultimately achieve the same protection, but after a delay during which CRS cases will still occur.

Research

Rubella vaccines (WHO position paper)

The global burden of CRS (congenital rubella syndrome) has been sufficiently characterized to justify advocating for its control and prevention. However, additional disease burden studies are required to further refine estimates at national and regional levels, particularly in developing countries. Such studies will facilitate comparison between rubella control efforts and other health priorities, and make cost-effectiveness assessments more precise.

Schedule

Immunization in practice: a practical resource guide for Health workers 2004 update Module 1: Target diseases

For prevention of CRS, women of childbearing age are the primary target group for rubella immunization. Immunizing women between the ages of 15 and 40 will rapidly reduce the incidence of CRS without affecting childhood transmission of the rubella virus.
Rubella vaccines (WHO position paper)

Rubella vaccine is usually administered at age 12-15 months, but can also be administered to children as young as 9 months of age. In most countries, the vaccine is given as MR or MMR, and the age of administration is chosen based on the appropriate age for measles vaccination. It may also be administered to older children, adolescents, students, child care personnel, health care workers, military personnel and adult men in contact with women of childbearing age.

Tetanus

Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

VPD Surveillance

Rubella vaccines (WHO position paper)

Appropriate methods for CRS surveillance include hospital record review, deaf/blind surveys, clinician reporting, and active searches for CRS cases after outbreaks of acquired rubella. Where therapeutic abortions are available, the numbers undertaken because of rubella infection may be a sensitive indicator of the impact of a rubella immunization programme. If resources permit, longitudinal serological surveillance monitors the impact of the immunization programme, especially through collection of samples among women attending antenatal clinics. Monitoring changes in age- and sex-specific seroprevalence provides data for identification of necessary modifications to the immunization strategy. Integrating rubella laboratory investigation with activities to strengthen measles and dengue surveillance will allow the detection of circulation of rubella, and confirm clinically suspected cases.

Although detailed surveillance and cost-benefit studies are not needed in every country before implementing rubella vaccination, the choice of policy in this regard requires some baseline information on the susceptibility profile of women of childbearing age (e.g. through serological studies of women attending antenatal services). Also, surveillance for CRS (as outlined in WHO guidelines) should be initiated.
WHO recommended standards for surveillance of selected vaccine-preventable diseases

All countries that include rubella vaccine in their immunization services should conduct surveillance for CRS (congenital rubella syndrome) and rubella. In the CRS prevention stage, disease surveillance should focus on detecting cases of CRS. In the CRS/rubella elimination phase (usually conducted in conjunction with measles elimination), case-based surveillance of febrile rash illness is necessary.

Recommended types of surveillance for rubella and congenital rubella syndrome (CRS):

1. CRS prevention stage - minimum requirements:
   A. Routine monthly reporting of the number of suspected CRS cases; zero reporting should be required. All suspected CRS cases in infants aged under 1 year should be investigated. The investigation should include clinical and laboratory analysis.
   B. Routine monthly reporting of the number of suspected rubella cases.
   C. All febrile rash illnesses in pregnant women should be investigated.
   D. If a rubella outbreak is detected a limited number of suspected rubella cases should be investigated with rubella-specific IgM tests periodically during the outbreak (5 to 10 cases investigated per outbreak). Active surveillance (defined as regular visits to selected reporting sites to look for unreported cases) should be initiated to improve detection of suspected CRS in infants aged under 1 year and continued for nine months after the last reported case of rubella.

2. CRS/rubella elimination stage - minimum requirements:
   A. Same as CRS prevention stage, plus
   B. Routine monthly reporting of the number of confirmed rubella cases; zero reporting should be required.
   C. All febrile rash illnesses, regardless of age, should be investigated. The investigation should include laboratory analysis of each case for measles and, if the result is negative, for rubella (see section of this document on measles). Priority should be given to the investigation of febrile rash illnesses in pregnant women.
   D. Regardless of the type of surveillance, designated reporting sites at all levels should report at a specified frequency (e.g. weekly or monthly) even if there are zero cases (often referred to as zero reporting).

Infants with CRS (congenital rubella syndrome) are likely to be seen at specialty facilities that do not normally participate in the immunization service or the routine communicable disease surveillance system, e.g. eye hospitals and hospitals specializing in cardiac surgery. For comprehensive CRS surveillance these facilities should be included in CRS detection, investigation and reporting activities.
Vaccine introduction guidelines. Adding a vaccine to a national immunization programme: decision and implementation

While many countries have readily replaced single-antigen measles vaccine with measles-mumps-rubella (MMR) or measles-rubella (MR) vaccines, to prevent a potential gradual increase in rubella susceptibility among women of childbearing age and a paradoxical increase in congenital rubella syndrome (CRS) incidence, efforts are needed to assure that women of childbearing age are also protected against rubella.

A strong laboratory-based surveillance mechanism is a must for identification of rubella outbreaks following the introduction of MMR or MR into the NIP.

A screening programme should be available for females entering childbearing age because, once the vaccine is introduced into the NIP, the susceptibility of adults getting rubella will be increased.

Vaccine Administration

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.

Vaccine Handling

Rubella vaccines (WHO position paper)

The (rubella) vaccine should be stored at 2°C-8°C and protected from light.

Immunization in practice: a practical resource guide for Health workers 2004 update Module 3: The cold chain

BCG, measles, MR, MMR and rubella vaccines are equally sensitive to light (as well as to heat). Normally, these vaccines are supplied in vials made from dark brown glass, which gives them some protection against light damage, but care must still be taken to keep them covered and protected from strong light at all times.
Temperature sensitivity of vaccines

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81_1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15oC and -25oC. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15oC to -25oC if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2oC and +8oC. All other vaccines should be stored at between +2oC and +8oC at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.

Temperature sensitivity of vaccines

There is a serious risk when reconstituted (measles, mumps, and rubella vaccines and their combinations are) stored at any temperature for longer than six hours or above 8C for any period. This is not only because of the lack of potency, but also because of the possibility of contamination of the product, which could cause serious adverse consequences in those being vaccinated. When used, measles vaccine should be protected from elevated temperature and from light (light may inactivate the virus). Reconstituted vaccines must be discarded at the end of each immunization session and should NEVER be kept for use in subsequent sessions.

After reconstitution, measles and MMR vaccine rapidly lose their potency when kept at temperatures above 2-8C. Reconstituted measles and MMR vaccines should be kept cold during immunization procedures, must be discarded at the end of each immunization session and must never be kept for use in subsequent sessions.

Vaccine Quality

Thermostability of vaccines

The WHO thermostability requirements for mumps and rubella vaccines are similar to those for measles vaccine. At least three containers of monovalent or MMR vaccine are tested by incubation at 37C for seven days, at the end of which each monovalent vaccine or individual vaccine component is titrated in PFUs or CCID50 after selective neutralization, as necessary, of the other components. The geometric mean infectious virus titre must equal or exceed the required minimum number of infective units per human dose (3 log10), and the geometric mean virus titre must not have decreased by more than 1 log10 infective units during incubation.
**Vitamin A**

**WHO-UNICEF joint statement on strategies to reduce measles mortality worldwide**

Measles immunization provides an opportunity to reach children with other measures that improve overall child health, including:

- supplemental vitamin A doses;
- rubella immunization and surveillance activities.

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**Yellow Fever**

**Temperature sensitivity of vaccines**

The recommended conditions for storing vaccines used in immunization programmes are shown in Appendix 81-1. This diagram also indicates the maximum times and temperatures in each case. At the higher levels of the cold chain, i.e., at national (primary), and regional or province level, OPV must be kept frozen between -15°C and -25°C. Freeze-dried vaccines (i.e., BCG, measles, MMR and yellow fever) may also be kept frozen at -15°C to -25°C if cold chain space permits, but this is neither essential nor recommended. At other levels of the cold chain (intermediate vaccine stores and health facilities), these vaccines should be stored between +2°C and +8°C. All other vaccines should be stored at between +2°C and +8°C at all levels of the cold chain. Liquid formulations of vaccines containing diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, IPV and their combinations should not be frozen.