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A.1 Recommended Screening Tests in Pregnant Women

Principle
Intrauterine or perinatally transmitted blood-borne viral infections, and some sexually transmitted infections, can have fatal or severely debilitating effects on the foetus. Pregnant women should be offered screening for syphilis, hepatitis B and HIV in order to facilitate appropriate treatment and thereby reduce the risk of foetal or neonatal infection. At the Rotunda, screening for varicella zoster antibody is also offered, this will facilitate management of exposure incidents. In some circumstances, screening for hepatitis C is also offered. Written consent must be obtained for these serological investigations. A consent form is available on all Wards and in the patient chart.

1. Recommended Screening Tests at the Booking visit

➢ syphilis
Serological tests for syphilis (treponemal serology) should be performed at the booking visit. For patients recognised as falling into high-risk groups, screening should be, if possible, repeated in the third trimester (examples of women at high-risk are, those who have concomitant sexually transmitted diseases and those with multiple sexual partners).

N.B. Any woman who delivers a stillborn infant should be tested for syphilis.

➢ hepatitis B
A serological test for hepatitis B surface antigen should be performed at the first antenatal visit. The test should, if possible, be repeated late in pregnancy in the case of women who test negative and who are at high-risk of acquiring the infection (e.g., injecting drug users, and women who have another infection that may be sexually transmitted).

➢ HIV
A test for HIV antibody should be offered to all pregnant women at the first antenatal visit. The test should, if possible, be repeated in the second trimester (ideally at about 24 weeks) and again near term (36 weeks) in the following groups:
- women at risk of acquiring the infection or women who may be in the negative "window period" at booking (e.g., injecting drug users, those who have other sexually transmitted infections, and women with a partner who is HIV positive).

➢ hepatitis C
Screening for Hepatitis C is offered to women with risk factors for hepatitis C, (i.e., injecting drug use, recipient of transfusion of blood/blood products, sexual contact with a potentially infected partner, the presence of tattoos or body piercing, or a history of jaundice, and immigrants from moderate-high prevalence areas). To avoid missing women in the "window period", during which a false negative result may be obtained, hepatitis C tests should if possible be repeated at 36 weeks, in women at high risk of infection. (Because of the chaotic lifestyle of some of these patients, it may not be possible to perform repeat serology).

➢ rubella
All pregnant women including those who present unbooked, should be screened for antibody to rubella.

➢ Varicella zoster virus
All pregnant women including those who present unbooked, should be screened for antibody to varicella zoster virus. This will simplify management in the event of a significant exposure incident. (For guidance on management of vzz exposure incidents, page 26 - 28).
A.2 Women who present unbooked, near term or in labour

- Screening for hepatitis B and HIV should be offered and performed with minimal delay when the patient presents in order to facilitate intervention to reduce the risk of vertical transmission.
  - Every effort should be made to arrange this testing before the birth of the baby.

- Urgent testing should be performed in the case of all women who present in labour, or with ruptured membranes, or in whom labour is imminent; this should be performed with minimal delay.

- Rapid testing should be performed in each of the following
  - all women who present at >36 weeks gestation,
  - all women in whom premature labour is anticipated

In general, testing in these groups does not have to be performed outside normal working hours, this will be dictated by individual circumstances.

- A second blood sample should be taken for testing for rubella, syphilis and varicella zoster; these are not emergency tests.

- There is no need to arrange urgent testing for hepatitis C infection.

A.2a Woman in labour, or with ruptured membranes, or labour is imminent: In these situations, HIV testing should be performed urgently.

N.B. Two clotted blood samples are required.

- In normal working hours, ensure that the specimens are labelled “urgent”, bring the specimens to the Microbiology laboratory and hand to a Microbiology technician.

- Urgent out-of-hours testing is at present performed at the National Virus Reference Laboratory (NVRL).
  - The medical laboratory technician “on-call” at the Rotunda will arrange testing.
  - The results will be telephoned from the NVRL to the Obstetric Registrar “on-call”.
  - Please ensure that the results are recorded in the patient’s chart.

- Which tests are urgent?
  - HIV antibody test should be requested urgently
  - Only if the next day is not a normal working day, should hepatitis B surface antigen testing be requested urgently.

    When the next day is a normal working day hepatitis B testing can usually be performed in-house on the next day.

  - Hepatitis C testing is not required urgently (there is at present no preventive intervention); HCV testing can be arranged at a later date if required.

- Serological testing for syphilis should be performed by arrangement with the Microbiology laboratory on the next working day. (There is no emergency testing service available). The Microbiology laboratory must be contacted so that arrangements can be made for prompt testing.
A.2b. Woman not in labour, membranes not ruptured, labour not imminent: Testing will usually be performed in-house.

N.B. Two clotted blood samples are required.
- In normal working hours, ensure that the specimens are labelled “unbooked” and with the gestation, bring the specimens to the Microbiology laboratory and hand to a Microbiology technician.
- Outside normal working hours, leave the specimens in the refrigerator outside the laboratory.

A.3 Management of Positive HIV or HBV results on women who present unbooked near term or in labour

A.3a HIV antibody positive

See The Rainbow Clinic guidance, available on all wards and in the Delivery Suite, for detailed management.

The following is a summary of the action that should be taken:

Management of the Mother:
- Notify and discuss with Consultant Obstetrician and with Professor Cafferkey.
- If the woman is in labour, Caesarean section should be performed if possible, when loaded with zidovudine (preferably 4 hours treatment): discuss with Consultant Obstetrician.
- If the woman is not in labour, an elective section should be scheduled. Discuss with Consultant Obstetrician.

Labour and Delivery:
In all cases
Commence IV zidovudine infusion at onset of labour or 4 hours prior to elective Caesarean section, or with minimal delay if the woman is in labour; the dosage is zidovudine 2mg/kg loading dose over 1 hour followed by 1mg/kg/hr until delivery is complete and the cord is clamped.
(Appendix 3 Rainbow Clinic Guidance)

Minimise exposure to the infant as follows:
- *Where possible avoid artificial rupture of membranes (ARM)
- Avoid foetal scalp electrodes or foetal blood sampling
- Clean eyes with saline on delivery of the head
- Clamp cord ASAP to minimise the risk of maternal foetal microtransfusions
- Avoid nasopharyngeal suction. Use gentle oral suction
- Towel dry baby and bath as soon as possible after birth
- Clean skin thoroughly before any infusions or injections

HIV transmission risk correlates with the duration of labour and membrane rupture. Every effort should be made to safely minimise this risk. Decisions to expedite delivery or induce labour in women with pre-labour ROM will be made balancing potential risks and benefits.

N.B. If the mother has delivered when the positive HIV screening results become available, there is no need to commence treatment in the mother however treatment of the infant should commence without delay.

Antiretroviral Treatment of the infant (post-exposure prophylaxis):
Refer to The Rainbow Clinic guidance
A.3b Hepatitis B

In the event that tests are positive for hepatitis B surface antigen, the following action should be taken:

*Minimise exposure to the infant as follows:*
- Where possible avoid artificial rupture of membranes (ARM)
- Avoid foetal scalp electrodes or foetal blood sampling
- Clean eyes with saline on delivery of the head
- Clamp cord ASAP to minimise the risk of maternal foetal microtransfusions
- Avoid nasopharyngeal suction. Use gentle oral suction
- Towel dry baby and bath as soon as possible after birth to remove any blood. (Wear plastic apron and gloves)
- Clean skin thoroughly before any infusions or injections

**Management of the Infant:**
- The infant should be bathed as soon as possible after delivery

**Recommended Immunisation:**

<table>
<thead>
<tr>
<th>Mother’s status</th>
<th>Hepatitis B vaccine</th>
<th>HBIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg positive, regardless of other markers</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>HBsAg negative, Anti-HBc positive, &amp; Anti-HBs negative</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Anti-HBs positive</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Acute hepatitis B infection in pregnancy</td>
<td>Yes</td>
<td>As for markers listed above</td>
</tr>
</tbody>
</table>

- **Active Immunisation**
  Intramuscular injection of 0.5ml hepatitis B vaccine ("Engerix B" or "HB-Vax II") is given as soon as possible after birth. The anterolateral-thigh is the preferred site for injection. *"Engerix B" is available from the Pharmacy.*

- **Passive Immunisation**
  Intravenous infusion of 0.4ml/Kg body weight of ("Hepatect") hepatitis B immunoglobulin (HBIG) should be given as soon as possible after birth. The infant must be admitted to the NICU for this procedure. The solution should be administered at room temperature infused over 30 minutes. *HBIG is available from the Pharmacy.*

**N.B.:** See detailed hepatitis B guideline (Page 10-11).
A.4 General guidance on Antiretroviral treatment in labour and for the infant of a known HIV positive patient in whom results of viral load or treatment protocol are not available

In the case of all HIV positive women attending Infectious Diseases / GUM services throughout Ireland, individualised treatment protocols are developed in collaboration with Dr. Karina Butler, Paediatric Infectious Diseases Consultant.

Close to term, details of the individualised recommendations are sent to the Obstetric team and will be placed in the patient’s Obstetric chart.

In addition Dr. Butler will usually give each patient a “red card” detailing the recommended antiviral protocol for delivery.

➢ If the treatment details are not in the chart:

➢ Determine whether or not the woman has got the red card/information card with her.
➢ If the woman does not have the details, consult The Rainbow Clinic guidance which is available on each ward.
➢ If the appropriate treatment remains then unclear, consult Professor Cafferkey through the hospital switchboard.
➢ The Infectious Diseases Liaison Midwife will in the usual course of events contact Dr. Butler’s team and the adult Infectious Diseases services on the next normal working day.

For detailed guidance on management of women with HIV infection, please consult The Rainbow Clinic guidelines, “Preventing mother to child transmission of HIV infection: management of the HIV positive pregnant woman and the neonate”, which are available on all wards and in the delivery Suite.

A.5 Hepatitis C

At the present time, selective screening for HCV is performed at the Rotunda. Urgent testing is rarely if ever required. The risk of vertical transmission is about 7%. At the present time there is no proven method of preventing or reducing the risk of vertical transmission. The suggestion that Caesarean section may be helpful must be tested in larger trials.
A.6 General Management of Antenatal Patient found to be positive for HIV, hepatitis B or hepatitis C

- General antenatal management is usually by the Obstetric team with special interest in maternal disease (Wednesday afternoon Antenatal Clinic, the Dove Clinic).
- The Infectious Diseases Liaison Midwife or the Obstetric Registrar on the Dove Clinic team will arrange for repeat (confirmatory) testing with minimal delay in women found to be HBsAg carriers or positive for HIV antibody.
- The individual Consultant will usually manage personal patients.
- Women with confirmed HIV infection are referred urgently to Adult Infectious Diseases Services and also to the Paediatric Infectious Diseases Service. Details of peripartum antiretroviral treatment and recommended mode of delivery will be inserted in the chart near to the time of anticipated delivery.
- In the case of women confirmed to be hepatitis B carriers and those found to have hepatitis C antibody, liver function tests are performed and blood sent to the NVRL for HBV or HCV PCR. Referral arrangements are made to the hepatology services (Dr. P. MacMathuna) for assessment; a monthly Hepatology Clinic now takes place at the Rotunda.
- For HBsAg, details of the recommended immunoprophylaxis of the infant (active +/- passive immunisation) are inserted in the front of the mother’s chart.

General precaution with labour and delivery to minimise exposure of the infant to blood borne viral infection
- Where possible, avoid artificial rupture of membranes
- Avoid foetal scalp electrodes or foetal blood sampling
- Clean the infant’s eyes with saline on delivery of the head
- Clamp the cord as soon as possible to minimize the risk of maternal-foetal microtransfusion
- Avoid nasopharyngeal suction: use gentle oral suction
- Towel the infant dry and wash as soon as possible
- Clean the infant's skin thoroughly before any infusions or injections

A.7 Breast feeding

- Hepatitis B carriage is not a contraindication to breast feeding (early immunisation should be performed as per guideline).
- Hepatitis C infection is not usually a contraindication. However, women with other risk factors for blood-borne viral infection may be at risk of other infection. Hence each case should be assessed individually.
- In developed countries, Breast Feeding is contraindicated for women who are HIV positive.

For detailed guidance on management of women with HIV infection, please consult The Rainbow Clinic guidelines “Preventing mother to child transmission of HIV infection: management of the HIV positive pregnant woman and the neonate”, which are available on all wards and in the delivery Suite.
**A.8 Prevention of vertical transmission of hepatitis B:**

*Guideline for the management of the neonate born to HBsAg positive mother or to a mother who had acute hepatitis B infection during the pregnancy.*

**Principle**

Neonates born to mothers who have acute hepatitis B during pregnancy or who are chronic carriers are at increased risk of developing hepatitis B. Transmission of hepatitis B virus (HBV) from mother to baby occurs most often during delivery. It may also occur following delivery and there is some evidence that transplacental transmission may occasionally occur. HBV DNA has been demonstrated in breast milk but breast-feeding has not been determined to be an important route of transmission.

Vertical transmission of HBV is increased if the mother has a high titre of HBsAg and is e antigen (HBeAg) positive.

- Overall, some 25% of unimmunised infants born to HBsAg positive mothers develop HBV infection and approximately 90% of such infants become chronic carriers.
- The risk of the infant developing the infection is greatest when the mother is HBeAg positive - some 80-90% of unimmunised neonates born to HBeAg-positive mothers become infected.
- Transmission of HBV to the neonate will be prevented in the majority of cases (>90%) by immunoprophylaxis i.e., active and passive immunisation of the infant.

**Immediate management of the infant**

- Due care should be taken to avoid percutaneous exposure of the infant to maternal blood e.g. avoid scalp electrodes.
- The infant should be bathed as soon as possible after delivery to remove any blood. (Wear plastic apron and gloves).
- Prior to administration of immunoprophylaxis clean the skin carefully with an alcohol swab.

**Recommended Immunisation:**

<table>
<thead>
<tr>
<th>Mother's status</th>
<th>Hepatitis B vaccine</th>
<th>HBIG</th>
</tr>
</thead>
<tbody>
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<td>No</td>
</tr>
<tr>
<td>Anti-HBs positive</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Acute hepatitis B infection in this pregnancy</td>
<td>Yes</td>
<td>As for markers listed above</td>
</tr>
</tbody>
</table>

**Active Immunisation**

*intramuscular* injection of 0.5ml hepatitis B vaccine ("Engerix B" or "HB-Vax II") is given as soon as possible after birth. Thiomersol free vaccines are preferred for neonatal vaccinations and should be used preferentially where available. The anterolateral-thigh is the preferred site for injection. A total of three doses of the vaccine are necessary, the second and third doses being given at 1 and 6 months respectively after the first. For infants at continuing risk of infection adequacy of response to vaccination should be confirmed by checking the titre of anti-
HBs, for this a blood sample should be drawn 2–4 months after the third dose of vaccine. A titre of > 10mIU/l is considered protective. In the event that an accelerated schedule of vaccination is used (0, 1 and 4 months) a fourth dose of vaccine, at twelve months, is recommended.

**Vaccine interchangeability:**
Hepatitis vaccines produced by different manufacturers are interchangeable. The immune response following a course where product from more than one manufacturer has been used is comparable to that where just one brand of vaccine has been used.

**Preterm Infants:**
For preterm infants weighing <2 kg at birth vaccination should commence as soon as possible following birth. Because of the poor immunogenicity of these vaccines in this population the initial dose cannot be counted as part of the required three doses to complete immunisation. Thus for premature infants 4 doses will be required (i.e at birth, at discharge and 1 & 6 months following discharge).

"Engerix B" or "HB-Vax II" are available from the Pharmacy.

**Passive Immunisation**
Intravenous infusion of 0.4ml/Kg body weight of ("Hepatect") hepatitis B immunoglobulin (HBIG) is given as soon as possible after birth. The solution should be administered at room temperature infused over 30 minutes. HBIG is available from the Pharmacy.

**Breast-Feeding**
For infants born to HBsAg positive women, immunoprophylaxis (active together with passive immunisation) has a protective efficacy of ≥ 90%. HBV DNA has been demonstrated in breast milk, however it is the current consensus that breastfeeding of immunised infants does not significantly increase their risk of infection. Currently, hepatitis B infection is not an accepted contraindication to breast-feeding

**Follow Up of Infants**
- All infants to receive the second doses of vaccine at the baby clinic at one month of age.
- All infants to receive the third dose of vaccine at six months of age. (An appointment can be made for this at the Rainbow Clinic (ID clinic) at Our Lady’s Hospital for Sick Children Crumlin (Tues AM, Wed PM) or The Children’s University Hospital Temple St (Thurs AM). Alternatively, definitive arrangements for follow up with the family GP can be made.
- All infants to have follow-up serology performed,
  - Measure Anti-HBs, 1-2 months after the third dose of vaccine.
  - INFANTS WHO HAVE NOT MOUNTED AN ADEQUATE PROTECTIVE RESPONSE SHOULD HAVE HBsAg DETERMINED TO EXCLUDE INFECTION. (Even with active and passive immunisation up to 10% of infants may become infected).

**Public Health Considerations**
Hepatitis B infection is a statutorily notifiable disease. All newly diagnosed infections should be reported in accordance with standard procedures. Household contacts, including other children, should be screened for hepatitis B infection and if uninfected, should be immunised.

**Abbreviations:**
- HBsAg: ‘Hepatitis B surface antigen’
- HBeAg: ‘Hepatitis B e antigen’
- Anti-HBs ( also written as HBsAb): ‘Hepatitis B surface antibody’ or ‘antibody to hepatitis B surface antigen’
- Anti-HBe (also written as HBeAb): ‘Hepatitis B e antibody’ or ‘antibody to hepatitis B e antigen’
- Anti-HBc (also written as HBcAb): ‘Hepatitis B core antibody’ or ‘antibody to hepatitis B core antigen’
- HBIG: Hepatitis B immune globulin (Preparation currently available in Ireland is Hepatect®)
A.9 Guideline for Management of a Mother with Reactive Treponemal Serology in Pregnancy

Principle
Syphilis, caused by the spirochaete *Treponema pallidum*, is a complex systemic disease with protean manifestations. The infection can be transmitted vertically from an infected pregnant woman to her foetus; some two-thirds of all infants born to untreated women with syphilis are infected. Syphilis can be transmitted transplacentally at all stages during the course of untreated maternal disease, from incubation, through primary, secondary, latent and to tertiary syphilis. However transplacental transmission becomes less likely the longer the infection has been present and most cases of congenital infection result from primary or secondary maternal infection. Congenital syphilis can result in stillbirth, hydrops foetalis, or prematurity.

All mothers should be screened serologically for syphilis. Screening should be performed at the booking visit. Women who present late or unbooked should be screened as soon as possible. Women who may be at risk of acquiring syphilis during the pregnancy should if possible be re-screened at 24 and 36 weeks. The priority is to give timely and adequate treatment to the mother and prevent infection of the foetus. It is believed that adequate treatment of the infected mother before the 16th week of gestation prevents congenital syphilis. After the 16th week, treatment cures the infection but may not prevent the stigmata of congenital syphilis.

Background
The general obstetric history of a woman with untreated syphilis, known as Kassowitz’s law, is that pregnancy in a woman with early syphilis typically ends in abortion or a stillbirth, subsequent pregnancies typically result in full-term infants with congenital syphilis and at higher parities, the infant is usually not infected. *Treponema pallidum* bacteraemia occurs during the early stages of the infection; if the infection is not treated, bacteraemia can persist for as long as 8 years; congenital transmission can occur at any time during the period of untreated bacteraemia.

- During the first year of infection in an untreated woman, there is an 80-90% risk of transmission to the foetus. If a mother with early syphilis is not treated, 25–30% of foetuses die in *utero*, 25–30% die postnatally and 40% of the survivors will develop symptomatic syphilis with symptoms typically appearing after the third week of life.
- The probability of foetal infection diminishes rapidly after the second year of untreated infection.
- Transplacental transmission is rare after the fourth year of untreated maternal infection.

It has been believed that infection of the foetus does not occur before the fourth month of pregnancy because treponemes from the maternal circulation are unable to pass through the Langhan’s cell layer of the early placenta. The Langhan’s cell layer begins to atrophy during the fourth month of pregnancy and the foetus is then exposed to the risk of infection; after the sixth month, when the Langhan’s cell layer has completely atrophied, the risk of transmission of infection is highest.

Manifestations of congenital syphilis
Congenital syphilis can be asymptomatic especially in the first weeks of life, or it may have multisystem manifestations, including hepatosplenomegaly, lymphadenopathy, mucocutaneous lesions, osteochondritis, haemolytic anaemia and thrombocytopaenia.
Late manifestations of congenital syphilis, usually appearing after 2 years of age, can involve the central nervous system, bones and joints, teeth, eyes and skin. Some consequences of intrauterine infection may not become apparent until many years after birth, such as interstitial keratitis (5-20 years) and eighth nerve deafness (10-40 years).

Serological screening for syphilis

Serologic testing is the mainstay of syphilis screening and diagnosis. There are two principal types of serological test for syphilis, the non-treponemal (VDRL, RPR) and the treponemal (TPHA, TPPA, FTA) tests. At present, one test, TPPA-EIA (a specific treponemal test) is used in antenatal screening of Rotunda patients. Sera that are reactive with the TPPA are then tested by TPPA (quantitative) and RPR (quantitative).

- The non-treponemal tests detect antibody to reagin, a cholesterol-lecithin-cardiolipin antigen that cross-reacts with antibody present in the serum of a patient with syphilis. In the majority of patients with syphilis, the reagin tests become reactive early, usually at about 4 to 7 days following on the appearance of the primary lesion. After many years of follow-up and even without treatment in some 25% of cases, the reagin tests become negative.

- Following treatment for syphilis, the reagin titres decline. In this regard the RPR is the most sensitive of the reagin tests and the RPR titre declines rapidly, usually becoming nonreactive between 3 and 12 months after treatment.

- The main advantage of reagin tests is that they are relatively inexpensive, easy to perform and sensitive. In addition, they are quantitative, and can be followed over time to monitor response to treatment.

- A disadvantage of non-treponemal tests is that false positives often of a transient nature can occur in pregnancy (so called “biological-false positives”) or with acute viral infections including measles and hepatitis. Sustained false positive tests can be caused typically by autoimmune conditions. N.B. Reagin positive but treponemal test negative tests should be confirmed as false positives by repeat testing 4 to 6 weeks later.

In most patients, the treponemal tests remain positive indefinitely, regardless of treatment.

Antenatal screening

Serologic testing is the mainstay of syphilis screening and diagnosis.

- All pregnant women should be offered screening for syphilis at the booking visit.
- Women at ongoing risk of syphilis, and women who have a concomitant sexually transmitted disease should, if possible, be re-screened in the second trimester (usually about 24 weeks of gestation) and shortly before or at delivery.
- A positive treponemal test is indicative of treponemal infection, which may be active or latent. Further antibody testing is performed on all sera exhibiting positive treponemal tests.

All women with reactive specific treponemal serology should be considered to be infected, unless an adequate treatment history is fully documented in the clinical notes and sequential serologic antibody titres have declined or low titres have remained stable.

Problems may arise in the interpretation of raised reagin titres in patients who have in the past, been treated for syphilis. Re-treatment may be appropriate – always seek advice in this scenario.

In addition, women who are immigrants from countries where treponemal infections other than syphilis are endemic may have positive serology because of another type of
treponemal infection. However, because there is no test available that will discriminate between the different types of treponemal infection, it must be assumed in the antenatal setting that positive treponemal serology is because of syphilis.

- The important non-venereal treponemal disease are bejel, yaws and pinta. Bejel caused by *Treponema pallidum* subspecies *endemicum*, is present particularly in poverty-stricken communities, in Asia, Africa and Australia; yaws caused by *Treponema pertenue* is present in primitive tropical areas of South America, Central Africa and Southeast Asia; pinta, caused by *Treponema carateum*, is present in Central and South America.

### Treatment and treatment complications

Penicillin is the treatment of choice for all stages of syphilis. Treatment during pregnancy is highly effective however in the third trimester treatment failures have occasionally been reported. Hence, clinical and serological follow-up is essential. There has been much debate on the use of single dose penicillin regimens, and in the UK such regimens are rarely if ever used for treatment in pregnancy.

**No alternatives to penicillin have been proven to be effective for treatment of syphilis during pregnancy hence all pregnant women who give a history of penicillin allergy must be managed in consultation with Adult ID/GUM services.**

Erythromycin was formerly considered to be the treatment of choice in the penicillin-allergic pregnant woman; however treatment failures may occur, and in addition, erythromycin does not reliably cross the placenta and the foetus may develop congenital syphilis despite apparently successful treatment of the mother (decline in reagin titres).

- The presence of ultrasound signs of foetal syphilis (e.g., hepatomegaly or hydrops foetalis) prior to treatment, indicate an increased risk of foetal treatment failure. Such cases require very careful follow-up and a second course of treatment may be required.

Treatment of syphilis at any stage may be complicated by the Jarisch-Herxheimer reaction. This has been reported more frequently in association with penicillin than with erythromycin treatment. The Jarisch-Herxheimer reaction is a local and systemic exacerbation of whatever stage of syphilis is present. For example, a primary chancre may become oedematous and lymphadenopathy may increase, or a secondary rash may become more prominent. Pyrexia will typically occur within 12 hours of initiation of treatment and will terminate within 24 hours. Associated headache, malaise, myalgia, pharyngitis and leucocytosis with lymphopaenia have been reported. In pregnancy, increased uterine activity and transient reduction in foetal movements and foetal heart rate abnormalities have been described. If the foetus is severely infected prior to treatment, preterm labour or foetal death may occur.

- Concern for the possible obstetric complications should not delay the necessary treatment.
- A woman with early syphilis (high titre, or moderate titre reactive treponemal serology) should be admitted for the first 48 hours of specific treatment. This will facilitate monitoring for adverse effects of treatment including baseline scan.

For details of treatment, see **Box (on next page) and algorithm** which is included in the Rainbow Clinic guidelines.
Antibiotic Treatment of Mothers with Reactive Treponemal Serology in Pregnancy

A woman with primary, secondary or early latent syphilis, and/or an RPR titre >4, should be admitted for initiation of treatment (initial dose of im penicillin). This will facilitate monitoring for adverse effects of treatment. Monitor vital signs 4-hourly overnight for signs of the Jarisch-Herxheimer reaction. In the case of women at >24 weeks gestation, a CTG should be performed >4 hours post-penicillin or if symptomatic.

All women treated for syphilis during pregnancy should be scanned for evidence of foetal syphilis. The timing of the initial scan may be individualised depending on the likely stage of the infection (primary, early latent etc.,) and the gestation.

A mother with low titre syphilis (late latent) can be treated as an outpatient.

At all stages of pregnancy, patients with syphilis should be treated with penicillin in the dosage schedules recommended for non-pregnant patients at a similar stage of the disease. The recommended treatment is:

**Primary, Secondary or Early Latent* (< 2 years duration) syphilis:**
benzathine penicillin G, 1.84g (2.4 million units) i.m., weekly for 2 weeks

* Early latent is defined as positive serology without other evidence of disease and documented by a negative serological test for syphilis within the previous year

**Late latent syphilis (>2 years) and syphilis of unknown duration^:**
benzathine penicillin G, 1.84g (2.4 million units) i.m., weekly for 3 successive weeks

^This includes all patients with positive serological tests, and no evidence of disease with the exception of those defined as early latent*.

Benzathine penicillin, 1.84g (2.4 million units), is available as “Extencillin” - each dose (8 mls) should be given as 0.46g (2ml) at four separate sites because of the volume.

Exceptions and enhanced evaluation

Patients in the following groups must be referred to Adult ID/GUM services for evaluation (?neurosyphilis).
- Neurologic or ophthalmologic signs or symptoms
- Treatment Failures
- HIV infection

Treatment of a woman who is Penicillin allergic

No alternatives to penicillin have been proven to be effective for treatment of syphilis during pregnancy. All pregnant women who give a history of penicillin allergy must be managed in consultation with Adult ID/GUM services. The following options may be considered
- Densensitisation to penicillin followed by penicillin treatment is the ideal therapy
- Alternatives include azithromycin 500 mg once daily for 10 days or ceftriaxone 250-500mg im daily for 10 days. However, published evidence of safety of these two agents during pregnancy is limited.
Other investigations
All women with confirmed positive treponemal serology should be screened for other sexually transmitted infections. Sexual partner(s) should be referred to a GUM/Adult ID Clinic urgently for investigation and treatment.

Follow-up during the pregnancy
Anti-treponemal treatment during pregnancy is usually highly effective, however, in the third trimester treatment may be less successful. Treatment failures have been reported at any gestation but particularly in the third trimester. Therefore careful clinical and serological follow-up is important.

When a woman has been treated for syphilis during pregnancy, there should be monthly serological follow-up for the remainder of the pregnancy. Any woman who shows any evidence of serological relapse or clinical or serological evidence of re-infection should be treated again. In early or high-titre syphilis, a 4-fold or greater decrease in titre indicates successful treatment. In latent low-titre syphilis, the titres should remain stable and low.

There may be insufficient time to demonstrate a fourfold decline in titre or unchanged titres during the pregnancy; serological follow-up should also be arranged postnatally.

The appearance of or persistence of ultrasound signs of foetal syphilis (e.g., hepatomegaly or hydrops foetalis) are indicators of foetal treatment failure; if no other cause is detected re-treatment will be required.

Unbooked patient with reactive treponemal serology, results available after delivery
- The patient and her sexual partner should be referred to a GUM Clinic as a matter of urgency. Treatment of both partners can be carried out at the GUM clinic. (Phone in advance and discuss with Consultant).
- The infant must be admitted without delay for evaluation for congenital syphilis, and treatment.
**Guideline for Management of the Infant Born to a Mother who had Reactive Treponemal Serology in Pregnancy**

### Principle

Syphilis can be transmitted transplacentally at all stages during the course of untreated maternal disease, from incubation, through primary, secondary, latent and to tertiary syphilis. Congenital syphilis can be asymptomatic especially in the first weeks of life, or it may have multisystem manifestations, including hepatosplenomegaly, lymphadenopathy, mucocutaneous lesions, osteochondritis, haemolytic anaemia and thrombocytopenia. Late manifestations of congenital syphilis, usually appearing after 2 years of age, can involve the central nervous system, bones and joints, teeth, eyes and skin. Some consequences of intrauterine infection may not become apparent until many years after birth, such as interstitial keratitis (5 to 20 years) and eighth nerve deafness (10 to 40 years).

### Management of the Infant

All infants of mothers who were treated for syphilis, before or during pregnancy, should be fully examined clinically at birth and at 6 weeks, 3, 6, and 12 months of age. Serological testing with quantitative RPR should be performed at birth and at 3, 6 and 12 months.

- If the mother was treated with an appropriate course of penicillin and has shown reduction in titres, the infant should be monitored serologically as above. Full evaluation and treatment for congenital syphilis will be necessary in such cases only if there is a rise or persistence of titre and/or clinical or radiological evidence of disease.

An infant should be evaluated for congenital syphilis if he/she was born to a mother with a positive specific treponemal test and one or more of the following conditions are operative:

1. The mother received no treatment
2. The treatment given to the mother is not known
3. The treatment given to the mother is inadequate
4. The probability of follow-up is uncertain
5. The mother was treated with an antibiotic other than penicillin (erythromycin usually)
6. Treatment was with penicillin but the expected decrease in nontreponemal antibody titre after treatment did not occur
7. Appropriate treatment was given but there was insufficient serological follow-up to assess the response to treatment and the current infection status
8. Treatment was less than one month before delivery

- In each of these cases above, the infant should be admitted for **evaluation** for congenital syphilis. Treatment should commence with minimal delay in each of the above scenarios regardless of the findings (see Table and Algorithm).

- In addition, any infant with physical or laboratory findings consistent with a diagnosis of congenital syphilis should be treated without delay.

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*Document: Clinical Microbiology Guideline*

*Prepared by Professor M. Cafferkey, Consultant Microbiologist; This version December 2005*
**Evaluation for congenital syphilis:**

- Physical examination
- Quantitative nontreponemal test for syphilis (RPR) and antitreponemal IgM serology (TPPA and FTA-abs IgG and FTA IgM) on the infant's serum (**N.B., not** on cord blood, false negatives and false positives may occur on cord blood)
- FBC and liver function tests
- Fundoscopy
- CSF examination for, cell count, protein concentration, treponemal serology and nontreponemal serology.
- Long bone X rays (unless the diagnosis has been otherwise established)
- Other tests as clinically indicated e.g., chest X-ray
- Pathological examination of the placenta requesting specific staining / examination for treponemes

**Antibiotic Treatment**

Penicillin is of proven efficacy in the treatment of congenital infection and is the treatment of choice. Treatment in relation to maternal history is summarised in the Algorithm in The Rainbow Clinic guidelines.

**Follow-up**

All infants who are treated for because of positive syphilis serology in the mother, should be referred to the Paediatric Infectious Diseases Service for follow-up at 6 weeks, 3, 6 and 12 months and serological testing at 3, 6 and 12 months.
Management of Malaria in Pregnancy

Malaria and Pregnancy
Malaria infection in pregnant women may be more severe than in women who are not pregnant. In addition the risk of adverse outcomes of pregnancy, including prematurity, abortion, and stillbirth appear to be increased. The risk to the foetus is greatest with infection in the first pregnancy and declines with each subsequent pregnancy.

Diagnostic Tests
Definitive diagnosis relies on identification of the parasites in stained blood films. Both thick and thin blood films should be examined. It is important to be aware that in a patient recently arrived from a hyperendemic area, the presence of malaria parasites on a blood film is not conclusive evidence of malaria as the cause of the illness because an additional infection may be superimposed on low-concentration parasitaemia. Hence blood cultures and MSU for culture should be taken in a patient with suspected malaria and additional investigations as clinically indicated.

Choice of therapy
The geographical area in which the infection was acquired, the likelihood of chloroquine resistance, the species of Plasmodium involved and the clinical findings, all influence the choice of therapy. The spread of chloroquine-resistant P. falciparum is of increasing importance. Chloroquine resistance has also been reported in P. vivax from S.E. Asia.

- As a general rule, a patient with severe malaria (defined above) and all pregnant woman with suspected or confirmed falciparum malaria should be admitted to hospital for assessment and intravenous treatment initially. Until the species has been identified, empiric treatment with quinine is indicated.
- In patients with P. falciparum, sequential blood films are indicated to monitor response to treatment.

Complications of malaria in pregnancy
Hypoglycaemia Quinine stimulates pancreatic secretion of insulin hence prolonged parenteral administration may precipitate hypoglycaemia in patients with malaria. Pregnant women appear to be particularly susceptible to this complication.

- Monitor blood glucose 4 hourly or as indicated
- Treat hypoglycaemia with 50% dextrose injection 50ml, followed by 5% or 10% dextrose infusion

Congenital malaria due to perinatal transmission may occur rarely. P. vivax and P. falciparum have caused most congenital cases. P. malariae and P. ovale account for fewer than 20% of such cases. Manifestations can resemble those of neonatal sepsis, including fever and nonspecific symptoms of poor appetite, irritability and lethargy.

- If a mother has had malaria in pregnancy the placenta should be examined histologically including staining for malaria parasites.
## Drug treatment of Malaria

<table>
<thead>
<tr>
<th>Route</th>
<th>Drug</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenteral Therapy</td>
<td>Drug of choice</td>
<td>20 mg/kg loading dose i.v. in normal saline over 4 hours, followed by 10 mg/kg over 2-4 hours, 8 hourly, (max. 1800 mg/day) until oral therapy can be started, followed by 10 mg/kg, orally, 8 hourly, to complete a 7-day course of treatment plus (see below)</td>
</tr>
<tr>
<td>All Plasmodium species</td>
<td>Quinine dihydrochloride</td>
<td></td>
</tr>
<tr>
<td>Oral Therapy</td>
<td>Drug of choice</td>
<td>1g (600 mg base), then 500 mg (300 mg base) 6 hours later, then 500 mg (300 mg base) at 24 and 48 hours</td>
</tr>
<tr>
<td>All Plasmodium species except chloroquine-resistant P. falciparum and chloroquine-resistant P. vivax</td>
<td>Chloroquine phosphate</td>
<td></td>
</tr>
<tr>
<td>Chloroquine-resistant Plasmodium falciparum^^ or P. vivax&quot;</td>
<td>Quinine sulphate plus [in pregnancy or if breast feeding] clindamycin</td>
<td></td>
</tr>
<tr>
<td>Oral Therapy</td>
<td>Drug of choice</td>
<td>600 mg, 8 hourly, x 3-7 days</td>
</tr>
<tr>
<td></td>
<td>or plus [only if not pregnant] pyrimethamine-sulphadoxine~</td>
<td>900 mg 8 hourly x 5 days</td>
</tr>
<tr>
<td></td>
<td>or plus [only if not pregnant or if not breast feeding] doxycycline</td>
<td>3 tablets at once on last day of quinine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 mg, 12 hourly, x 7 days</td>
</tr>
</tbody>
</table>

^^Chloroquine resistant P. falciparum occur in all malarious areas except Central America west of the Panama Canal zone, Mexico and some parts of the Middle East.

" Chloroquine-resistant P. vivax has been reported in Indonesia, Papua New Guinea, Solomon Islands and Myanmar.

~ Resistance to pyrimethamine-sulphadoxine has been reported from SE Asia, the Amazon basin, sub-Saharan Africa, Bangladesh and Oceania

Table adapted from The Red Book 2003 and WHO Guidance.
**Management of Genital Herpes in Pregnancy:**

**Summary of RCOG Clinical Green Top Guideline No. 30, May 2002**

**Principle**
Neonatal herpes is a severe systemic viral infection with a high morbidity and mortality, which is most commonly acquired at or near the time of delivery. It is rare in the UK and the Republic of Ireland.

Almost all cases of neonatal herpes occur as a result of direct contact with infected maternal secretions, although cases of postnatal transmission have been described. The risks are greatest when a woman acquires a new infection (primary genital herpes) during late pregnancy, so that the baby is delivered before the development of protective maternal antibodies. Most of these maternal infections are asymptomatic or unrecognised and it may be difficult to distinguish clinically between recurrent and primary genital HSV infections.

1. Management of women presenting with a first episode of genital herpes during pregnancy

1.i. Any woman with suspected first-episode genital herpes should be referred to a genitourinary physician, who will advise on management and arrange a screen for other sexually transmitted infections. Treatment with aciclovir should be considered for all women who develop a first episode of genital herpes in pregnancy.

1.ii. Caesarean section is recommended for all women presenting with first-episode genital herpes lesions at the time of delivery, but is not indicated for women who develop first-episode genital herpes lesions during the first or second trimesters. For women who present with first-episode genital herpes lesions within six weeks of the expected date of delivery or onset of preterm labour, elective Caesarean section may be considered at term, or as indicated, and the paediatricians should be informed.

1.iii. For women who develop first-episode genital herpes lesions within six weeks of delivery and who opt for a vaginal birth, invasive procedures* should be avoided. For women who develop first-episode genital herpes lesions at or within six weeks of delivery, intravenous aciclovir given intrapartum to the mother and subsequently to the neonate, may reduce the risk of neonatal herpes.

*such as fetal scalp electrode monitoring, fetal blood sampling, and instrumental delivery
2. Management of women presenting with a recurrent episode of genital herpes during pregnancy

2.i Cultures during late gestation to predict viral shedding at term are not indicated.

2.ii Daily suppressive aciclovir in the last four weeks of pregnancy may prevent recurrences of genital herpes at term. However, there is insufficient evidence to recommend this practice routinely.

2.iii For women presenting with recurrent genital herpes lesions at the onset of labour, the risks to the baby of neonatal herpes are small and should be set against the risks to the mother of Caesarean section. A recurrent episode of genital herpes occurring at any other time during pregnancy is not an indication for delivery by Caesarean section.

3. Prevention of acquisition of genital herpes infection during pregnancy

3.i All women should be asked at their first antenatal visit if they or their male partner have ever had genital herpes. Female partners of men with genital herpes, who themselves give no history of genital herpes, should be advised about reducing their risk of acquiring this infection.

3.ii Identifying women susceptible to acquiring genital herpes in pregnancy by means of type-specific antibody testing is not indicated.

4. Prevention of postnatal HSV transmission to the neonate

4.i Healthcare workers and family members with active HSV infection, such as oro-labial herpes or herpetic whitlow, should avoid direct contact between lesions and the neonate.
GUIDELINE FOR TESTING FOR *Chlamydia trachomatis* INFECTION

**Principle**
Several important sequelae can result from *C. trachomatis* infection in women; the most serious of these include pelvic inflammatory disease, ectopic pregnancy and infertility. In pregnancy *C. trachomatis* infection is associated with preterm labour and stillbirth and maternal postnatal complications include postpartum endometritis. The neonate may develop conjunctivitis or pneumonia. Screening and treatment of cervical infection can reduce the likelihood of all of these complications of chlamydial infection.

**Background**
*Chlamydia trachomatis* is an intracellular organism that causes urogenital infection. Untreated *Chlamydia trachomatis* infection plays an important role in causing pelvic inflammatory disease and has recently been found to be a risk factor for cervical carcinoma. In pregnant women, *Chlamydia trachomatis* infection is associated with preterm labour, stillbirth and postpartum endometritis. In addition ophthalmic and respiratory infection may develop in the neonate. Most acute chlamydial infections in the female are asymptomatic but can cause lower abdominal pain, a mucopurulent discharge and pyrexia.

**Laboratory Diagnosis and groups in whom screening is appropriate**
The diagnosis of urogenital chlamydial infection has been facilitated by the introduction of nucleic acid amplification technology. This methodology demonstrates greatly increased sensitivity when compared with traditional methods. In addition this technology is suitable for use with urine samples in both sexes. Facilities are now available at the Microbiology laboratory at the Rotunda to test for chlamydial infection using this nucleic acid amplification method.

**Who should be offered testing for *Chlamydia trachomatis***?

*a. Testing is strongly advised in the following:*  

*a.i. Pregnant women in the following groups:*  
- Those with other sexually transmitted infections  
- Those admitted with abdominal pain who have a documented negative MSU on culture

*a.ii. Women who are not pregnant and who are in the following groups:*  
- Women being investigated for infertility  
- Those admitted for gynaecological investigation/treatment with lower abdominal pain and who have a documented negative MSU  
- Those with a history of pelvic inflammatory disease whether an in-patient or an out-patient who have not previously been screened.

*a.iii. Postnatal women in the following groups:*  
- Those with suspected postpartum endometritis with onset of symptoms seven or more days post delivery

*a.iv. Ectopic pregnancy:*  
- All women with an ectopic pregnancy should be screened.
b. **Testing should be considered in the following:**

b.i. **Pregnant women as follows:**
- Those admitted with threatened or definite preterm labour

b.ii. **Postnatal women in the following groups:**
- Infant with IUGR
- Those with pyrexia of unknown origin and lower abdominal pain who have a documented negative MSU

**Specimen Collection**
The patient should ideally not have urinated for at least 2 hours. A FIRST VOID urine sample (ideally ≥20mls) should be collected in a sterile MSU collection bottle and sent to the laboratory, accompanied by a urine Microbiology request form, clearly marked “CHLAMYDIA”. Testing will be performed in-house in batches, and positive results will be communicated to the requesting doctor with minimal delay.

**Management of a positive Chlamydia trachomatis test & antibiotic regimens recommended for treatment of pelvic inflammatory disease**

*Chlamydia trachomatis* infection is a notifiable disease. The women must be informed that her sexual partner(s) will require treatment. Specific treatment is as follows.

a. Women who are pregnant or breast-feeding and who have no symptoms suggestive of PID:
   i. erythromycin 500mg four times daily for 7 days.
   *Alternative: Only if unable to tolerate the above regimen* azithromycin 1g orally, in a single dose

   ii. **Referral of patients sexual partner(s) for treatment**

b. Women who have delivered and who are not breast-feeding:
   azithromycin 1g orally, in a single dose
   *Alternative: doxycycline 100mg twice daily orally, for 7 days.*

c. Gynaecology patients:
   c.i. **uncomplicated** chlamydia infection; i.e., no evidence of PID
   azithromycin 1g orally, in a single dose
   *Alternative: doxycycline 100mg twice daily orally, for 7 days.*

   c.ii. **complicated** chlamydia infection: i.e., probable or definite PID
   (N.B., Regimens will usually include agents to cover other pathogens as co-infection is frequent)
   - in-patient regimen
doxycycline 100mg twice daily orally\(^\wedge\) (if this can be tolerated) *plus*
ceftriaxone 1g once daily intravenously, *plus*
metronidazole 500 mg 12 hourly intravenously
*This regimen is continued 48 hours after significant clinical improvement, and followed by*
doxycycline 100mg 12 hourly orally, *plus*
metronidazole 400mg 12 hourly orally
*to complete a 14-day course*
Because of pain associated with infusion, doxycycline should be administered orally when possible, even when the patient is hospitalized. The bioavailability of doxycycline is similar following either oral or intravenous administration.

- **out-patient regimen**
  - ofloxacin 400 mg 12 hourly orally, for 14 days *plus*
  - metronidazole, 400 mg 12 hourly orally, for 14 days

N.B. In all cases referral of the patient’s sexual partner(s) to Mater Hospital Infectious Diseases Unit for full STD screen is the optimal course of action. However, at this time (2004) there is a prolonged waiting time for appointments at the Clinic, and because of this referral to the General Practitioner for treatment is appropriate.

**Post-treatment testing**
A post-treatment specimen should be sent not less than 4 weeks after the initial specimen to confirm cure and absence of re-infection. In pregnant women, the post-treatment specimen should, if possible, be sent before delivery.

**Testing for other sexually transmitted diseases**
Any woman found to have *Chlamydia trachomatis* infection should be screened for other sexually transmitted infections. If she is pregnant, every effort should be made to repeat serology at 36 weeks.
Guidelines for management of exposure to or infection with Varicella-zoster virus in pregnancy and in the newborn period

1. Management of exposure to or infection with *Varicella*-zoster virus during pregnancy

2. Management of the neonate
   2.i Mother with active chickenpox in the period from 5 days before to 2 days after delivery
   2.ii Postnatal exposure to *Varicella*

3. Management of mother exposed to shingles or who develops shingles (zoster) during pregnancy, or at the time of delivery

4. Management of exposure to a staff member with primary *Varicella Zoster* infection

5. Management of *Varicella* exposure in the neonatal ICU

6. Summary Tables
   - **Table 1** Types of exposure to *Varicella* or Zoster for which VZIG is indicated for Susceptible Persons.
   - **Table 2.** Candidates for VZIG, Provided Significant Exposure has Occurred (see Table 1).
   - **Table 3.** Prophylaxis and Treatment of Chickenpox in Pregnancy and the Neonate
Management of exposure to varicella-zoster virus during pregnancy

1. MANAGEMENT OF THE PREGNANT WOMAN WHO PRESENTS WITH A HISTORY OF CONTACT WITH CHICKENPOX

- Routine antenatal screening for varicella-zoster antibody was introduced at the Rotunda in November 2001. This is performed as part of the booking serology tests. Testing for VZV antibody has greatly simplified the management of exposure incidents.

- The first and most important step is reassurance.
  - If the mother has a history of chickenpox or if vzv serology is positive, she is immune to primary infection and then there is no risk - hence no action is necessary.

- When serology for vzv antibody has not been performed and the mother believes that she never had chickenpox, or does not know her history, she should be advised that should she develop chickenpox there is a small risk of damage to the foetus.
- The woman must be questioned with regard to the contact; how certain is the diagnosis in the contact & what was the nature or duration of the contact.
- In those without immunity to chickenpox, household exposure or significant exposure is associated with the greatest risk of transmission of chickenpox. The risk of developing chickenpox following casual contact with a case is negligible. The risk of non-immune household contacts of a case developing chickenpox is approximately 60%.

As a guideline, significant exposure is defined as being within a confined airspace such as the same room (e.g., house or classroom or 2-4 bed hospital bay) as an infective person for at least 15 minutes or in sufficiently close proximity to be at least face-to-face.

- Mothers without a history of chickenpox and who have not been screened, should be screened for Varicella-Zoster IgG. (Subclinical chickenpox is relatively frequent). The antenatal booking blood if already taken may be used for this purpose by arrangement with the laboratory. From Sunday to Thursday VZIgG testing can usually be done on the next day – N.B. there is no need to arrange out-of-hours serology. At the weekend and on Bank Holiday or long weekends, each case should be assessed individually. Dependent on the circumstances, serology may usually be deferred until the next working day or in some limited rare circumstances it may be appropriate to arrange urgent testing – discuss with the Consultant Microbiologist.

- A mother without a history of chickenpox and in whom antibody is detected within 10 days of a reported contact is immune to primary Varicella infection and is at no risk.
• If no antibody is detected, the woman is non-immune.
  ➢ Specific anti-VZV immunoglobulin (i.v.) should be offered to the non-immune woman at all gestations*. The primary aim of this immunoprophylaxis is to modify the illness in the mother. There is little evidence that VZ immunoglobulin will have any affect on preventing the foetal varicella syndrome, which may complicate some 2% of affected pregnancies in which chickenpox develops in the first 20 weeks.
  *For optimum efficacy, VZIG should ideally be administered within 96 hours of exposure but may modify the illness if given within 10 days of exposure (up to and not including 10 days). If the exposure occurred 10 or more days previously it is not appropriate to administer VZIG.
  For continuous household exposure (e.g., when a child in the household is infected), VZIG should be offered within 10 days of the onset of the rash in the index case.

N.B. Advise the mother that chickenpox may still develop after administration of VZ immunoglobulin.
  ➢ All non-immune (antibody-negative) women should be advised to seek medical attention promptly should manifestations of chickenpox develop regardless of VZIG immunoprophylaxis.
  ➢ A pregnant woman with chickenpox who has pulmonary involvement must be hospitalised, in single room isolation, and treated with intravenous aciclovir.

• All women who develop chickenpox in the first 20 weeks should have an ultrasound scan performed at approximately 25 weeks (small risk of limb or other abnormality Discuss with and refer to FAU Consultant Obstetrician.

• All infants of mothers who have had chickenpox in the first 22 weeks should be referred for full ophthalmological assessment (chorioretinitis is the most common manifestation of congenital Varicella syndrome).

• The principal risk to the neonate occurs when a mother has active chickenpox in the period from 5 days before to 2 days after delivery. Disseminated infection with a historical reported high mortality rate may ensue.

2. Management of the Neonate

2.i. The principal risk to the neonate occurs when a mother has active chickenpox in the period from 5 days before to 2 days after delivery.
• VZ immunoglobulin is recommended in those infants born to mothers who had chickenpox in the period from 5 days before to 48 hours post delivery
• Prophylactic intravenous aciclovir should be considered in these infants as they are at the highest risk of severe complicated infection. Discuss with Consultant Microbiologist.
• N.B. A baby who has been given VZIG may still develop chickenpox and must be closely observed. Hospitalisation and i.v. aciclovir treatment may be required.
2.ii. Infant exposed postnatally to varicella
(N.B. See also section 5, “Management of varicella exposure in the NICU”.)

- For healthy, full-term infants of varicella-immune mothers exposed postnatally to Varicella and those whose mothers’ rash developed more than 48 hours after delivery, VZIG is **not usually indicated**. This is because infants who develop Varicella under these circumstances are not known to be at any greater risk for complications of chickenpox than older children.

- If the **mother is non-immune**, the newborn up to 7 days of age, may be given VZIG.

- VZIG is recommended for all exposed premature infants and those with low birthweight, regardless of maternal history or VZV serology results.

- Some infants born at >28 weeks gestation may be VZ antibody negative if they are >60 days old or have had repeated venepuncture, despite a maternal history of varicella or zoster; serological testing on such infants is recommended.

- If other children in the family have varicella and the mother is immune, there is no reason to prevent a healthy, full-term newborn baby going home. If the mother is susceptible, contact with siblings with varicella should be delayed until the new baby has reached 7 days of age.

- Mothers with varicella should be allowed to breast-feed. If they have lesions close to the nipple, they should express milk from the affected breast until the lesions have crusted; this expressed milk can be fed to the baby if he/she has received immunoprophylaxis with VZIG or is receiving prophylactic aciclovir.

3. MANAGEMENT OF MOTHER EXPOSED TO SHINGLES (zoster) OR WHO DEVELOPS SHINGLES DURING PREGNANCY OR AT THE TIME OF DELIVERY

- Shingles (zoster) is reactivation of latent VZV infection. The foetus is not affected by maternal zoster except in the rare circumstance that the mother is immunosuppressed and there is maternal viraemia with dissemination of the virus.

- Exposure to **Secondary** Varicella-zoster infection (Zoster or shingles) in pregnancy carries a negligible risk of Varicella. In this circumstance, reassurance is all that is required. The exception is where the lesions are very extensive such as in an immunocompromised individual, or where the lesions are on an exposed part of the body, e.g. the head. (*Discuss with Consultant Microbiologist*)

There is no evidence that maternal zoster in the perinatal period can result in transmission of VZV to the infant. Reassurance is all that is required.
4. MANAGEMENT OF EXPOSURE TO A STAFF MEMBER WITH PRIMARY Varicella Zoster INFECTION

4.i. Infected Staff Member
- Take a history from the staff member
- Draw up a full list on contacts in the 72 hours prior to onset of the rash and in the period of the clinical illness.
- Try to establish which patients and other staff members had significant exposure. As a guideline, significant exposure is defined as being within a confined airspace such as the same room as an infective person for at least 15 minutes or in sufficiently close proximity to be at least face-to-face.

4.ii. Patients exposed
- Those who have delivered or who will definitely deliver within 10 days of the contact do not need any testing or intervention.
- The Varicella status on all other antenatal patients should be checked. In the first instance, if vZV serology has not been performed, the status should initially be checked by taking a history. If the mother has a history of chickenpox, she is immune to primary infection and then there is no risk either to her or to her baby - hence no further action is necessary other than reassurance.
- If serology has not been performed and the mother believes that she never had chickenpox, or does not know her history, the Varicella status should be checked on a blood sample. A blood sample should be taken for urgent testing if there is no stored antenatal sample available for testing.
- In the case of women who have been discharged, booking bloods, if available should be tested urgently. If no stored blood is available arrange for collection of a serum sample without delay for urgent testing.
- If the blood is IgG positive the woman is immune and is at no risk of developing chickenpox.
- If the woman is IgG negative, she is not immune and is at risk of developing chickenpox.
- If an IgG negative negative woman is likely to deliver in the time period from 10 to 28 days of contact, VZ immunoglobulin (iv) is recommended.

4.iii. Other Healthcare Workers exposed
- Take a history. Those who had chickenpox are immune and at no risk.
- If a healthcare worker who has had significant exposure to chickenpox does not have a history of chickenpox, or does not know if he/she has had chickenpox, a clotted blood specimen should be collected for urgent Varicella titre.
- If the blood is IgG positive the person is immune and is at no risk of developing chickenpox.
- If the blood is IgG negative the person is not immune and is at risk of developing chickenpox. Administration of Varicella vaccine within 72 hours and possibly up to 120 hours after exposure may prevent or significantly modify the disease and may be considered in this circumstance.
- A non-immune healthcare worker should be removed from patient care in the period from day 10 to day 21 after contact as the infection may develop during this period.
5. MANAGEMENT OF Varicella EXPOSURE IN THE NEONATAL ICU

**Principle:**
The risk of complications of primary Varicella infection in preterm infants and infants in NICU is poorly defined. However disseminated disease may be severe especially in those born before 28 weeks completed gestation, at which stage maternally acquired antibody cannot be assumed. The aim of this protocol is to facilitate assessment of Varicella exposure incidents and to put in place appropriate preventive measures as rapidly as possible following upon notification of a significant exposure incident.

The following guidance should be followed in the event of **significant** Varicella exposure in the NICU. **Significant** exposure is defined as being in the same room for at least 15 minutes, or in sufficiently close proximity to be at least face-to-face.

5.i **The Quarantine Period**
- The quarantine period will be defined as the period from 7 to 28 days after the development of rash in the index case.
- All infants who have had **significant exposure** are potentially infectious from day 10 to day 28 of the contact regardless of whether VZ immunoglobulin has been administered.

5.ii **The Index Case**
- Rapid Laboratory confirmation of the diagnosis should if possible be obtained preferably by electron microscopy of vesicular fluid.
- If the index case is a staff member, he/she should be removed from all clinical duties until non-infectious.

5.iii **NICU patients**
- Parents / guardians should be advised of the incident.
- All exposed infants should be cohorted and cared for by immune staff.
- All **high-risk** infants (defined below) should be given VZIG intravenously without delay following discussion with parents, unless urgent testing of neonatal and/or maternal blood samples can be performed.
  - **High-risk is defined as:**
    - infants born at <28 weeks completed gestation;
    - Infants of low birth weight (<1000g);
    - ventilated infants;
    - those with broncho-pulmonary dysplasia;
    - those with immunodeficiency syndromes;
    - those receiving steroids
    - those born to mothers receiving immunosuppressive treatment or therapeutic steroids.
- Exposed infants who are not in the high-risk groups should also be screened as soon as possible for VZ antibody. VZIG should be given to infants with negative or equivocal VZ titres.
- New admissions should be cohorted and cared for by immune staff. VZIG is not indicated for new admissions.
- Exposed infants should be transferred to the Isolation Wing (single room) or, if possible, discharged as soon as feasible.

5.iv **Staff**
- Those in whom VZ titres have not already been performed and who do not have a definite chickenpox history should be screened urgently for VZ antibody.
- Non-immune staff should be removed from the NICU during the Quarantine period.

5.v **Parents**
- All parents/guardians of cohorted(exposed) infants should be questioned about their Varicella history.
- All parents/guardians with no history of chickenpox or shingles should have an urgent VZ titre performed. Parents/guardians of infants with negative/ equivocal VZ titres should be screened for VZ antibody. Those with negative titres should be excluded during the Quarantine period.
Table 1. Types of Exposure to Varicella or Zoster for which VZIG is Indicated for Susceptible Persons*

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household:</td>
<td>Residing in the same household</td>
</tr>
<tr>
<td>Community:</td>
<td>Face-to-face contact in the same room for more than 15 minutes</td>
</tr>
<tr>
<td>Hospital (Varicella):</td>
<td>In the same 2- to 4-bed room or adjacent beds in a large ward, face-to-face† contact with an infectious staff member or patient, or visit by a person deemed contagious</td>
</tr>
<tr>
<td>Hospital (Zoster):</td>
<td>Intimate contact (eg, touching or hugging) with a person with disseminated zoster, or extensive exposed lesions in an immunocompetent person, or localised or disseminated zoster in an immunosuppressed person.</td>
</tr>
<tr>
<td>Newborn infant:</td>
<td>Onset of varicella in the mother 5 days or less before delivery or within 48 hours after delivery; VZIG is not indicated if the mother has zoster</td>
</tr>
</tbody>
</table>

* Patients should meet criteria of both significant exposure and candidacy for receiving Varicella-zoster immunoglobulin (VZIG), as given in Table 2. VZIG should be administered as soon as possible, and ideally within 96 hours of exposure. (There is limited evidence that VZIG may attenuate the illness if given within 10 days of exposure; however the product that has Irish Medicines Board approval “should be administered… not later than 96 hours after exposure”).

† Experts differ in the duration of face-to-face contact that warrants administration of VZIG. However, the contact should be non-transient. Some experts suggest a contact of 5 or more minutes as constituting significant exposure for this purpose; others define close contact as more than 1 hour.

References


Table 2. Candidates for VZIG, Provided Significant Exposure has Occurred (see Table 1)*

- **Susceptible pregnant women** (when there are restrictions in availability of VZIG, priority should be given to those women at less than 20 weeks gestation and within 3 weeks of anticipated delivery)

- **Newborn infant** whose mother has onset of chickenpox within 5 days before delivery to 48 hours after delivery

- **Hospitalized premature infant (>28 wk of gestation)** whose mother lacks a reliable history of chickenpox or serologic evidence of protection against varicella

- **Hospitalized premature infants (<28 wk of gestation or <1000 g)**, regardless of maternal history of varicella or varicella-zoster virus serostatus

Table 3. Prophylaxis and Treatment of Chickenpox in Pregnancy & the Neonate

<table>
<thead>
<tr>
<th>Significant contact in pregnancy (see Table 1)</th>
<th>VZIG (“varitect”) 1ml/kg iv*⊥</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated chickenpox rash less than 24 hours old in pregnancy</td>
<td>aciclovir 800mg 5/day po for 7 days</td>
</tr>
<tr>
<td>Uncomplicated chickenpox rash more than 24 hours old in pregnancy</td>
<td>No therapy</td>
</tr>
<tr>
<td>Complications of chickenpox (respiratory symptoms/pneumonitis, encephalitis, haemorrhagic rash, clinical progression)</td>
<td>aciclovir 10mg/kg 8 hourly iv</td>
</tr>
<tr>
<td>Onset of chickenpox rash in mother within 5 days before delivery to 48 hours after</td>
<td>Neonate receives VZIG (“varitect”) 1ml/kg iv*⊥</td>
</tr>
<tr>
<td>Neonate develops chickenpox and mother had chickenpox from 3 weeks before delivery to 48 hours after</td>
<td>Neonate receives aciclovir 10mg/kg 8 hourly iv for 10 days</td>
</tr>
</tbody>
</table>

* VZIG is administered by intravenous infusion at a dose of 1 ml per kg. The solution must be inspected for particulate matter and discolouration prior to administration; cloudy or discoloured solutions or those that have deposits must not be used. During the infusion, a rate of 1 ml per minute must not be exceeded. Patients should be observed for at least 30 minutes following completion of infusion

⊥ Adverse effects of VZIG include nausea, chills, fever, headache, vomiting, allergic reactions, arthralgia and mild back pain.
Management of Exposure to or Development of a Non-Vesicular Rash in Pregnancy

Principle

Various illnesses may be associated with development of a non-vesicular rash. In the case of a pregnant woman, rubella virus and parvovirus B19 are the most important of these, because of their potential transmission to, and impact on the foetus. Transplacental transmission of rubella can lead to the congenital rubella syndrome. The risk to the foetus of primary rubella in the first 16 weeks of gestation is substantial, with major congenital abnormalities associated with infection in the first trimester and a lesser risk, limited to deafness, in the fourth month. Rubella between 16 and 20 weeks carries a minimal risk of deafness only, and after 20 weeks carries no documented risk. For a non-immune pregnant significantly exposed to rubella in the “at-risk” period, there is no specific prophylaxis or treatment available.

Parvovirus B19V can be transmitted transplacentally from the infected mother to the foetus and may cause hydrops foetalis and in some cases foetal death. Early diagnosis of B19V infection will identify those pregnancies at risk and may allow for early intervention with intrauterine transfusion.

These guidelines consider the management of a pregnant woman who is exposed to or develops a rash compatible with a “systemic viral illness” that is non-vesicular in appearance. For management of a vesicular rash please refer to the varicella zoster guidelines. Localised skin infections are not addressed.

1. Infections that may present with a non-vesicular rash in pregnancy include
   - rubella
   - parvovirus B19
   - enteroviruses
   - measles
   - infectious mononucleosis – Epstein-Barr virus or rarely cytomegalovirus
   - secondary syphilis
   - scarlet fever
   - meningococcal disease
   - others, including tropical infections such as typhoid fever and dengue fever
     (ascertain recent travel history)

2. Background on specific infections
   - rubella (German Measles)
     **Epidemiology** Rubella occurs worldwide, both sporadically and in outbreaks. It is highly infectious, although, since implementation of universal vaccination, the incidence has declined dramatically in the developed world and only 1-2% of pregnant women in the UK are currently susceptible to infection. However, immunisation levels in children in Ireland are currently well below the 85-87% critical vaccination coverage required to block transmission of rubella within the community and healthcare workers should be vigilant with regards to the re-emergence of rubella. Transmission is via droplet spread and the incubation period is 14-23 days. There may be a prodrome, especially in adults, of fever, malaise and sub-occipital lymphadenopathy. The rash is macular, appearing first on the face and neck, spreading to the trunk and limbs. Conjunctivitis and polyarthralgia may also be present. Many infections are non-specific or sub-clinical and therefore a clinical diagnosis of infection is unreliable. A clinical diagnosis of rubella
must be confirmed serologically by the presence of rubella virus IgM or a 4-fold rise in rubella IgG.

**Rubella infection and pregnancy** Transmission can occur transplacentally from the mother to her foetus. Congenital rubella syndrome can cause some or all of the following abnormalities: IUGR, cataracts and other ocular problems, deafness, patent ductus arteriosus and other heart lesions, hepatosplenomegaly, microcephaly and mental retardation, amongst others. The risk of an adverse outcome is related to the gestational age:

<table>
<thead>
<tr>
<th>Gestation</th>
<th>Risk of Adverse Foetal Outcome with maternal rubella</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8 weeks</td>
<td>60-85%</td>
</tr>
<tr>
<td>8-12 weeks</td>
<td>10-25%</td>
</tr>
<tr>
<td>13-17 weeks</td>
<td>&lt;10% (mostly deafness)</td>
</tr>
<tr>
<td>&gt;17 weeks</td>
<td>No increased risk</td>
</tr>
</tbody>
</table>

*Prevention by immunoprophylaxis following exposure* For a non-immune pregnant significantly exposed to rubella in the “at-risk” period, there is no specific prophylaxis or treatment available.

- **Parvovirus B19 (Erythema Infectiosum / Fifth Disease / Slapped Cheek Syndrome)**

  Human parvovirus B19 (B19V) causes the common childhood rash illness. erythema infectiosum or “fifth disease” (“slapped cheek syndrome”). In childhood erythema infectiosum is typically a benign illness with pyrexia and a distinctive rash. Between 20% and 50% of infections are asymptomatic. In adults, especially women, B19V infection may be complicated by acute arthritis, which typically lasts 3-4 weeks, although occasionally may be of longer duration. Infection with B19V can cause other manifestations, including chronic erythroid hypoplasia in immunodeficient persons and transient aplastic crisis lasting 7-10 days in patients with haemolytic anaemias (e.g., sickle cell disease and autoimmune haemolytic anaemia) and other conditions associated with low haemoglobin concentrations including haemorrhage, severe anaemia and thalassaemia. Parvovirus B19 targets erythrocytes by means of the erythrocyte P antigen.

*Epidemiology* B19V is distributed worldwide and is a human-only pathogen. Erythema infectiosum is commonly acquired in childhood and outbreaks can occur, particularly in winter and early spring. Transmission of infection is greatest during the viraemic phase. It is believed that persons with erythema infectiosum are most infectious before the onset of symptoms, and are unlikely to be infectious after onset of the rash and other associated symptoms. In contrast, patients with aplastic crises are contagious from before the onset of symptoms and through the week after onset or even longer. Epidemic cycles usually occur every 4 years, lasting 1-2 years. Infection is common in school age children and in Ireland approximately 50-60% of women of childbearing age are immune. Transmission is via droplet spread and the incubation period is 13-18 days. Children often develop the classical erythematous “slapped-cheek” rash, followed by a maculo-papular rash on the trunk and limbs. In adults, the infection may be sub-clinical or atypical, presenting with a rubelliform rash and/or polyarthritis.

**Parvovirus B19 infection and pregnancy** Approximately 50% of women of childbearing age are immune to B19V infection. If infection occurs during pregnancy,
the rate of transplacental transmission is approximately 33%. There is a 3.4 to 9% increased risk of spontaneous abortion in the first 20 weeks gestation and a 1-3% risk of non-immune hydrops foetalis. It is not a proven cause of congenital anomalies. The risk of foetal death appears to be highest with infection in the first 20 weeks of pregnancy, although foetal death may still sometimes occur with infection at a later gestation. Diagnosis in the mother is confirmed by the presence of parvovirus B19 IgM or a 4-fold rise in specific IgG.

_Treatment of intrauterine B19V infection_ Several reports have described intrauterine blood transfusion for treatment of B19V-related foetal anaemia, with a survival rate of >80%. More than one transfusion will usually be required for correction of foetal anaemia.

- **Measles**
  Infection during pregnancy is not associated with congenital infection or foetal damage, however, it can lead to intrauterine death and preterm delivery. Normal human immunoglobulin (NHIG) is recommended for all exposed pregnant women within 6 days of exposure (Guidelines for control of measles in Ireland; see www.ndsc.ie).

- **Enteroviruses**
  Infection in the peripartum period can result in transmission to the infant, which can cause a severe multi-system infection, especially in premature infants.

- **Infectious mononucleosis**
  Epstein-Barr infection during pregnancy is not associated with any specific risk to the foetus. Cytomegalovirus (CMV) is the most common congenital infection, causing a spectrum of disease from asymptomatic to severe multi-system abnormalities, including foetal death. However, CMV infection in the mother is usually asymptomatic or non-specific and is a rare cause of rash. There is no proven treatment or prophylaxis to prevent vertical transmission.

- **Secondary syphilis**
  Management of syphilis in pregnancy is dealt with elsewhere in these guidelines.

- **Other causes of non-vesicular rash in pregnancy**
  Infection with other causes of non-vesicular rash during pregnancy is usually not associated with an adverse foetal outcome, although any maternal febrile illness can result in spontaneous abortion or preterm delivery.

3. **Management of the pregnant woman in contact with or who develops a non-vesicular rash**

- Contact is defined a being in the same room for 15 minutes or face-to-face contact.

- All women should be screened for rubella immunity at the first antenatal visit of each pregnancy. If rubella IgG >15iu/ml on 2 or more occasions or on 1 occasion following a documented and recent history of rubella immunisation, then reassure the woman that she is immune to rubella.
• If susceptibility to rubella infection is possible, test serum (clotted red topped tube) for rubella IgG and IgM plus parvovirus B19 IgG and IgM.

• If rubella immunity has been confirmed, test serum for parvovirus B19 IgG and IgM only.

**Interpretation of results following contact with or within 4 weeks of development of a non-vesicular rash:**

<table>
<thead>
<tr>
<th>Results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubella IgG detected/IgM not detected**</td>
<td>Rubella immune</td>
</tr>
<tr>
<td>Rubella IgG and IgM not detected</td>
<td>Rubella susceptible – repeat in 3-4 weeks for specific rubella IgM (seroconversion)</td>
</tr>
<tr>
<td>Rubella IgM detected</td>
<td>Repeat to confirm acute infection</td>
</tr>
<tr>
<td></td>
<td>Refer to Foetal Assessment Unit for counselling regarding risk of foetal anomaly</td>
</tr>
<tr>
<td>Parvovirus IgG detected / IgM not detected**</td>
<td>Parvovirus immune</td>
</tr>
<tr>
<td>Parvovirus IgG and IgM not detected</td>
<td>Parvovirus susceptible – repeat 3-4 weeks for specific B19V IgM (seroconversion)</td>
</tr>
<tr>
<td>Parvovirus IgM detected</td>
<td>Repeat to confirm acute infection. Confirmed positive B19V IgM indicates recent infection and the possibility of foetal infection</td>
</tr>
<tr>
<td></td>
<td>Refer to Foetal Assessment Unit urgently for ultrasound follow-up for potential development of hydrops foetalis x 12 weeks</td>
</tr>
</tbody>
</table>

• **N.B.:** If more than 4 weeks have elapsed since the development of a non-vesicular rash in a pregnant woman, the specific IgM produced following an acute infection may have become undetectable. Therefore, if result is specific IgG detected and IgM undetected, do not interpret result as immune in this instance. Check with laboratory regarding storage of earlier serum (e.g. booking bloods) to test for sero-conversion.

• Consider serological testing for other infections if clinically indicated, contact with a known infection or outbreak of specific infection in the community. Discuss individual cases with Professor Cafferkey, Consultant Microbiologist.
Management of a Pregnant woman who presents following contact with a case of Parvovirus B10 infection [slapped cheek syndrome or aplastic crisis] and see Summary Algorithm, next page

- A detailed history of the timing of the contact, and any maternal symptoms suggestive of recent parvovirus infection, should be taken.

- Maternal serological testing for B19V antibody should be performed, with minimal delay.

- Those women who are IgG positive and IgM negative can be reassured that they are immune and that they had infection in the past.

- Those women who are negative for Parvovirus B19 antibody should have repeat testing in 14-28 days for specific B19V IGM (seroconversion).

- The presence of IgM with or without IgG indicates recent infection, and the possibility of foetal infection.

- A woman found to have B19V IgM must be referred urgently to the Foetal Assessment Unit. N.B. Discuss with FAU Consultant Obstetrician.

- A detailed ultrasound examination of the foetus should be undertaken, looking for foetal hydrops or other signs suggestive of foetal anaemia. The first sign of foetal hydrops due to anaemia is typically the development of foetal ascites. However some cases of B19V-related hydrops present with pleural or pericardial effusions without ascites. The cause of hydrops in these cases is probably cardiac failure secondary to myocarditis, rather than foetal anaemia.

- In cases with no hydrops or other signs suggestive of foetal anaemia, follow-up ultrasonography is required. Foetal hydrops typically develops within 3 to 8 weeks following maternal infection, however it may take up to 12 weeks.

Long term effects

- The current evidence is that B19V infection in pregnancy (when intrauterine transfusion was not required) has not been found to be associated with long-term adverse effects in the infant.

- Most infants in whom intrauterine transfusion was required have been found to have a normal outcome. However, in one report, persistent red cell aplasia occurred in three infants who required repeated transfusions because of B19V infection. Therefore, close follow-up of infants who have received intrauterine transfusions is essential.
Management of a pregnant woman exposed to parvovirus B19 infection

Recently exposed (or symptoms)

Test for parvovirus B19 IgG/IgM

IgG +     IgG + or -     IgG -
IgM -     IgM +     IgM -

Likely past infection  Possible recent infection  No past or recent infection

Reassure  Refer to Foetal Assessment Unit Obstetrician & Confirm recent infection Test booking blood if available (? seroconversion) and obtain further serum

Send further serum 14-28 days after contact; diagnose and manage based on results

Hydrops foetalis  No Hydrops foetalis

Management by Foetal-Maternal Medicine Specialist  Consider serial ultrasounds for up to 12 weeks

If Hydrops develops
These guidelines are principally based on the November 2000 report from the Public Health Laboratory Services Working Group (UK) on “Guidance on the management of and exposure to rash illness in pregnancy”.

References


Clinical Microbiology Guidelines

Guidelines for Prevention of Group B β haemolytic Streptococcal Infection in the Neonate

**Principle**

Some 25% of pregnant women are colonised with the Group B streptococcus (GBS). Approximately 25% of infants born to GBS carrier mothers become colonised. Neonatal sepsis is a major complication. In Ireland the incidence of GBS disease in the first 90 days of life was found to be 0.60/1,000 live births (LB), comprising 0.34/1,000 LB early-onset disease, and 0.26/1,000 LB late-onset disease (Feb 2000-Mar 2001). This is similar to the rate observed at the Rotunda, 1993-2003. Early-onset GBS disease is primarily an intrauterine infection and hence may be amenable to prevention by intrapartum chemoprophylaxis. In addition Group B streptococci occasionally cause peripartum maternal sepsis.

**Management of the Mother**

- **Routine Screening for GBS carriage**
  Routine screening for GBS carriage is not recommended in the UK or Ireland at this time. The incidence of early-onset disease with GBS in Ireland is below the rate now seen in the USA following universal antenatal screening and intrapartum antibiotic prophylaxis (IAP) regimens.

- **Preterm prelabour rupture of the membranes**
  Women who present with suspected preterm prelabour rupture of the membranes (PPROM) before 37 weeks completed gestation should be screened for GBS carriage; the appropriate specimens are high vaginal swab, low vaginal swab and rectal swab. Women with PPROM may be treated (usually orally) with erythromycin for 7 days or until labour commences (whichever is the shortest). This is because antibiotics have been shown to delay delivery in these circumstances. Also see below* for intrapartum management.

- **Asymptomatic pregnant woman found to be a GBS carrier**
  Antepartum antibiotic treatment of an asymptomatic mother who is found to be a GBS carrier is not recommended. Such treatment does not eradicate colonisation and may favour overgrowth of antibiotic resistant microorganisms.

- **GBS bacteruria**
  Antenatal patients who are found to be GBS carriers should be screened for bacteruria; the bacteruria screen should be repeated at each subsequent visit. This is because GBS bacteruria in a mother is associated with an increased risk of invasive infection in the neonate; this increased risk has not been quantified. Maternal GBS bacteruria must be treated. Oral amoxycillin is appropriate if the woman is apyretrial and asymptomatic however in the event that the woman is symptomatic, admission and treatment with intravenous penicillin is recommended. **N.B. Mothers found to have GBS bacteruria should receive IAP unless** delivered by elective Caesarean section before the onset of labour and before rupture of the membranes.
• **Caesarean Section in women who are GBS carriers**
Women undergoing elective Caesarean section in the absence of labour or membrane rupture do not require specific IAP regardless of GBS carrier status and/or the presence of risk factors. (At the clinician’s discretion prophylactic antibiotics may be administered as per antibiotic guidelines; this is primarily to prevent wound infection. Intrapartum administration of agents and dosages other than those recommended below does not comprise specific IAP for GBS).

• **Risk factors for invasive infection in the infant**
All women in whom one or more of the following recognised risk factors is operational should receive specific anti-GBS IAP.

  **Risk factors:**
  - Preterm labour at less than 37 weeks gestation
  - Premature rupture of the membranes at less than 37 weeks gestation
  - Fever (temperature >38.0°C) during labour
  - Multiple birth
  - Rupture of the membranes beyond 18 hours at any gestation
  - GBS bacteruria in this pregnancy

• **Previous infant with invasive GBS infection**
All mothers who had a previous infant with invasive GBS infection should receive IAP regardless of carrier status in the current pregnancy. In general there is no need to screen these mothers for GBS carriage in subsequent pregnancies; IAP is recommended regardless of results of repeat screening.

• **GBS invasive infection in the mother**
At the Rotunda it is also recommended that IAP be administered to mothers who had invasive GBS infection in any pregnancy (GBS isolated from blood or another normally sterile site such as abdominal cavity).

• **Intrapartum antibiotic prophylaxis (IAP) regimen**
The recommended *Intrapartum antibiotic prophylaxis (IAP) regimen* is as follows:

  **Intravenous penicillin 3g initially, to be given as soon as possible after onset of labour, then penicillin 1.5g 4 hourly until delivery**

**Intrapartum antibiotic prophylaxis in the “Penicillin-allergic” patient:**

  **Intravenous clindamycin 900mg 8 hourly, to commence as soon as possible after the onset of labour and to continue until delivery**

  **Note:** In order to optimise the efficacy of IAP, the first dose should preferably be given 4 or more hours before delivery; in general administer IAP as soon as possible after the onset of labour.

• **Chorioamnionitis diagnosed or suspected clinically**
Broad spectrum antibiotics are indicated and must include adequate GBS cover. At the Rotunda, the recommended regimen is intravenous cefotaxime 1g 8 hourly iv plus gentamicin 5mg/kg once daily plus metronidazole 500 mg 12 hourly iv.

• **Breast-feeding**
Breast-feeding by a mother who is a GBS carrier does not increase the risk of neonatal GBS disease
Guidelines for Prevention of Group B β haemolytic Streptococcal (GBS) Infection in the Neonate

Management of the Mother

Specific "Intrapartum antibiotic prophylaxis" (IAP) regimen for GBS is as follows:

Intravenous penicillin 3g initially, to be given as soon as possible after onset of labour, then penicillin 1.5g 4 hourly until delivery

IAP for GBS in the “Penicillin-allergic” patient:

Intravenous clindamycin 900mg 8 hourly, to commence as soon as possible after the onset of labour and to continue until delivery

Note: In order to optimise the efficacy of IAP, the first dose should be given at least 2 hours and preferably 4 or more hours before delivery.

SPECIFIC IAP IS INDICATED IN THE FOLLOWING SITUATIONS:

1. Previous infant with GBS disease

2. Mother had GBS invasive infection in any pregnancy

3. Mother with any of the following risk factors:
   - Preterm labour at less than 37 weeks gestation
   - Premature rupture of the membranes at less than 37 weeks gestation
   - Fever (temperature ≥38.0°C) during labour
   - Multiple birth
   - Rupture of the membranes beyond 18 hours at any gestation
   - GBS bacteruria in the current pregnancy
   - In the event that a mother is found to have untreated GBS bacteruria intrapartum, the infant should be treated with iv antibiotics for 10 days.

IAP not indicated

Planned Caesarean section performed in the absence of labour or membrane rupture regardless of GBS carrier status
Management of an infant born to a mother who received IAP for prevention of early-onset group B streptococcal disease, or other antibiotic treatment/prophylaxis in labour

Maternal IAP for GBS

YES

Signs/symptoms in infant

YES

Limited evaluation:
FBC with differential and Blood Culture
Observe >48 hours

NO

Gestational Age <35 weeks

YES

Duration of maternal IAP before delivery >4 hours

NO

Yes

No evaluation
No antimicrobial therapy
Observe > 48 hours

Mother received antibiotic(s) in labour, but not specific IAP for GBS

YES

Full diagnostic evaluation*:
FBC and differential, Blood culture, CXR if respiratory signs present, and LP when signs of sepsis are present
Empiric therapy with penicillin plus gentamicin

NO

NO

Limited evaluation:
FBC with differential and Blood Culture
Observe >48 hours

If sepsis is suspected, full diagnostic evaluation* and empiric therapy with penicillin plus gentamicin

\[1\] After 48 hours antibiotic treatment the infant should be reassessed in the light of culture results. If the infant is well and culture results are negative, antibiotics can be discontinued. Antibiotic therapy should continue for 14 days if a) the infant had a positive blood culture or b) was symptomatic when blood cultures were collected or at follow-up

N.B. In the event that a mother has a positive peripartum blood culture or is found to have untreated GBS bacteruria intrapartum, the infant should be treated with iv antibiotics for 10 days.
References


CDC, Prevention of Perinatal Group B streptococcal Disease Revised Guidelines from CDC, Schrag S., Gorwitz R., Fultz-Butts K., Schuchat A., MMWR Recommendations and Reports, 2002;51, RR11


Prevention of invasive infection with *Neisseria meningitidis* or *Haemophilus influenzae* type b (chemoprophylaxis)

**Rationale for chemoprophylaxis**
- The close contacts of a case of invasive meningococcal disease are at increased risk of developing the infection. The risk may be as great as 1,000 times the risk of infection for a person who is not a close contact. This risk applies to all age groups.
- Invasive infection with *Haemophilus influenzae* type b is primarily a disease of the pre-school child (<48 months of age). It has been found that (unimmunised) close contacts of a case who are themselves <48 months of age are at increased risk of developing the infection; the risk is approximately 240 times greater for this group. In addition, individuals who are anatomically or functionally asplenic, and individuals who are infected with HIV, are also at increased risk of invasive disease with *Haemophilus influenzae* type b.

Chemoprophylaxis is offered to close contacts in order to reduce the risk that they may develop the infection. To be effective, chemoprophylaxis should be administered as soon as possible after the diagnosis has been made in the index case. In addition, insofar as possible, chemoprophylaxis should be administered to all members of the contact network at the same time. Close contacts are defined below.

**Rifampicin is the standard chemoprophylactic agent**
- Recipients of rifampicin should be warned that it may:
  - interfere with the contraceptive pill
  - interfere with anticoagulants
  - discoulour urine, sweat and tears (red or orange discoulouration) temporarily &
  - permanently discoulour soft contact lenses

Rifampicin is contraindicated in the presence of severe liver disease and should be used with caution in pregnancy.

**Dose Schedule for Rifampicin: Note: Maximum single dose 600mg**

<table>
<thead>
<tr>
<th>Age</th>
<th><em>H. influenzae type b</em></th>
<th><em>N. meningitidis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 12 month</td>
<td>20 mg/kg once daily for 4 days (For infants &lt;1month 10mg/kg/day)</td>
<td>5mg/kg twice daily for 2 days</td>
</tr>
<tr>
<td>1 – 12 years</td>
<td>20mg/kg once daily for 4 days</td>
<td>10mg/kg twice daily for 2 days</td>
</tr>
<tr>
<td>Children &gt;12 &amp; Adults</td>
<td>600mg once daily for 4 days</td>
<td>600mg twice daily for 2 days</td>
</tr>
</tbody>
</table>
**TREATMENT OF CONTACTS: Meningococcal infection**

**When to give?**
Within 24 hours if possible, & up to 30 days following identification of the index case. Insofar as possible, all contacts should be given chemoprophylaxis at the same time.

**Who should receive prophylaxis:**
(1) Close contacts: i.e., those who in the 7 days preceding the hospital admission
- shared living/sleeping accommodation
- were baby-sitters/baby minders of the index case
- were mouth kissing contacts (not cheek kissing contacts)
- were in the same nursery/crèche (this includes adult carers)
- gave mouth to mouth resuscitation to the index case.

(2) Chemoprophylaxis is not necessary for classmates of an index case unless there are two or more cases of the same strain in the school during the same term.
   - If the cases occur in the same class, all class members and staff should receive prophylaxis
   - If the cases occur in different classes discuss management with the Clinical Microbiology/Public Health service

(3) Special consideration should be given to situations where there is greater than the usual interaction between members of the extended family or adverse living conditions exist e.g., it may be appropriate wish to give prophylaxis to all travellers on a given site

(4) Prophylaxis is not recommended for co-passengers on public transport.

**TREATMENT OF CONTACTS: Haemophilus influenzae type b infection**

**When to give:** Within 24 hours if possible

**Who should receive prophylaxis?**
All household contacts, irrespective of age or immunisation status, in those households with at least one contact < 48 months who is not fully immunised.
All household contacts in those households where there is an individual who is immunocompromised, asplenic or who has sickle cell disease.

**ALTERNATIVE CHEMOPROPHYLACTIC AGENTS**
In cases of meningococcal infection if rifampicin is contraindicated alternative agents include: ceftriaxone one dose iv/im: for a child <12yrs give 125 mg , for an adult give 250mg.

**PREGNANCY:**
For close contacts who are pregnant, options include ceftriaxone at any stage of pregnancy or rifampicin after the first trimester. **N.B., Please discus each such case individually with the Consultant Microbiologist.**

**VACCINATION:**
For meningococcal infection where there is a vaccine (strains of groups A, C, Y, W135) vaccination will be offered by the public health service to all close contacts as appropriate for age.
"ANTIBIOTIC GUIDELINES"

GUIDELINES FOR MANAGEMENT OF SPECIFIC INFECTIONS & PRE-EMPTIVE MANAGEMENT OF PATIENTS WITH SUSPECTED INFECTION

Introduction
This section gives guidelines on antimicrobial use in Obstetrics & Gynaecology. Dosages are appropriate for women of average size and with normal renal and hepatic function. For patients with renal or hepatic impairment or those who weigh less than 50Kg, these doses must be adjusted.

1. Ensure that appropriate microbiological specimens are taken prior to commencing antimicrobials

2. Use generic names of antimicrobials

3. Administer antibiotics by the oral route except in severe infection, the presence of pyrexia or vomiting and when the oral route is not possible.

4. In the event that the patient does not respond within 24-36 hours of commencing treatment, ensure that the dosage is correct, that pus is drained & SEEK ADVICE.

5. Avoid unnecessarily prolonged courses of antimicrobials.

6. Further advice, both technical and medical can be sought from the microbiology laboratory. The Consultant Microbiologist can be contacted through the hospital switchboard.

7. Antimicrobial treatment should be reviewed in the light of microbiological investigations.

8. Make appropriate adjustments to dosage in the presence of renal failure.

9. The reader is reminded to consult MIMS and/or the Product insert literature for information on drug interactions, adverse events and contraindications.
Management of Intrapartum/Peripartum Sepsis

Principle
Sepsis contributes significantly to maternal morbidity. Pyrexia may be the only symptom in early sepsis. Causes of peripartum and postpartum pyrexia include sepsis, urinary tract infection, deep venous thrombosis, mastitis and breast abscess. Pyrexial patients should be assessed clinically and in the absence of another obvious cause should be treated empirically for sepsis as follows, pending the results of microbiological investigations.

Empirical treatment of Intrapartum Pyrexia

All patients exhibiting intrapartum pyrexia of
≥ 37.8°C on two occasions or ≥ 38.0°C on one occasion should have a septic work-up*;
co-amoxiclav 1.2G (single dose iv) should be administered without delay.
N.B. If symptoms continue, triple antibiotic therapy with penicillin, gentamicin and metronidazole should be instituted (see next page).

Penicillin-allergic patients
i. A patient who has had a rash, which was macular, or maculopapular and non-itchy or who had gastrointestinal upset with penicillin treatment may be treated with cefuroxime 1.5G single dose iv plus metronidazole 500mg single dose iv
ii. A patient who has had
   i) a hypersensitivity reaction to penicillin or a cephalosporin or
   ii) an urticarial rash whilst receiving penicillin or a cephalosporin or
   iii) a desquamating rash with mucositis whilst receiving penicillin or a cephalosporin may be treated with clindamycin 900 mg single dose intravenously plus gentamicin 160mg single dose iv, after specimen collection.
N.B. If symptoms continue, antibiotic therapy should be continued.

N.B. In all cases of maternal pyrexia, the placenta should be sent for culture and histology

*Septic Screen:
   White cell count & differential      Blood culture
   MSU for microscopy & culture        HVS in established labour
   Cervical swab in early labour or post-partum
   Sputum if appropriate
Empirical Treatment of women with Postpartum Pyrexia

Including women with Retained Products

All patients exhibiting postpartum pyrexia of ≥38.0°C on two occasions 6 hours apart, should have a septic work-up*.

- If there is no obvious focus of infection present then these patients should be treated empirically with:
  penicillin 1.2g (2 megaunits) 4 hrly iv  plus
  gentamicin^^ 5mg/Kg 24 hourly iv  plus
  metronidazole 500mg 12 hrly iv

(^^Note: adjust gentamicin dosage in the presence of mild/moderate renal impairment; in severe renal impairment use cefotaxime plus metronidazole)

- If the woman had a Caesarean section and there is any evidence of wound infection, flucloxacillin 1g, 6 hourly iv should be given instead of penicillin.

The above antibiotic treatment should proceed regardless of intrapartum antibiotics.

Penicillin-allergic patients
i. A patient who has had a rash which was macular or maculopapular and non-itchy or gastrointestinal upset with penicillin may be treated with cefuroxime 1.5g 8 hourly iv  plus gentamicin^^ 5mg/Kg 24 hourly iv, plus metronidazole 500mg 12 hourly iv

ii. A patient who has had
  i) a hypersensitivity reaction to penicillin or a cephalosporin
  ii) an urticarial rash whilst receiving a penicillin or a cephalosporin
  iii) a desquamating rash with mucositis whilst receiving a penicillin or a cephalosporin may be treated with vancomycin 1g 12 hourly by slow iv infusion, gentamicin^^ 5mg/Kg 24 hourly iv, and metronidazole 500mg 12 hourly iv, after specimen collection.

Comments & Duration of Treatment
- All patients should be reassessed after 24 and 48 hours in the light of clinical findings and microbiological results.
- With negative blood cultures, normal white cell count and clinically well patient, discontinue antibiotics.
- In proven sepsis and/or ill patients continue iv antibiotics.
- In proven sepsis and clinically well patients continue iv antibiotics until the patient has been apyrexial for 48 hours then change to the most appropriate oral antibiotics - discuss with Consultant Microbiologist.
- In proven sepsis the minimum duration of therapy is 10 days.

*Septic Screen:
  White cell count & differential  Blood culture
  MSU for microscopy & culture  Cervical swab post-partum
  Sputum if appropriate  A sample of milk for culture if appropriate
## Empiric Treatment of Acute Community-Acquired Infections in Gynaecology When the Causative Organism Is Unknown

<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Organism</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicitis</td>
<td><em>N. gonorrhoea</em>, <em>C. trachomatis</em></td>
<td>ceftriaxone 250mg, single dose i.m., <em>plus</em> azithromycin 1 g, single dose p.o.</td>
<td>Treat partner concurrently with ofloxacin.</td>
</tr>
<tr>
<td>Pelvic Inflammatory Disease</td>
<td><em>C. trachomatis</em>, <em>N. gonorrhoea</em>, Gram negative rods, anaerobes</td>
<td>ofloxacin 400mg, 12 hourly x 14 days <em>plus</em> metronidazole 400mg, 12 hourly x 14 days</td>
<td>Remove IUCD after initiation of antibiotic therapy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Treat partner concurrently with ofloxacin.</td>
</tr>
<tr>
<td>Pelvic Inflammatory Disease</td>
<td><em>C. trachomatis</em>, <em>N. gonorrhoea</em>, Gram negative rods, anaerobes</td>
<td>doxycycline 100mg 12 hourly <em>oral</em>, <em>plus</em> ceftriaxone 1g, once daily <em>i.v</em>, <em>plus</em> metronidazole 500mg, 12 hourly <em>i.v.</em></td>
<td>Remove IUCD after initiation of antibiotic therapy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Oral switch when symptoms have settled and patient is apyrexial x48 hours: doxycycline 100mg 12 hourly <em>oral</em>, <em>plus</em> metronidazole 500mg, 12 hourly <em>i.v.</em> to complete 14 days treatment in total</td>
</tr>
<tr>
<td>UTI: Uncomplicated Cystitis</td>
<td><em>E. coli</em>, <em>Proteus spp.</em>, <em>Staph saprophyticus</em></td>
<td>trimethoprim 200mg <em>po</em>, 12 hourly for 5 days</td>
<td>Duration of treatment 3 to 5 days Alternative: cephradine 500mg 6 hourly <em>po</em></td>
</tr>
<tr>
<td>UTI: Acute Pyelonephritis</td>
<td><em>E. coli</em>, <em>Proteus spp.</em>, Other GNB</td>
<td>cefotaxime 1g 8 hourly <em>iv</em> for 7 days</td>
<td>Review in light of culture results</td>
</tr>
</tbody>
</table>

Always review antibiotics in light of results of microbiology culture results
## PREFERRED TREATMENT OF SPECIFIC ACUTE COMMUNITY-ACQUIRED INFECTIONS – Obstetrics & Gynaecology

<table>
<thead>
<tr>
<th>Condition</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial Vaginosis</td>
<td>metronidazole 400mg, 12 hourly, po for 7 days</td>
<td>In Pregnancy: Defer treatment until the second trimester</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Treat partner in recurrent infection</td>
</tr>
<tr>
<td>Candida vaginitis</td>
<td>clotrimazole 200mg, pessary, pv at night for 3 nights OR clotrimazole 500mg pessary, pv at night, single dose</td>
<td></td>
</tr>
<tr>
<td>Candida vulvitis</td>
<td>Clotrimazole 200mg, pessary, pv at night for 6 nights plus clotrimazole cream 1%, t.i.d.</td>
<td></td>
</tr>
<tr>
<td>Chlamydia cervicitis</td>
<td><strong>Non-pregnant patient:</strong> azithromycin 1g, single dose, po</td>
<td>Treat partner concurrently with azithromycin</td>
</tr>
<tr>
<td>Uncomplicated case of cervicitis</td>
<td><strong>Pregnant patient:</strong> erythromycin 500mg 6 hourly po for 14 days</td>
<td></td>
</tr>
<tr>
<td>Gonococcal cervicitis</td>
<td>amoxyccillin 3g single dose, po</td>
<td>Use spectinomycin 4g single dose, i.m. in penicillin allergic patient^</td>
</tr>
<tr>
<td>Penicillin sensitive strain</td>
<td></td>
<td>Treat partner concurrently</td>
</tr>
<tr>
<td>Gonococcal cervicitis</td>
<td>ceftriaxone 250mg, single dose im</td>
<td></td>
</tr>
<tr>
<td>Penicillinase producing strain</td>
<td><strong>In penicillin allergy use</strong> spectinomycin 4g single dose im^</td>
<td>^Spectinomycin is available on named patient basis</td>
</tr>
<tr>
<td>Herpes genitalis: Primary</td>
<td>In the event that treatment is considered necessary by the Consultant: aciclovir 200mg 5 times / day po x 10 days</td>
<td>At Term; or if admission is required in a woman who is not pregnant: aciclovir 5mg/kg, 8 hourly i.v. for 5 to 10 days</td>
</tr>
<tr>
<td>SEEK ADVICE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syphilis</td>
<td>Primary: benzathine penicillin G, 1.84g (2.4 million units) im weekly for 2 successive weeks</td>
<td>Penicillin-allergic: These women should be managed in consultation with Adult ID/GUM services</td>
</tr>
<tr>
<td>N.B.: SEEK ADVICE &amp; Refer to detailed Guideline</td>
<td>Secondary, Latent and Tertiary: benzathine penicillin G, 1.84g (2.4 million units) im weekly for 3 successive weeks</td>
<td></td>
</tr>
<tr>
<td>Trichomoniasis</td>
<td>Gynaecology: metronidazole 2g single dose po</td>
<td>In Pregnancy: a) Treat only if severe &amp; b) Defer treatment until the second trimester</td>
</tr>
<tr>
<td></td>
<td><strong>In Pregnancy:</strong> metronidazole 400mg, 12 hourly po for 7 days</td>
<td>Treat partner in recurrent infection</td>
</tr>
</tbody>
</table>
### EMPIRIC TREATMENT OF POST-OPERATIVE INFECTIONS IN GYNAECOLOGY – [organism unknown]

<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Organism</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal wound infection without cellulitis or systemic signs</td>
<td>haemolytic streptococci, anaerobes, S. aureus</td>
<td>If antibiotics are required: flucloxacillin 500mg 6 hourly po <strong>plus</strong> metronidazole 400mg, 12 hourly po</td>
<td>Surgical drainage and antiseptics may negate the need for antibiotics. Pus must be drained. 5 days antibiotics usually adequate.</td>
</tr>
<tr>
<td>Abdominal wound infection with cellulitis and/or systemic symptoms</td>
<td>S. aureus, haemolytic streptococci, anaerobes, [Gram negative rods]</td>
<td>flucloxacillin 1 g, 6 hourly iv <strong>plus</strong> penicillin 1.2g 6 hourly iv <strong>plus</strong> metronidazole 500mg, 12 hourly iv</td>
<td>Pus must be drained. Change to oral therapy when cellulitis has resolved and patient is apyrexial. <strong>Discuss with Microbiologist</strong>. Duration of therapy dependent on severity, 10 days usually.</td>
</tr>
<tr>
<td>Pelvic infection post-operatively</td>
<td>Haemolytic streptococci, Anaerobes, Gram negative bacilli, S. aureus</td>
<td>Penicillin 1.2g, 6 hourly, i.v. <strong>plus</strong> gentamicin ^^5mg/Kg, 24 hourly i.v. <strong>plus</strong> metronidazole 500mg, 12 hourly iv</td>
<td>Pus must be drained. Change to oral therapy when symptoms have resolved and patient is apyrexial. <strong>Discuss with Microbiologist</strong>. Duration 7-10 days. **^('^ adjust gentamicin dosage in the presence of renal impairment; in severe renal impairment seek advice.</td>
</tr>
<tr>
<td>Lower Respiratory Tract Infection previously healthy chest</td>
<td>S. pneumoniae, (H. influenzae)</td>
<td>amoxycillin 500mg, 8 hourly, po <strong>Penicillin-allergic:</strong> clarithromycin 500mg 12 hourly po</td>
<td>Effective physiotherapy may negate the need for antibiotics in mild cases. Intravenous therapy at higher dosage will be required in severe cases.</td>
</tr>
<tr>
<td>Lower Respiratory Tract Infection previously unhealthy chest</td>
<td>H. influenzae, S. pneumoniae, (S. aureus)</td>
<td>cefuroxime 750mg, 6 hourly iv <strong>Penicillin-allergic:</strong> clarithromycin 500mg 12 hourly iv</td>
<td>Effective Physiotherapy may negate the need for antibiotics in mild cases. Duration of treatment: 5 to 7 days usually.</td>
</tr>
</tbody>
</table>

Always review antibiotics in light of results of microbiology.
## EMPIRIC TREATMENT OF ASYMPTOMATIC BACTERURIA & SYMPTOMATIC URINARY TRACT INFECTION IN PREGNACY

<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Organism</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic Bacteruria</td>
<td>E. coli, Proteus species, Staph saprophyticus, other Gram negative bacilli</td>
<td>nitrofurantoin 100mg, 6 hourly po for 5 days or cephradine 500mg 12 hourly po for 7 days</td>
<td>Use the coarse granular formulation of nitrofurantoin Do not use nitrofurantoin at or near term - it may cause neonatal haemolysis In Proteus infection be guided by laboratory results</td>
</tr>
<tr>
<td>Symptomatic bacteruria</td>
<td>E. coli, Proteus species, Staph saprophyticus, Other Gram negative bacilli</td>
<td>nitrofurantoin 100mg 6 hourly p.o. for 5 days or cephradine 500mg 12 hourly for 7 days</td>
<td>Use the coarse granular formulation of nitrofurantoin Do not use nitrofurantoin at or near term - it may cause neonatal haemolysis In Proteus infection be guided by laboratory results In recurrent asymptomatic Bacteriuria be guided by laboratory results</td>
</tr>
<tr>
<td>Acute pyelonephritis</td>
<td>E. coli, Proteus species, Staph saprophyticus, Other Gram negative bacilli</td>
<td>cefotaxime 1 g, 8 hourly iv</td>
<td>The duration of treatment is for seven days usually In the case of Recurrence and/or Relapse; treat for 10 days and SEEK ADVICE. Long term prophylactic antibiotic treatment may be warranted N.B. iv cephradine is not appropriate blind therapy.</td>
</tr>
</tbody>
</table>

Always review antibiotics in light of results of microbiology
# Empiric Treatment of Perinatal & Pregnancy-Related Infection - Organism Unknown

<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Organism</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal wound infection</td>
<td>haemolytic streptococci, anaerobes, S. aureus, Gram negative rods</td>
<td>If antibiotics are required: flucloxacillin 500mg, 6 hourly, po plus metronidazole 400mg, 12 hourly po</td>
<td>Surgical drainage and antiseptics may negate the need for antibiotics. Pus must be drained. Five days treatment is usually adequate.</td>
</tr>
<tr>
<td>Without cellulitis or systemic symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal wound infection</td>
<td>S. aureus, haemolytic streptococci, anaerobes, [Gram negative rods]</td>
<td>flucloxacillin 1g, 6 hourly iv plus penicillin 1.2g, 6 hourly iv plus metronidazole 500mg, 12 hourly iv Penicillin-allergic: vancomycin 1G, 12 hourly iv plus gentamicin^^ 5mg/Kg 24 hourly iv plus metronidazole 500mg, 12 hourly iv</td>
<td>Pus must be drained. Change to oral therapy when cellulitis has resolved and patient is apyrexial. Duration of treatment dependent on severity; 10 days usually. ^^ adjust gentamicin dose or omit in renal impairment</td>
</tr>
<tr>
<td>with cellulitis and/or systemic symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast Abscess or Infective Mastitis</td>
<td>Staph aureus, haemolytic streptococci</td>
<td>flucloxacillin 500mg, 6 hourly po plus amoxycillin 500 mg, 8 hourly po Penicillin-allergic: Discuss with Consultant Microbiologist</td>
<td>Duration of therapy: 7 days usually N.B., iv therapy may be required initially in a very severe case</td>
</tr>
<tr>
<td>Chorio-amnionitis</td>
<td>haemolytic streptococci, aerobic Gram negative bacilli, S. aureus, anaerobes</td>
<td>cefotaxime 1g 8 hourly iv plus gentamicin^^ 5mg/kg 24 hourly iv plus metronidazole 500 mg 12 hourly iv.</td>
<td>^^ adjust gentamicin dosage in mild/moderate renal impairment and omit in severe renal impairment</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>L. monocytogenes</td>
<td>ampicillin 2g, 4 hourly iv plus gentamicin</td>
<td>Penicillin-allergic: Discuss with Consultant Microbiologist</td>
</tr>
<tr>
<td>Perineal infection</td>
<td>haemolytic streptococci, S. aureus, anaerobes</td>
<td>cefuroxime 750 mg 8 hourly iv plus metronidazole 500 mg, 12 hourly iv</td>
<td>True perineal wound infection is uncommon</td>
</tr>
<tr>
<td>Septic abortion, Post-Abortal sepsis</td>
<td>haemolytic streptococci, Gram negative bacilli, anaerobes including Cl. perfringens</td>
<td>penicillin 1.2g, 6 hourly iv plus gentamicin^^ 5mg/Kg 24 hourly iv plus metronidazole 500 mg, 12 hourly iv Penicillin-allergic: vancomycin 1G, 12 hourly iv plus gentamicin^^ 5mg/Kg 24 hourly iv plus metronidazole 500 mg, 12 hourly iv</td>
<td>Duration of therapy:10 days usually Discuss appropriate oral therapy with Microbiologist when symptoms have subsided and patient is apyrexial ^^ adjust gentamicin dose or substitute with cefotaxime in renal impairment</td>
</tr>
</tbody>
</table>

Always review antibiotics in light of results of microbiology.
### EMPIRIC TREATMENT OF PERINATAL & PREGNANCY-RELATED INFECTION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Organism</th>
<th>Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-partum endometritis with Symptoms developing 7-10 days after delivery</td>
<td>C. trachomatis, less likely: haemolytic streptococci, Gram negative rods, Anaerobes</td>
<td>Discuss with Consultant Microbiologist</td>
<td>** N.B. If symptoms have been present since delivery or within 120 hours of delivery, treat as for puerperal sepsis. Chlamydia post-partum endometritis is rare.</td>
</tr>
<tr>
<td>Puerperal Sepsis** SEEK ADVICE</td>
<td>Strep. pyogenes (Group A), Group B streptococcus, aerobic gram negative bacilli, anaerobes</td>
<td>Strep. pyogenes, Gram positive cocci; Group B streptococcus, aerobic gram negative bacilli, anaerobes</td>
<td>Duration of treatment: 10 days usually. Discuss possible oral switch with Consultant Microbiologist when symptoms have subsided and patient is afebrile. **adj ust gentamicin dose or substitute with cefotaxime in renal impairment.</td>
</tr>
<tr>
<td>Lower Respiratory Tract Infection previously healthy chest</td>
<td>S. pneumoniae</td>
<td>Amoxycillin 500mg, 8 hourly, po</td>
<td>Effective Physiotherapy may negate the need for antibiotics in mild cases. Duration of antibiotic treatment: 5 to 7 days usually.</td>
</tr>
<tr>
<td>Lower Respiratory Tract Infection Previously unhealthy chest</td>
<td>H. influenzae, S. pneumoniae, (S. aureus)</td>
<td>Cefuroxime 750mg, 8 hourly iv</td>
<td>Effective Physiotherapy may negate the need for antibiotics in mild cases. Discuss possible oral switch with Consultant Microbiologist when symptoms have subsided and patient is afebrile.</td>
</tr>
</tbody>
</table>

Always review antibiotics in light of results of microbiology.
### PROPHYLACTIC ANTI-BIOTICS IN HYSTERECTOMY, or MANUAL REMOVAL OF PLACENTA/ ERPC / 3° TEAR

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Prophylaxis</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abdominal hysterectomy</strong></td>
<td><strong>At the clinician’s discretion:</strong></td>
<td><strong>Penicillin or cephalosporin allergic</strong>:</td>
</tr>
<tr>
<td></td>
<td>co-amoxiclav 1.2G iv single dose <strong>may be used</strong></td>
<td>vancomycin 1g, <strong>plus</strong> gentamicin 2mg/Kg iv single dose may be used</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> A patient who has had a rash that was macular and <strong>non-itchy</strong>, or gastrointestinal upset, with a penicillin, may be treated with cefuroxime, 1.5G iv. <strong>Single dose</strong></td>
</tr>
<tr>
<td><strong>Vaginal hysterectomy</strong></td>
<td>Prophylaxis is primarily to prevent post-operative UTI: erythromycin is <strong>NOT appropriate</strong></td>
<td><strong>Penicillin or cephalosporin allergic</strong>:</td>
</tr>
<tr>
<td></td>
<td>co-amoxiclav 1.2G iv <strong>single dose</strong></td>
<td>gentamicin 2mg/Kg iv. <strong>plus</strong> metronidazole 500mg iv</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> A patient who has had a rash that was macular and <strong>non-itchy</strong>, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5G iv <strong>single dose plus</strong> metronidazole 500mg iv <strong>single dose</strong></td>
</tr>
<tr>
<td><strong>Manual Removal of Placenta or ERPC</strong></td>
<td></td>
<td>Antimicrobials are not routinely recommended unless the patient is pyrexial or unwell or it is a difficult procedure</td>
</tr>
<tr>
<td><strong>Manual Removal of Placenta or ERPC</strong></td>
<td><strong>When Patient is pyrexial or unwell or difficult procedure</strong></td>
<td><strong>Penicillin or cephalosporin allergic</strong>:</td>
</tr>
<tr>
<td></td>
<td>benzylpenicillin 1.2g, 4 hourly, iv <strong>plus</strong> gentamicin**^^ 5mg/Kg iv infused over 30 minutes, 24 hourly <strong>plus</strong> metronidazole 500mg, 12 hourly, iv</td>
<td>clindamycin 600 mg iv 8 hourly <strong>plus</strong> gentamicin**^^ 5mg/kg iv infusion 24 hourly <strong>^^adjust gentamicin dose or substitute with cefotaxime in renal impairment</strong></td>
</tr>
<tr>
<td></td>
<td>Continue treatment intravenously for at least 48 hours depending on results of cultures and clinical condition</td>
<td><strong>Note:</strong> A patient who has had a rash that was macular and <strong>non-itchy</strong>, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5G 12 hourly iv <strong>plus</strong> metronidazole 500mg, 12 hourly iv</td>
</tr>
<tr>
<td><strong>Third degree Perineal Tear</strong></td>
<td>co-amoxiclav 1.2g iv, two doses 12 hours apart</td>
<td><strong>Penicillin or cephalosporin allergic</strong>:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clindamycin 900 mg iv, <strong>single dose</strong> <strong>plus</strong> gentamicin 2mg/kg iv, <strong>single dose</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> A patient who has had a rash that was macular and <strong>non-itchy</strong>, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5G iv, 2 doses 12 hours apart</td>
</tr>
</tbody>
</table>

**N.B.** “**Penicillin or cephalosporin allergic** is defined as
A patient who, while receiving a penicillin or a cephalosporin, developed one or more of the following:

a) a hypersensitivity reaction,  b) an urticarial rash,
   c) a desquamating rash with mucositis

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## PROPHYLACTIC ANTIBIOTICS IN CAESAREAN SECTION

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Prophylaxis</th>
<th>Comment</th>
</tr>
</thead>
</table>
| Non-elective/emergency Caesarean section       | co-amoxiclav 1.2G iv single dose                                           | **Penicillin or cephalosporin allergic:** clindamycin 900 mg iv single dose plus gentamicin\(^{\uparrow}\) 5mg/kg iv single dose  
Note: A patient who has had a rash that was macular and **non-itchy**, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5g iv single dose  
\(^{\uparrow}\)adjust gentamicin dose or substitute with cefotaxime in renal impairment |
| in all patients in labour and all patients with ruptured membranes & when the patient is <90kg |                                                                                |                                                                                                   |
| Non-elective/emergency Caesarean section       | co-amoxiclav 1.2G iv 8 hourly for 3 doses                                   | **Penicillin or cephalosporin allergic:** clindamycin 900 mg iv 8 hourly for 3 doses plus gentamicin\(^{\uparrow}\) 5mg/kg iv single dose  
\(^{\uparrow}\)adjust gentamicin dose or substitute with cefotaxime in renal impairment  
**Note:** A patient who has had a rash that was macular and **non-itchy**, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5g iv 12 hourly for 2 doses |
| in all patients in labour and all patients with ruptured membranes & when the patient is >90kg | **A pressure dressing should be applied to the wound in theatre**           |                                                                                                   |
| Elective Caesarean Section Prophylaxis is not routinely recommended but is advisable in a patient with risk factors for post-operative infection, such as weight >90 kg, Insulin Dependent Diabetes Mellitus, poor nutrition | **At the clinician’s discretion:** co-amoxiclav 1.2G iv single dose may be administered | **Penicillin or cephalosporin allergic:** clindamycin 900 mg iv single dose plus gentamicin\(^{\uparrow}\) 2mg/kg iv single dose  
\(^{\uparrow}\) in renal impairment substitute with cefotaxime for gentamicin  
**Note:** A patient who has had a rash that was macular and **non-itchy**, or gastrointestinal upset with a penicillin, may be treated with cefuroxime, 1.5G iv single dose |

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**N.B.** *Penicillin or cephalosporin allergic is defined as*  
A patient who, while receiving a penicillin or a cephalosporin, developed one of  
a) a hypersensitivity reaction  
b) an urticarial rash  
c) a desquamating rash with mucositis
**Guideline for specimen collection and antibiotic treatment in a patient with ruptured membranes** *(see also general Obstetric Guidelines)*

### Pre-labour rupture of membranes at <35 weeks gestation

In these women, it is recommended that the following specimens be taken:
- Cervical swab for routine culture
- High vaginal swab for culture for *Mycoplasma* and *Ureaplasma*
- Low vaginal swab & rectal swab, for culture for Group B streptococcus
- Mid-stream specimen of urine for microscopy and culture

Because antibiotics have been found to prolong the period until delivery in this situation, oral erythromycin treatment is recommended, at a dosage of 500 mg 6 hourly, to continue for 7 days or until delivery, whichever is soonest.

If urinary tract infection is diagnosed, treat with an appropriate antimicrobial.

### ROM with Pyrexia, &/or systemic signs, &/or evidence of Chorioamnionitis at any gestation

The following specimens should be taken:
- Cervical swab for routine culture
- Low vaginal swab & rectal swab, for culture for Group B streptococcus
- Mid-stream specimen of urine for microscopy and culture
- Blood cultures

Empirical antibiotic treatment is as follows:
- Cefotaxime 1g 8 hourly *plus* gentamicin\(^\text{^^}\) 5mg/kg 24 hourly *plus* metronidazole 500 mg 12 hourly iv.

\(^{\text{^^}}\) adjust gentamicin dosage in mild/moderate renal impairment, and omit in severe renal impairment.

This treatment should be adjusted based on results of cultures (for e.g., if Group B streptococcus is isolated on culture, substitute cefotaxime with penicillin 1.2g 4 hourly iv and give also anti-GBS intrapartum chemoprophylaxis in labour as per guideline).

### Intrapartum GBS prophylaxis

Specific Group B streptococcal intrapartum prophylaxis is recommended in women with risk factors including: premature labour before 37 completed weeks, premature rupture of the membranes, or rupture of the membranes >18 hours at any gestation (see GBS guideline pages 41-45).

The Specific *“Intrapartum antibiotic prophylaxis” (IAP)* regimen for GBS is:

- Intravenous penicillin 3g initially, to be given as soon as possible after onset of labour, then penicillin 1.5g 4 hourly until delivery

IAP for GBS in the “Penicillin-allergic” patient:

- Intravenous clindamycin 900mg 8 hourly, to commence as soon as possible after the onset of labour and to continue until delivery

**Note:** In order to optimise the efficacy of IAP, the first dose should be given at least 2 hours and preferably 4 or more hours before delivery.

**For full GBS guideline see pages 41-45**
Prevention of Bacterial Endocarditis

The following cover is recommended (adults):

- Amoxycillin 1g iv plus gentamicin 160 mg iv or im
  at induction of anaesthesia or 15 minutes prior to surgery

followed by: amoxycillin 500 mg. orally 6 hours later

For patients with prosthetic valves or who are allergic to penicillin

vancocin 1g by slow iv infusion over at least 60 minutes

*followed by: gentamicin 160 mg iv
  at induction of anaesthesia or 15 minutes prior to surgery

[* N.B., Do not mix vancocin and gentamicin in the same infusion; alternatively, administer at separate sites]

Cardiac conditions

Endocarditis prophylaxis is recommended in

- Prosthetic cardiac valves
- Previous bacterial endocarditis even in the absence of cardiac disease
- Most congenital cardiac malformations
- Rheumatic & other acquired valvular dysfunction even after cardiac surgery
- Hypertrophic cardiomyopathy
- Mitral valve prolapse in the presence of valvular regurgitation

Endocarditis prophylaxis is not recommended in

- Isolated secundum atrial septal defects
- Mitral valve prolapse without regurgitation
- Physiologic, functional or innocent heart murmurs
- Cardiac pacemakers and implanted defibrillators

Procedures

Endocarditis prophylaxis recommended in

- Cystoscopy
- Emergency Caesarean section
- Vaginal histerectomy
- Vaginal delivery in the presence of Infection
- Incision and Drainage of Infected Tissue

Endocarditis prophylaxis is not recommended in

- Endotracheal intubation
- Elective Caesarean section
- Uncomplicated vaginal delivery
- Sterilisation procedures
- Insertion or removal of IUCD