Sgrinio Cyn Geni Cymru
Antenatal Screening Wales

Infections and Rashes in Pregnancy:

A Guide for Health Professionals (revised edition)

December 2019

Version 6

GIG CYMRU NHS WALES
Iechyd Cyhoeddus Cymru
Public Health Wales

This document was presented at an all Wales consultation workshop, prior to wider consultation and publication.

Contributors:

Bryan Beattie	Consultant in Fetal Medicine
Maria Chapman	Regional Coordinator, Antenatal Screening Wales
Jennifer Evans	Consultant Paediatrician
Gavin Forbes	SpR in Medical Microbiology
Rachel Jones	Consultant Virologist
Elizabeth Kubiak	Consultant Microbiologist
Anne McGowan	Nurse Consultant, Vaccine Preventable Disease Programme
Nicola Price	Consultant Virologist
Samantha Ray	Health Protection Nurse
Owen Seddon	SpR in Infectious Disease and Medical Microbiology
Anju Sinha	Consultant in Obstetrics and Gynaecology
Kindry Williams	Regional Coordinator, Antenatal Screening Wales

In consultation with:

CARIS

Laura Cunningham	Consultant in Sexual Health
Helen Bradshaw	SpR in Sexual Health
Brendan Healy	Consultant in Infectious Diseases and Microbiology
Richard Roberts	Head of Vaccine Preventable Disease Programme

With thanks to:

For the preparation of the document

Vickie Harding	Antenatal Screening Wales

Summary of Change December 2019			
Date	Section	Page	Comments
December 2019	Section 3 – 3.3 Chickenpox (Varicella Zoster Virus).	Page 31	Updated guidance and link to updated guidance by Public Health England added

Contents

Introduction

The aim of this document is to provide a basic overview of infections and vaccinations that are relevant in pregnancy and on how best to use the laboratory diagnostic tests that are currently available.

The document is broken down into five sections:

- ***Antenatal screening tests*** gives a brief overview of the nationally agreed tests for communicable diseases that are offered as part of antenatal care
- ***Vaccinations*** details of vaccinations that are recommended in pregnancy
- ***The diagnosis and management of rashes in pregnancy*** provides information regarding the infective causes for rashes
- ***Infections associated with abnormal fetal ultrasound findings*** highlights the commonly identified fetal abnormalities at the 18 - 20 week ultrasound scan and the infections associated with each abnormality
- ***Common infections in pregnancy*** which cause concern and warrant consideration.

This document is intended to provide an easy reference tool and complements UK guidance where available.

These guidelines are not exhaustive, but should provide the user with sufficient information regarding specific infections and references that allow for more detailed reading when required.

Data regarding incubation periods for infections can be variable, for the purposes of this document and for consistency all incubation periods are taken from; Heymann DL, (2004) Control of Communicable Diseases Manual, 18th Edition. American Public Health Association: Washington.

Please note that a review of antenatal screening for rubella susceptibility, held in 2012, by the UK National Screening Committee (UK NSC) found that rubella susceptibility screening in pregnancy no longer meets the UK NSC criteria for a screening programme because of the effectiveness of rubella immunisation.

The Wales Screening Committee has considered the UK NSC's recommendation and endorsed the decision for Wales. England ceased screening in April 2016 and Scotland ceased in June2016. The offer of antenatal screening for rubella susceptibility should stop for pregnant women in Wales whose booking blood tests are taken on or after 3rd October 2016. This is due to the high uptake of the measles, mumps and rubella (MMR) vaccination. The epidemiology of rubella has changed providing the rationale to end screening for susceptibility in pregnancy.

Section 1: Antenatal Screening Tests

All women in Wales should be offered antenatal screening for communicable diseases. These are HIV, hepatitis B, and syphilis. These should be offered preferably before 13 weeks gestation (see table 1).

Rubella susceptibility screening in Wales ceased on 3rd October 2016 due to the success of the MMR vaccination programme and the significant reduction in congenital rubella syndrome (CRS). Information on MMR vaccine is found in section 2 and information on rashes in pregnancy including rubella is found in section 3.

Communicable disease blood samples should be sent to the microbiology laboratory (during the working hours of Monday to Friday).

> *If the woman is more than 23 completed weeks pregnant when the sample is taken, the sample should be marked urgent.*
>
> *If the woman is more than 36 weeks pregnant when the sample is taken, the sample should be marked urgent and the laboratory contacted.* [1]

Women who present in labour with undocumented communicable disease status

These women require a risk assessment to determine if an urgent communicable disease test is required. This should be done in consultation with your local consultant microbiologist (this requires a consultant to consultant dialogue).

Table 1: Antenatal Screening Tests

Infectious Agent	Laboratory Investigation	Purpose
Hepatitis B (HBV)	Hepatitis B surface antigen (HBsAg)	Babies born to women who have a hepatitis B infection are offered the hepatitis B vaccination at birth to reduce the risk of vertical transmission. These babies will require follow up
HIV	HIV Ag/Ab combination assay	Women who have an HIV infection are offered treatment to reduce the risk of fetal/ neonatal infection These neonates will require follow up
Syphilis *(Trepenema pallidum)*	Syphilis ELISA (combined IgG and IgM)	Women who have a confirmed syphilis infection are offered treatment to reduce the risk of fetal/ neonatal infection The neonate will require follow up

[1] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C10

Management of reactive communicable disease initial screening results

In a small number of cases, the primary laboratory test is weakly reactive, making it difficult to give a definitive result to the woman. The testing strategy is complicated by the fact that this sort of profile could occur in a recently acquired infection. In that scenario, the diagnostic tests can take up to three weeks to become a definitive result of infection. This can lead to a long potential period of confusion and anxiety for both staff and pregnant women when such results occur. In the majority of cases these are unlikely to be of any clinical significance. Antenatal Screening Wales have developed protocols, factsheets and information for women leaflets for the management of these reactive communicable disease initial screening results.

1.1 Hepatitis B

Hepatitis B is an infectious disease of the liver caused by the hepatitis B virus, resulting in both acute and chronic infection.

Mothers with HBsAg can transmit infection to their baby during the birth process. Neonates who acquire infection from their mother have a high chance of becoming long term carriers of hepatitis B and are therefore at risk of developing liver disease as adults. Twenty per cent of babies infected in infancy may develop cirrhosis or hepatocellular carcinoma in later life.

Antenatal screening for hepatitis B is offered to all pregnant women to identify infants at risk of perinatal hepatitis B infection and therefore enable a programme of active and passive vaccination for the baby after birth. This is extremely effective at reducing vertical transmission of hepatitis B.

Incubation Period	Range 45 days to 180 days Mean 60 - 90 days
Routes of Transmission	Vertically from mother to baby (peripartum) Through contact with contaminated blood products Through sexual contact Through close, prolonged household contact with an infected person
Clinical Features	Jaundice with acute infection is rare, usually asymptomatic Chronic infection can result in liver disease such as cirrhosis and liver cancer
Implications for Pregnancy	The baby can be infected during the birth process Vaccination of the baby is very successful at reducing this transmission Intrauterine infection is extremely rare
Incidence in Pregnancy (UK)	0.15% (1 - 2 per 1000 women) Varies across ethnic groups and is higher from women born in countries where disease is endemic (e.g. 67% of carriers are women born in Africa, China or South Asia)
Infection Control Precautions	Standard precautions and/ or transmission based precautions for blood and body secretions
Notifiable	Yes, acute hepatitis is notifiable at presentation Chronic hepatitis is reported through the laboratory processes

In pregnancy, women are more likely to have chronic hepatitis B infection i.e. those who remain HBsAg positive for longer than six months following acute hepatitis B infection. Samples that screen positive for HBsAg will automatically be tested for all markers for hepatitis B to determine the stage of infection. Antenatal diagnosis of hepatitis B infection is usually made by screening antenatal booking bloods for the presence of HBsAg.

Antenatal management of women found to be positive for HBsAg

- Refer for consultant led maternity care
- Only named health professionals with suitable skills and knowledge as agreed by the Health Board should give the result to the woman[2]
- For complete confirmation of sample identity, a second sample will be required[5].
- It is recommended, in order to expedite the management of women who have been newly diagnosed with hepatitis B that a sample for hepatitis B DNA is taken at the time as the confirmatory sample. A copy of the result is sent to the health board's consultant gastroenterologist/ hepatologist to whom the woman has been referred.
- A copy of the ASW information for women leaflet should be provided to the woman[2] .
- The woman should be reviewed by a hepatology/ gastroenterology team within 6 weeks of diagnosis to assess viral load and consider treatment to reduce the woman's viral load[3].
- Verbal information should be given about the importance of the baby completing a hepatitis B vaccination programme (monovalent hepatitis B vaccines are given at birth, and 1 month, and then the 6 in 1 hexavalent vaccine against diphtheria, tetanus, pertussis hepatitis B, polio and *Haemophilus influenzae* type b (hib) infection (DTaP/IPV/Hib/Hep B) at 2,3 and 4 months and monovalent hepatitis B at 12-13 months. The woman should be advised about the screening of family members, such as partners and existing children for the infection, in order that they may be referred, or vaccinated, as appropriate[4].
- In cases where the diagnosis is already known, a sample for hepatitis B DNA should be taken, with verbal consent, at the same time as the antenatal screening tests and that a copy of the result is sent to health board's consultant gastroenterologist/ hepatologist to whom the woman has been referred.
- The laboratory should inform the Health Protection Team of the confirmed positive result to enable care planning to commence[5].

Most babies only require hepatitis B vaccine at birth. Please refer to neonatal management for details of exceptions.

Intrapartum management

- Standard precautions and/or transmission based precautions should be taken for control of infection
- Caesarean delivery is not indicated
- Breastfeeding is not contraindicated
- Home delivery requires discussion[6]
- A joint care plan should be written and may require discussion with the obstetrician, paediatrician, hepatologist/ gastroenterologist and virologist[3].

---

[2] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C40

[3] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C43

[4] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C45

[5] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C41

[6] Davies EM, Lewis M (2016). All Wales Midwifery Led Guidelines 4th Ed.

Neonatal management[7,8]

- All infants born to mothers with documented hepatitis B infection should receive hepatitis B vaccination
- Neonates that are deemed at high risk of perinatal acquisition require both passive immunity with hepatitis B immunoglobulin (HBIG) and active immunity with a course of hepatitis B vaccine (accelerated course) starting at birth as per table below
- The response to the hepatitis B vaccine is slower in preterm and low birth weight infants. Therefore, babies with a birth weight lower than 1500g should receive HBIG in addition to the vaccine, regardless of the e-antigen status of the mother
- Babies born to mothers with high viral loads (≥1x10^{6}IU/ml) should be given HBIG as a precautionary measure
- The paediatrician should be informed following delivery to prescribe and administer hepatitis B vaccine and HBIG if indicated
- Hepatitis B vaccine (and HBIG, if required) should be given to the baby within the first 24 hours of life. See local policy for details on coordination and responsibility[4]
- The dose of hepatitis B vaccine varies according to the brand used, so it should be prescribed by brand name not as hepatitis B vaccine. The dose of HBIG is 200IU
- If the woman's baby is identified as requiring both hepatitis B immunoglobulin and vaccination at birth they should be given as soon as possible and within 24 hours of delivery. If both need to be given simultaneously, they should be given at the same time in separate sites. If hepatitis B immunoglobulin is not available quickly, hepatitis B vaccination should be obtained and given immediately without delay, whilst arrangements are made to obtain hepatitis B immunoglobulin
- An unscheduled vaccination form should be completed and sent to the Child Health Department after the vaccination has been given. Refer to local protocols on how this is obtained
- The baby will require five more vaccinations in the first year of life and the timing for these are at:
    - one month
    - two months (as part of routine primary infant immunisation)
    - three months (as part of routine primary infant immunisation)
    - four months (as part of routine primary infant immunisation)
    - twelve to thirteen months

The baby requires a blood test to confirm absence of infection when the primary course is complete at 12-13 months.

---

[7] Department of Health (2017), Immunisation Against Infectious Diseases – 'The Green Book'. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/628602/Greenbook_chapter_18.pdf

[8] Ramsey, R. (2008), Policy on the use of passive immunisation with hepatitis B immunoglobulin (HBIG) for infants born to Hepatitis infected mothers. London: Health Protection Agency.

Hepatitis B Status of Mother	Baby Should Receive	
	Hepatitis B Vaccine	HBIG
Mother is HBsAg positive and HBeAg positive	Yes	Yes
Mother is HBsAg positive, HBeAg negative and anti-HBe negative	Yes	Yes
Mother is HBsAg positive where e-markers have not yet been determined	Yes	Yes
Mother had acute hepatitis B during pregnancy	Yes	Yes
Mother is HBsAg positive and HBV DNA viral load level is $\geq 1x10^6$IU/ml	Yes	Yes
Mother is HBsAg positive and anti-HBe positive	Yes	No

1.2 Human Immunodeficiency Virus (HIV)

HIV is a retrovirus that attacks and destroys T-lymphocytes, resulting in immunosuppression that eventually leads to acquired immune deficiency syndrome (AIDS). Two forms of the virus have been identified: HIV-1 and HIV-2. The most common and most virulent form is HIV-1. HIV-2 is relatively uncommon in western countries.

Ninety five per cent of the total HIV positive population lives in the developing world. Over 90% of infected babies live in Sub-Saharan Africa.

Antenatal screening for HIV is offered to all pregnant women to identify infants at risk of perinatal HIV infection and offer maternal treatment and management to greatly reduce the risk of infection in the child.

Incubation Period	It is difficult to apply an incubation period for HIV infection A new infection can be detected in someone who has been exposed to HIV as early as 14 days after exposure. Infection cannot be excluded before 90 days On average it is about 4 weeks after the exposure that the symptoms of early infection (seroconversion illness) are seen (if present at all)
Routes of Transmission	Vertically from mother to baby (peripartum) Through contact with contaminated blood products Through sexual contact
Clinical Features	Usually asymptomatic Occasionally a rash and mild febrile illness at seroconversion is seen
Implications for Pregnancy	The baby can be infected during the birth process Without intervention mother to child transmission (MTCT) is 15 - 25% With intervention it is reduced to less than 1% Intrauterine infection is extremely rare
Incidence in Pregnancy (UK)	In 2014 HIV prevalence in pregnancy was 1.5 per 1000 women MTCT was diagnosed in 110 children born in UK between 2006 and 2013 (65 were born to mothers undiagnosed during pregnancy)
Infection Control Precautions	Standard precautions and/ or transmission based precautions for blood and body secretions
Notifiable	Not currently notifiable

Antenatal care

- Only named health professionals with suitable skills and knowledge, as agreed by the Health Board should give the result to the woman. Support should be sought from a member of the HIV specialist team[9]
- For complete confirmation of sample identity, a second sample will be required[10]
- A copy of the ASW information for women leaflet should be provided to the woman[9]
- The woman's care should be transferred to consultant led care (see local protocols)
- An urgent appointment within 10 working days to Integrated Sexual Health is required so that suitable treatment can be commenced promptly[11]
- An appropriate integrated care plan must be developed by the maternity services and in collaboration with Integrated Sexual Health and paediatrics and this must be documented in the hospital notes[12]. Best practice recommends that the care plan should include: a plan of care for delivery before 34 weeks; and an updated plan for delivery 34 weeks and later
- The woman will require ongoing support from a named midwife and all maternity care arrangements should be coordinated by the antenatal screening coordinator[12]
- The woman should be offered the opportunity to meet the paediatric team during pregnancy to explain care of the baby.

Intrapartum care planning

- The woman's labour plan must be documented in the hand held/ hospital notes under special considerations/ intrapartum plan of care section. This must include the treatment regime, mode of delivery and specific instructions for the individual care plan for the woman
- Breastfeeding is currently not recommended.

Elective caesarean section (EL LSCS)

- Consider admission to the maternity unit the day before EL LSCS
- When indicated intravenous (IV) zidovudine (AZT) is usually commenced at 12 midnight the night before EL LSCS and continued until the baby is born
- Oral antiretroviral drugs should be prescribed and administered as requested and documented. It is vital that the woman has this medication at the same time each day; otherwise the viral load may become detectable
- The woman should receive prescribed oral antiretroviral medication on the day of the EL LSCS.

---

9 ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C30

10 ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C31

11 ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C33

12 ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C34

Planned vaginal delivery

- If possible daily oral antiretroviral therapy (ART) should be taken as normal throughout labour. If vomiting occurs within two hours of taking medication, ensure anti-emetics are administered prior to retaking medication
- In women for whom a vaginal delivery has been recommended and labour has commenced, obstetric management should follow the same principles as for the uninfected population as per NICE guidelines for intrapartum care[13]. This includes: care of the woman with spontaneous rupture of membranes; using electronic fetal monitoring; use of fetal scalp electrodes and fetal blood sampling, for example continuous electronic fetal monitoring is therefore only required for additional obstetric implication
- If the agreed plan is to deliver vaginally and IV AZT has been identified as required in the birth plan it should be prescribed and administered as soon as possible. This is known to be most effective if given six to eight hours before delivery
- Instrumental delivery carries an increased risk of mother to child transmission and the decision to use instruments must be sanctioned by a senior member of the clinical team.

Emergency delivery

In the event of an emergency delivery:

- If AZT is indicated and the viral load is less than 1000 copies per ml, aim to start IV AZT at least two hours before delivery. Do not delay other emergency interventions to achieve this
- If viral load is greater than 1000 copies per ml a decision by a senior member of the team is required regarding priority of care.

Management of women who present in labour without a documented HIV status

These women require a risk assessment to determine if an urgent HIV test is required. This should be done in consultation with your local consultant microbiologist and requires a consultant to consultant dialogue.

Postnatal/ neonatal management

- Standard precautions and/ or transmission based precautions are recommended when taking blood samples
- There is no need for a side room, or a separate toilet, unless requested by the woman
- The baby must be referred to a paediatrician as soon as possible after delivery and within four hours of birth[14]. A paediatrician should have been part of the antenatal multi disciplinary team (MDT) and have provided birth plans for the baby. Drugs to be prescribed will be outlined in this plan and should be prescribed by the duty paediatrician within four hours of birth
- Ensure that the blood sample from the neonate and the mother are taken the next working day after delivery (see blood sample section).

---

[13] BHIVA (2014), British HIV Association Guidelines for the Management of HIV Infection in Pregnant Women 2012 (2014 interim review). HIV Medicine, 15 (Suppl. 4), 1-77

[14] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C35

Neonatal medication

- Oral zidovudine is usually prescribed twice a day for one month
- Infants who are at higher risk of becoming infected may require triple therapy. This will normally be determined prior to delivery
- On rare occasions, medicines will be altered after the results of the blood tests are known, usually between three to five days post delivery.

Use of triple ART for the infant

The paediatric team usually recommend this treatment in the following instances:

- The mother is found to be HIV infected only after the infant has delivered and the infant is less than 72 hours old
- The HIV infected mother has refused ART in pregnancy
- The HIV infected mother has had less than four weeks of ART in pregnancy, either through late booking or premature delivery
- If it is known that the mother has a detectable viraemia at delivery defined as greater than 70IU/ml
- Consideration should be given for triple therapy if the IV AZT, is not administered to the expectant mother where it was indicated, or with documented risk factors which include:
    - Preterm birth (less than 34 weeks)
    - Chorioamnionitis
    - Placental abruption.

Feeding

It is currently recommended that all babies born to HIV positive mothers are bottle fed.

Vaccinations

It is considered safe for the baby to continue the usual vaccination programme. However BCG vaccination should only be given when the infant has had three negative PCR results.

Blood Samples[15,16]

- EDTA samples are required
- These should be taken from both the mother and baby and sent together. The laboratory should be phoned to inform them that the blood samples are being sent (local protocols should be followed). Blood samples MUST be received into the laboratory before 4pm on a working day. They must not be sent on bank holidays and weekends as they cannot be processed and will therefore need to be repeated
- Ensure one of the HIV team is aware of delivery to coordinate postnatal care appointments.

---

[15] de Ruiter et al. (2008), British HIV Association and Children's HIV Association guidelines for the management of HIV infection in pregnant women, 2008. HIV Medicine. 9. pp. 452-502. Available from: http://www.bhiva.org/documents/Guidelines/Pregnancy/2012/BHIVA-Pregnancy-guidelines-update-2014.pdf

[16] HPA (2009), HIV in the United Kingdom. Found at: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/HIV/

1.3 Syphilis (Treponema Pallidum)

Syphilis is caused by a spirochete bacterium *Treponema pallidum* which if not treated promptly can result in serious short and long term morbidity.

The incidence of syphilis has been increasing over the past five years in the United Kingdom. Most cases of infectious syphilis are either acquired abroad, notably in Eastern Europe, or from men who have had sex/ are having sex with men.

Antenatal screening for syphilis should be offered to all pregnant women in Wales.

Incubation Period	10 days to 3 months (Usually 3 weeks)
Routes of Transmission	Sexual transmission Intrauterine transmission Peripartum transmission
Clinical Features	Primary infection – single genital lesion (chancre) Secondary infection – wide spread maculopapular rash with mild fever Tertiary infection – variety of presentations Latent infection – usually asymptomatic
Implications for Pregnancy	Can be transmitted across the placenta at any stage May result in: ○ Miscarriage ○ Pre-term labour ○ Stillbirth ○ Hydrops ○ Congenital syphilis
Incidence in Pregnancy (UK)	Rare in the UK Incidence of congenital syphilis was 0.025/1000 in 2011[17]
Infection Control Precautions	Standard precautions and/or transmission based precautions for blood and body secretions
Notifiable	Primary and secondary infections are notifiable to health protection teams. This is usually performed by the laboratory

[17] Public Health England (2013) Recent Epidemiology of Infectious Syphilis and Congenital Syphilis. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/336760/hpr4413_sphls.pdf

Antenatal management

Transplacental transmission can occur at any stage of pregnancy. Maternal early stage syphilis and high titre RPR/ VDRL are risk factors for congenital infection, though transmission rates of 10% have been reported in late disease. Maternal co-infection with HIV may increase the risk of transmission of syphilis. Any organ damage already caused by syphilis cannot be reversed. Careful assessment of clinical and microbiological tests must be undertaken prior to clinical advice and treatment, hence the need for early referral to Integrated Sexual Health.

All pregnant women should have been offered screening for syphilis at the initial antenatal visit. If during pregnancy, the woman changes her partner or is worried that she may have contracted HIV, hepatitis B, or syphilis, the midwife can repeat the test at any time during the pregnancy.

- If a screening sample is positive then appropriate further serological investigations will be performed on the booking blood sample. This will contribute to the information required to potentially treat the infection
- For complete confirmation of sample identity, a second sample will be required[18]
- Only health professionals with suitable skills and knowledge as agreed by the Health Board should give the result to the woman. Support should be sought from a member of the Integrated Sexual Health specialist team[19]
- Women with syphilis positive results should be referred to Integrated Sexual Health for treatment and follow up
- A copy of the ASW information for women leaflet should be provided to the woman[19]
- Follow up care and management should be planned in conjunction with the consultant obstetrician and Integrated Sexual Health and a care plan should be written in the All Wales Maternity Record with the woman's consent[20]. It is strongly recommended that paediatrics are involved in the development of the care plan
- Referral to a fetal medicine department to evaluate fetal involvement including non-immune hydrops or hepatosplenomegaly. Fetal monitoring for fetal distress in the early stages of therapy is recommended after 26 weeks gestation[20]
- The paediatrician should be informed of the confirmed maternal syphilis infection within 10 days of the woman receiving the result. This is to enable an appropriate care plan for the neonate to be developed with the woman and the maternity services. This should be recorded in the maternity notes[21].

Intrapartum care

- A caesarean section is not indicated
- Breastfeeding is not contraindicated.

[18] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C51

[19] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C50

[20] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C52

[21] ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C54

Postnatal management of mother and baby

If the care plan indicates that the baby should be tested:

- Arrangements must be in place for the baby to be reviewed by the paediatrician as soon as possible after delivery and within 4 hours of birth
- A 5ml plain tube from the mother and a neonatal sample of at least 0.5ml venous blood (not cord blood) should be taken and sent together to the laboratory. These samples need to be taken on the same day and 'linked' to ensure that the laboratory is aware of the connection, as they require testing in parallel
- Nasopharyngeal aspirate (NPA) from the neonate for syphilis PCR may also be indicated and requires discussion with the virology consultant/ microbiology consultant prior to being sent
- There is no facility to test these samples out of hours.

Most babies born to mothers who have been diagnosed and already referred to Integrated Sexual Health with confirmed syphilis early in pregnancy may not require treatment. This should be detailed in the woman's care plan.

Treatment should be considered in the following cases:

- IgM detected in neonate
- A four-fold higher titre in the neonate VDRL/ RPL compared to the mother
- Inadequately treated maternal infection
- Organisms detected in neonate's NPA sample
- Maternal infection diagnosed late in pregnancy.

When treatment is indicated for the neonate in the care plan a maternal and neonatal blood sample (clotted sample) for syphilis testing should be taken just after delivery before treatment of the baby is started[22]. In order to ensure paired samples are tested it is strongly recommended that the laboratory is contacted prior to samples being sent.

Treatment of the neonate[23,24,25]

- Treatment of the neonate should commence only after discussion with consultant paediatrician or consultant in medical microbiology or virology.
- Further investigations should include FBC, LFT and renal function. CSF analysis (cells, protein, and serology), ophthalmology review and x-ray of long bones (lesions found in up to 20% of asymptomatic and most symptomatic neonates) are also indicated.
- Treatment: Benzyl penicillin 30mg/kg BD IV if in first seven days of life and then 30mg/kg eight hourly after seven days of life. Total duration of treatment is 10 days.

---

22 ASW (2015). Policy, Standards and Protocols to Support the Provision of Antenatal Screening in Wales, Standard C55

23 Clinical Effectiveness Group (2008), UK National Guidelines on the Management of Syphilis 2008. International Journal of STD & AIDS. 19. pp. 729–740.

24 Lewis, DA et al (2006), Sexually transmitted infections: UK national screening and testing guidelines. London (UK): British Association for Sexual Health and HIV (BASHH), pp. 33–39.

25 Chakraborty, R. and Luck, S. (2008), Syphilis is on the increase: the implications for child health. Archives of Disease in Childhood. 93 (2), pp. 105–109.

Section 2: Vaccinations in Pregnancy

This section provides information about vaccines that are relevant to pregnant women and provides information on vaccinations that are recommended either in pregnancy or during the postnatal period.

In the past there has been anxiety about the use of vaccines in pregnancy. There is a theoretical concern that vaccinating pregnant women with live vaccines may infect the fetus. There is no evidence that any live vaccine (including rubella and MMR) causes birth defects. However, since the theoretical possibility of fetal infection exists, live vaccines should generally be delayed until after delivery. There is no evidence that inadvertent immunisation in pregnancy causes any abnormalities in the baby, therefore termination of pregnancy is not recommended for this reason[26].

Since inactivated vaccines cannot replicate they cannot cause infection in either the mother or the fetus. However inactivated vaccines should be administered to pregnant women only if protection is required without delay.

Hepatitis B vaccination is recommended for the neonate where the mother is known to be infected with hepatitis B. For more details on management of hepatitis B in pregnancy and in the neonate see section 1.1.

[26] Department of Health (2006), Immunisation Against Infectious Diseases – 'The Green Book'. Available from: *www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/DH_4097254*

2.1 Influenza

Influenza vaccination is recommended at all stages of pregnancy during the flu season and is offered as pregnant women are known to be at greater risk of a more severe infection with influenza A. Vaccination is to protect the mother from the infection but maternal vaccination is also 91% effective in preventing hospitalisation of infants for influenza in the first six months of life[27].

Influenza infection

Influenza is an acute viral infection of the respiratory tract caused by influenza A or B viruses. It is a seasonal virus and generally occurs during the winter months. The virus changes slightly every year. A new vaccine which protects against the circulating influenza viruses is offered every year. Every few decades the virus changes dramatically and this can cause a pandemic. The most recent pandemic occurred in 2009 with influenza A (H1N1) pdm09 viruses commonly referred to as 'swine flu'.

Incubation Period	1-3 days
Routes of Transmission	Airborne respiratory droplets or direct contact with contaminated surfaces or infected individuals
Presentation	Characterised by sudden onset of fever, chills and headache Can occasionally be asymptomatic or very mild symptoms
Implications for Pregnancy	Pregnant women are at increased risk of severe infection. Occasionally this may result in the need for intensive care treatment and rarely death Infection can result in pre term labour, low birth weight and fetal death
Incidence in Pregnancy (UK)	This is very variable as some influenza seasons are more severe than others In 2009-2012 there were 36 maternal deaths due to influenza
Infection Control Precautions	Respiratory infection control precautions should be taken for symptomatic individuals Prophylaxis is available following exposure in unvaccinated high risk groups (see also management of pregnant women section below)
Notifiable	No

[27] Benowitz I, et al. Influenza vaccine given to pregnant women reduces hospitalization due to influenza in their infants. Clin Infect Dis 2010; 51 (12):1355-61.

Influenza vaccination

- All pregnant women should receive inactivated influenza vaccine before the flu season, ideally between September and early November
- Antibody response takes approximately 14 days to reach protective levels
- The vaccine optimally provides around 60% protection[28]
- Data from worldwide use of inactivated vaccines does not indicate any adverse fetal or maternal outcomes[29]
- The inactivated influenza vaccine can be safely given throughout all stages of pregnancy
- Due to changes in circulating strains from one season to the next and waning immunity annual revaccination is necessary
- Whooping cough (pertussis) containing vaccine can be given at the same time as influenza vaccine.

Management of influenza in pregnant women

- Pregnancy (up to two weeks post partum) is a known risk factor for complicated influenza
- Use of antivirals should be considered in line with NICE guidance at any time of the year[30]. For uncomplicated influenza use oral oseltamivir 75mg twice a day for five days, ideally starting within 48 hours of onset. A discussion is required with your local microbiologist if treatment needs to be started after 48 hours[31]
- Oseltamivir and zanamivir may be used in primary care for treatment or prophylaxis of influenza like illness (ILI) in exposed, unprotected pregnant women at risk of developing medical complications from influenza when influenza virus is circulating
- If a pregnant woman has an ILI, antiviral treatment should be commenced within 48 hours of the first symptoms (36 hours for zanamivir), when influenza is circulating
- Women should be advised to:
    - Seek urgent medical attention if their respiratory condition worsens
    - Avoid contact with other susceptible individuals
    - Receive the flu vaccine to protect them against other viruses as soon as the illness has resolved.

---

28 Osterholm, MT. et al (2012) Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. Lancet Infect Dis 12. (1.), 36-44.

29 Tamma et al (2009) Safety of influenza vaccination during pregnancy. Am J, Obstet. Gynaecol. 201 (6) : 547 – 52.

30 NICE (2009) Amantadine, oseltamivir and zanamivir for the treatment of influenza. Available at: https://www.nice.org.uk/Guidance/TA168

31 Public Health England. (2015) PHE guidance on use of antiviral agents for the treatment and prophylaxis of influenza (2015-16). Version 6.0. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457735/PHE_guidance_antivirals_influenza_2015_to_2016.pdf

2.2 Pertussis (Whooping Cough)

Pertussis vaccination (as a combined vaccine dTaP/ IPV) is recommended for every pregnant woman, in each pregnancy, from 16 weeks gestation[32] and is offered to women to protect the newborn baby.

Whooping cough is caused by the bacterium *Bordetella pertussis* which can affect all ages, but is particularly severe in babies and infants in whom the characteristic inspiratory 'whoop' may occur. Most of the infant cases become ill before they are old enough to receive their first dose of vaccine.

Incubation Period	6 - 20 days Mean 10 days
Routes of Transmission	Airborne respiratory droplets or direct contact with contaminated surfaces or infected individuals
Presentation	Respiratory infection characterised by severe spasm of coughing persisting for several weeks. In infants less than one year old the cough can be minimal and apnoea may be the only symptom
Implications for Pregnancy	Pregnant women have no increased risk Pertussis in infants is a significant cause of illness and death[33]
Incidence in Pregnancy (UK)	In 2012 the highest incidence was amongst infants less than 3 months of age with 14 deaths reported in England and Wales[34]
Infection Control Precautions	Respiratory infection control precautions should be taken for symptomatic individuals
Notifiable	Yes

Pertussis vaccination in pregnancy

- Either Boostrix IPV® or Repevax® (dTaP/ IPV) vaccines, depending on availability, should be offered to all pregnant women ideally in the second trimester from 16 to 32 weeks gestation, to maximise antibody levels in the neonate, but can be given up to term
- Maternal vaccination passively protects infants, through intrauterine transfer of antibodies from birth until they can be actively protected by the routine infant vaccination programme
- Vaccination within two weeks of delivery is unlikely to allow maternal immunity to develop in time to offer passive protection to the baby[35]
- Effectiveness of maternal vaccination in preventing neonatal pertussis is 93%[36]
- Vaccination should be offered in every pregnancy
- Pertussis containing vaccine can be offered at the same time as influenza vaccine

---

[32] Welsh Government 2012 (CEM/CMO/2012/16) Temporary programme of pertusssis (whooping cough) vaccination in pregnant women. Available at http://nww.immunisation.wales.nhs.uk/policy-letters-j-to-z#Pertussis

[33] Crowcroft NS, Booy R, Harrison T et al (2003) Severe and unrecognised: Pertussis in UK Infants. Arch Dis Child 88 (9); 802-6

[34] Public Health England (2014). Laboratory confirmed Pertussis in England: data to end – October 2014. Health Protection report 8 (47).

[35] Eberhartdt CS, Blanchard-Rohner G, Lemaitre A et al, (2016) Maternal immunization earlier in pregnancy maximizes antibody transfer and expected infant serpositivity against pertussis. Clin Infect Dis. **62**(7): 829-836

[36] Amirthalingam G, Andrews N, Campbell H *et al*. (2014) Effectiveness of maternal pertussis vaccination in England: an observational study. *Lancet* **384**(9953): 1521-28

- For women who have not received the vaccine in pregnancy, pertussis-containing vaccine can be offered in the two months following birth to help prevent mother to baby transmission until their child receives their first dose of pertussis-containing vaccine
- There is no evidence of any increased risk of adverse events related to pregnancy in vaccinated mothers, including still birth[37].

Management of contact with pertussis in pregnant women

- For a woman diagnosed with pertussis in the last month of pregnancy erythromycin is recommended to prevent transmission to her infant. Use earlier in pregnancy can be considered against benefit and risk, avoidance in the first trimester is advised[38]
- Those diagnosed with pertussis should still be offered a dose of pertussis-containing vaccine from 16 weeks of pregnancy as part of the programme for all pregnant women
- If the pregnant woman is still infectious at delivery (i.e. onset within previous 21 days), the newborn infant should be offered chemoprophylaxis with clarithromycin (preferred) or azithromycin
- Because of the risk of transmission to newborn infants, any pregnant woman exposed to pertussis when she is more than 32 weeks gestation should be offered post exposure prophylaxis with erythromycin (other antibiotics not recommended) if they have not received a pertussis containing vaccine more than one week and less than five years previously[38].
- Chemoprophylaxis and vaccination is also recommended for those earlier than 32 weeks gestation if the pregnant contact is any of the following:
    - Healthcare worker who is working with infants and pregnant women
    - Someone whose work involves regular, close or prolonged contact with infants too young to be fully vaccinated
    - Someone who shares a household with an infant too young to be fully vaccinated[39]
- If the vaccine is given earlier than 16 weeks then an additional dose will be required after 16 weeks gestation.

---

[37] Donegan K, King B and Bryan P (2014) Safety of pertussis vaccination in pregnant women in UK: observational study. BMJ 349:g4219. Available at http://www.bmj.com/content/bmj/349/bmj.g4219.full.pdf.

[38] Amirthalingam G. et al (2012) HPA Guidelines for the Public Health management of pertussis. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/323098/HPA_Guidelines_for_the_Public_Health_Management_of_Pertussis_2012_PB65.01-_Oct_2012.pdf

[39] PHE (2016) Guidelines for the Public Health Management of Pertussis in England. Available at; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/538317/Guidelines_for_the_Public_Health_Management_of_Pertussis_in_England.pdf

2.3 MMR Vaccination

As a result of the measles, mumps and rubella (MMR) vaccination programme, rubella is effectively eliminated in the UK. The UK National Screening Committee (UK NSC) recommended the withdrawal of the rubella screening test in pregnancy to be replaced with the offer of MMR vaccination, either before pregnancy or postnatally, to those with no history of receiving two doses[40].

Mumps is not regarded as a cause for concern in pregnancy and as such is not mentioned further in this document. Rubella and measles are covered in detail in the section 'rashes in pregnancy'.

Ensuring women are protected against infection with rubella and measles

Before pregnancy

- Immunity to rubella can be assumed if the woman has had: two doses of a rubella containing vaccine (MMR, MR or rubella); one dose of MMR and a rubella specific antibody level greater than 10IU/ml; two rubella specific antibody levels greater than 10IU/ml; or has previously had a confirmed rubella infection
- Immunity to measles can be assumed in women born before 1970. Women who have a documented history of two doses of a measles containing vaccine (MMR or MR) or a strong history of measles should be regarded as immune
- If a woman is not sure of her immunisation history she should check with her GP
- Women, without a history of two doses of a rubella containing vaccine, should be offered two doses of MMR with a four week interval between the first and second vaccination
- Women should be advised to avoid getting pregnant for at least one month after completion of the vaccines because it is a live vaccine.

In pregnancy

- If a woman is currently pregnant and does not know if she has had two doses of MMR then she should check with her GP and be advised to have outstanding MMR vaccines at the GP surgery after the baby is born
- There is no contraindication to breastfeeding following MMR vaccination.

MMR postpartum

- Women susceptible to rubella with no history of MMR should be offered two MMR vaccinations post delivery.

[40] UK National Screening Committee (2012). Rubella Susceptibility Screening in Pregnancy Policy Position Statement. Available at http://legacy.screening.nhs.uk/rubellasusceptibility

Section 3: Rashes

(Including contact with rashes in pregnancy)

This section deals with viral infections that present with rashes and are of concern in pregnancy. HIV, secondary syphilis and rarely cytomegalovirus (CMV) may present with maculopapular rashes but are covered elsewhere within this guidance. Herpes simplex virus (HSV) is also covered separately.

It is important to remember that there are bacterial causes of rashes such as meningococcal disease which should always be considered as they are life threatening.

The guidance is aimed at healthy pregnant women, guidance in immunosuppressed individuals may be different and require specialist advice.

A multitude of viral infections not covered in this guidance may present with a rash where no specific clinical implications in pregnancy have been identified.

There are two main groups of women where there would be concerns in pregnancy regarding rashes:

- Contact with infectious rash
- Development of a rash caused by an infection

It is important to determine which of these two categories is relevant as the investigation and management will be different for each.

3.1 Description of Rashes

Rashes are broadly broken up into two categories. These are maculopapular rashes and vesicular rashes. It is often impossible to distinguish the viral infections on the basis of rashes alone.

Maculopapular rashes

Macule means 'spot' and papule means 'little bump'. Generally this term is used to describe uniform, small, red spots on the skin which may feel slightly 'bumpy' to touch.

Maculopapular rashes are seen in:

- Rubella (German measles)
- Parvovirus B19
- Measles
- Enterovirus infections.

Vesicular rashes

Vesicular rashes are described as small blisters. They are raised and have fluid filled vesicles.

Vesicular rashes are seen in:

- Chickenpox – all over the body
- Shingles (herpes zoster) – localised
- Herpes simplex – localised to mouth or genital regions
- Hand, foot and mouth (enterovirus) – localised to hands, feet and mouth and occasionally knees.

3.2 General Management of Contact with Rashes in Pregnancy

Once a woman reports contact with a rash, it is important to determine whether this contact was with a maculopapular rash or a vesicular rash. This will be determined by the history and description of the rash. It is unusual not to be able to make this distinction.

Information that is required to inform management is:

- The nature of the rash i.e. vesicular or maculopapular
- The date of last contact with the rash
- The nature of contact with the rash (same room for more than 15 minutes, household contact, conversation with a person with a rash)
- The duration of contact with the person with the rash
- The gestation of the pregnancy
- Previous history of infection with rubella, measles, parvovirus, chickenpox etc
- Vaccination history (rubella, measles and chickenpox).

Once an accurate history is obtained, a clotted blood sample should be sent for testing or alternatively the laboratory can be asked to test the booking blood if it is available.

If it is not possible to obtain a more specific diagnosis for the rash to which the pregnant woman has been exposed:

- Women who have been in contact with a person with a **maculopapular rash** should have diagnostic tests to look for both immunity and current infection with measles, parvovirus and rubella
- Women who have been in contact with a person with a **vesicular rash** should have a diagnostic test for immunity to chickenpox.

The flow chart on page 39 is a useful summary for suggested management of exposure to a rash.

3.3 Chickenpox (Varicella Zoster Virus)[41, 42, 43]

Varicella zoster virus (VZV) causes chickenpox as a primary infection. VZV is a herpes virus and as such can reactivate. Shingles (herpes zoster) is a reactivation of latent VZV virus. Shingles cannot be caught following contact with chickenpox (or shingles). However susceptible individuals can catch chickenpox from exposed shingles lesions on rare occasions. Exposed shingles is much less contagious than chickenpox and covered 'shingle' lesions pose no threat to pregnant women.

Maternal shingles carries no risk to the fetus or the neonate.

Incubation Period	7 - 24 days Mean 14 days
Routes of Transmission	Highly contagious airborne respiratory droplets or direct contact with infected individuals Individuals are regarded as infectious 48 hours prior to the onset of the rash until the rash has crusted over usually 5 days after rash onset date
Presentation	Widespread vesicular rash usually starts on the face. Lesions tend to crop A prodrome (mild fever and constitutional symptoms) may be seen 48 hours before the rash develops
Implications for Pregnancy	Chickenpox infection can have consequences for the mother, fetus and neonate Details are given below
Incidence in Pregnancy (UK)	The incidence is uncertain but is estimated to be 2 - 3 per 1000 pregnancies
Infection Control Precautions	Chickenpox is highly infectious and has a 90% transmission rate to susceptible contacts in a household setting Respiratory precautions are required and infected individuals should be isolated
Notifiable	No

Management of pregnant women exposed to chickenpox during pregnancy (contact with rashes)

This is summarised in the flow chart on page 40.

[41] Royal College of Obstetricians and Gynaecologists (2007), Chicken Pox in Pregnancy. Green Top Guideline No. 13. RCOG: London.

[42] Department of Health (2006), Immunisation Against Infectious Diseases – 'The Green Book'. Available at: *www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/DH_4097254*

[43] Public Health England (2016) Guidance on Viral Rash in Pregnancy. Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

Determine the nature of the contact

The definition of contact with chickenpox is:

- A household member has chickenpox
- Face-to-face conversation with a person with chickenpox
- Being in the same room as a person with chickenpox for at least 15 minutes.

Determine the timing of the contact

- The person with chickenpox is infectious for 48 hours before the onset of the rash and until the lesions have crusted over (usually five days)
- In order to prevent maternal infection the contact should have been within the last 10 days. Women who have been in contact with chickenpox within 10 days should be advised that there is an opportunity to offer treatment to either prevent or reduce the symptoms of infection.

Determine the maternal immunity status

- A good past maternal history of chicken pox, shingles or documented VZV vaccination requires no further action. Reassurance should be given to the woman that she is regarded as being immune

  Caution: A history of chickenpox has been shown to be a less reliable predictor of immunity in individuals who were born and raised abroad

- No history or uncertain past history of chickenpox, shingles etc:
  - Check for the presence of maternal IgG
  - Previously stored samples such as booking blood samples should be used if available
  - The laboratory should be contacted to request urgent testing
- If VZV IgG is absent varicella zoster immune globulin (VZIG) should be considered
- VZIG is available via the consultant virologist/ microbiologist and can only be made available following discussion
- Out of hours contact the consultant virologist/ microbiologist to determine if out of hours testing is indicated.

What is varicella zoster immune globulin (VZIG)?

VZIG is a blood product currently prepared in America. VZIG will not prevent infection, but should reduce the severity of maternal infection, if given within 10 days of the contact. This is believed to reduce the risk of adverse events relating to chickenpox in pregnancy.

Management of pregnant women exposed to shingles during pregnancy

It is unusual to offer any prophylaxis for contact with shingles. This may occasionally be warranted if the pregnant woman has:

- Significant exposure to exposed lesions
- Been dressing lesions and/ or is the primary carer of an individual suffering with shingles
- Prolonged exposure to severely immunocompromised individual with shingles.

Management of pregnant women with suspected chickenpox

Women who are suspected as having a rash caused by chickenpox should have a throat swab and swab from the lesion taken to look for the presence of viral DNA. A red topped dry swab is required for this investigation. Charcoal swabs cannot be used and will be discarded as they inhibit the molecular assay.

If the rash has already crusted a serum sample should be taken for VZV IgG and IgM. This should be tested with the booking blood when possible to demonstrate a sero-conversion from VZV IgG negative to VZV IgG positive. IgM in isolation is not considered diagnostic of recent infection.

Management of infected women with confirmed chickenpox in pregnancy

Chickenpox (primary VZV infection) can cause complications in pregnant women, the fetus and the neonate.

Complications for pregnant woman

Pregnant women are at risk of more severe infection and complications such as:

- Pneumonia (up to 10% if smokers)
- Hepatitis
- Encephalitis
- Death (mortality rate less than 1%)

Management of pregnant woman with chickenpox

- VZIG is not recommended in the management of women who present with chickenpox
- Acyclovir should be offered if the women presents within 24 hours of the onset of the rash (this includes women who have received VZIG)
- The woman should be advised to avoid contact with other susceptible individuals
- The woman should be advised to seek urgent medical attention if she develops:
    - Breathlessness
    - Confusion
    - A haemorrhagic rash.

The presence of any of these symptoms above indicates severe infection and the need for assessment and admission to hospital for antiviral therapy.

Woman who have had confirmed infection with chickenpox should be referred to fetal medicine in order that any additional investigations can be undertaken and appropriate follow up during the pregnancy offered.

Consequences for the fetus

Following infection during pregnancy there is a small risk that the fetus will develop fetal varicella syndrome (FVS). The fetus is at greatest risk if maternal infection occurs before 20 weeks gestation. FVS occurs in less than 2% of pregnancies with maternal chickenpox before 20 weeks gestation. There is some controversy as to whether there remains a small risk to the fetus up to 28 weeks gestation.

The fetus can present with abnormalities such as:

- Skin scarring in dermatome distribution
- Eye defects
- Limb hypoplasia
- Neurological abnormalities.

Consequences for the neonate

- Babies born to mothers who have contracted chickenpox around the time of delivery are at high risk of developing neonatal varicella. This carries a mortality of 30% if untreated
- Public Health England guidance states that babies born to mothers who have contracted chickenpox within 7 days of delivery or 7 days following delivery should receive prophylaxis[44]. Therefore urgent advice from a microbiologist/ virologist should be sought regarding prophylaxis or treatment for the neonate in these circumstances.

Update- December 2019
In response to a significant shortage of VZIG in 2018 and a review by Public Health England (PHE) updated guidelines on post exposure prophylaxis (PEP) for high risk contacts have been published in June 2019.
VZIG is recommended for:

- *Women who are susceptible to varicella and exposed in the first 20 weeks of pregnancy. For women exposed from 20 weeks, antiviral agents or VZIG can be used. Antiviral agents are recommended for post-exposure prophylaxis for immunosuppressed individuals.*
- *Young babies susceptible to varicella in their first week of life.*

Advice regarding contact with chickenpox/ shingles in pregnancy and access to VZIG is available via the consultant virologist/ microbiologist. VZIG will only be made available with agreement from your local microbiologist.
See the detailed guide 'Updated guidelines on post exposure prophylaxis (PEP) for varicella/shingles (PHE June 2019) for the latest information[45].

[44] Department of Health (2006), Immunisation Against Infectious Diseases – 'The Green Book'. Available at: www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/DH_4097254

[45] Public Health England Updated guidelines on post exposure prophylaxis (PEP) for varicella/shingles June 2019 https://www.gov.uk/government/publications/varicella-zoster-immunoglobulin

3.4 Hand, Foot and Mouth Disease/ Enterovirus[46]

Hand, foot and mouth disease is only one clinical presentation of a spectrum of diseases associated with enterovirus. Specific information about hand, foot and mouth disease is detailed in the table below.

Incubation Period	3 - 5 days
Routes of Transmission	Direct contact with nasal secretions and faeces from infected individuals
Presentation	Usually presents with vesicular lesion in the mouth and on the palms of the hands and soles of the feet. The lesions may also be present on the buttocks and the knees Often present with mild constitutional symptoms
Implications for Pregnancy	There is no recognised adverse consequence for this infection in pregnancy
Incidence in Pregnancy (UK)	Difficult to determine It is a common infection in childhood
Infection Control Precautions	Proper and frequent hand washing, particularly when changing nappies and before eating is recommended throughout pregnancy
Notifiable	No

Other enterovirus infections, including Coxsackie virus groups A and B, echovirus and enterovirus 68 - 71 may have a wide range of manifestations. More than 90% of manifestations (excluding polio) are either asymptomatic or cause a non-specific febrile illness. Other manifestations may include meningitis, encephalitis, respiratory illness, myocarditis and haemorrhagic conjunctivitis as well as a spectrum of rashes (exanthema) described below. Sporadic enterovirus infection is not uncommon, but major summer epidemics have not been seen in the UK for some years. Except for poliovirus, no vaccines are available.

Rashes caused by enterovirus can be maculopapular rashes (which may mimic rubella) roseoliform rashes. These typically occur as symptoms of the associated infection begin to disappear. They may also present as vesicular blistering rashes, commonly known as hand, foot and mouth disease and these may resemble chickenpox or herpes simplex.

Experienced clinicians should be able to distinguish the vesicular presentations of enterovirus, chickenpox and herpetic gingivostomatitis (primary oral herpes infection). The chickenpox rash rarely involves the oral cavity or palms of the hands and tends to be distributed over all of the body (as opposed to predominantly hands and feet). Herpetic gingivostomatitis will tend to make the patient more markedly unwell and is associated with cervical lymphadenopathy.

[46] Public Health England (2016) *Guidance on Viral Rash in Pregnancy.* Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

Vertical transmission of enterovirus has been documented in pregnancy. There is some evidence of an increased rate of adverse fetal outcomes following Coxsackie virus infection during pregnancy (including neonatal hepatitis and intrauterine death) but there is no clear causal relationship. There are no known treatments or preventative strategies. Infection of the neonate may be severe, especially for babies at risk of severe infection (e.g. preterm, low birth weight, concurrent illness). Immunoglobulin has been used as a therapeutic agent, without direct evidence of clinical efficacy. The Public Health England guidelines recommend seeking specialist advice. In Wales this would be accessed via your local consultant microbiologist.

3.5 Measles[47, 48]

Measles is by far the most severe of the common childhood viral infections. Measles used to be very rare in the UK, but as a result of unfounded anxiety surrounding MMR vaccine the uptake was reduced and as a result measles has become more prominent again. A previous history of measles, or a history of two doses of vaccination with MMR, makes measles an unlikely diagnosis. Seroprevalence studies indicate that less than 1% of individuals born before 1970 and less than 10% of individuals born after 1970 are susceptible to measles.

Measles is highly infectious, but the clinical diagnosis of measles is difficult due to the relative rarity of the infection. If measles is suspected on clinical grounds this must be discussed with your local health protection team to ensure prompt investigation of cases.

Incubation Period	8 - 14 days
Routes of Transmission	Measles is highly contagious and spread by airborne respiratory droplets or direct contact with contaminated surfaces or infected individuals Individuals are regarded as infectious 4 days prior to the onset of the rash until 4 days after the rash appears
Presentation	Measles classically presents with: • Maculopapular rash • Coryza • Conjunctivitis • Fever Generally children are unwell if they have measles
Implications for Pregnancy	There is no evidence to support an association with congenital infection and fetal damage directly from measles infection Maternal infection can be severe, which may result in complications, which include fetal loss or preterm delivery
Incidence in Pregnancy (UK)	Incidence of infection in pregnancy is rare in the UK in the absence of measles outbreaks
Infection Control Precautions	Measles is highly infectious and respiratory precautions should be taken and patients isolated on clinical suspicion
Notifiable	Yes this is notifiable on clinical suspicion

47 Department of Health (2006), Immunisation Against Infectious Diseases – 'The Green Book'. Available at: www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/DH_4097254

48 Public Health England (2016) Guidance on Viral Rash in Pregnancy. Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

Management of pregnant woman exposed to measles (contact with maculopapular rash)

- Women who have been exposed to measles should have their immunity to measles infection reviewed. Women born before 1970, or who have a documented history of two doses of MMR vaccination or a strong history of measles should be regarded as immune
- If required the presence of measles IgG can be looked for in a blood sample. This investigation can be performed on either a fresh sample or the booking blood sample
- Women who are found to be susceptible to measles can be offered human normal immunoglobulin (HNIG)
- The purpose of this blood product is to try and attenuate maternal infection. Ideally it should be given by intramuscular injection within 72 hours of contact, but may be of benefit up to six days after exposure
- Supplies of HNIG are limited and can only be obtained from the Health Protection Agency (HPA) in London. HNIG is a blood product and therefore should only be offered appropriately. Discussion with a local microbiologist, virologist or health protection team is essential to determine the urgency for testing for maternal immunity (IgG) and to undertake a full risk assessment of the contact.

See flow chart on page 39.

Management of pregnant women with suspected measles

- If a woman is suspected of having measles infection during pregnancy, this should be discussed with the local health protection team in order for an appropriate risk assessment to be made and any investigations performed in a timely manner
- Urgent testing for measles can only be offered if instigated via health protection teams
- If the risk assessment indicates that non urgent testing is required a current sample will be tested in conjunction with the booking blood.

Management of pregnant women with confirmed measles

- Pregnant women with measles are at greater risk of the complications of measles. There is no specific treatment for measles. There is no associated congenital abnormality but follow up of the infant should be considered
- Women may require admission to hospital and should be isolated from admission e.g. will require a side room
- Babies born to mothers in whom the rash appears six days prior to delivery or within six days of birth should also be offered HNIG (currently recommended dose is 0.6ml/kg of subcutaneous normal immunoglobulin up to a maximum of one vial). This is only available via the health protection teams.

3.6 Parvovirus B19[49, 50]

Parvovirus B19 is a virus that only affects humans. It is also known as erythrovirus, fifth disease, slapped cheek or erythema infectiosum. It is thought that 60% of all adults in the UK have been infected with parvovirus B19 and are therefore immune.

Every three to four years there is an increased incidence of parvovirus infection mostly in school children. Routine antenatal screening is not recommended as there is no vaccine or prophylaxis available.

Incubation Period	4 - 20 days
Routes of Transmission	Airborne respiratory droplets or direct contact with contaminated surfaces or infected individuals Individuals are regarded as infectious 7-10 days before rash At the time of the rash individuals are not usually infectious
Presentation	Adults are often asymptomatic or they can present with a non specific illness, rash and/ or arthralgia Children often present with red cheeks and/ or a fine lacey rash particularly after a bath
Implications for Pregnancy	Infection in the first 20 weeks can lead to a 9% increase of fetal loss There is also a 3% risk of hydrops if maternal infection is acquired between 9 - 20 weeks gestation Congenital abnormality and fetal anaemia are extremely rare
Incidence in Pregnancy (UK)	Incidence of infection in pregnancy is estimated to be 1 in 400 There is a 50% risk of transplacental transmission if the mother is infected in pregnancy
Infection Control Precautions	At the time of the rash women are no longer regarded as being infectious
Notifiable	No

Management of pregnant woman exposed to parvovirus (contact with maculopapular rash)

Women who have been exposed to parvovirus should have their immunity to parvovirus infection determined. This can be performed on either a fresh sample or the booking blood sample. Women who are found to be susceptible to parvovirus infection should have a follow up sample taken 28 days later to look for any serological evidence of recent infection. See flow chart on page 39.

[49] Crowcroft NS et al. (1999). Guidance on the control of parvovirus B19 infection in healthcare settings and the community. J Public Health Med. 1999 Dec;21(4):439-46

[50] Public Health England (2016) Guidance on Viral Rash in Pregnancy. Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

Management of women with suspected parvovirus infection

If a woman is suspected of having parvovirus a blood sample should be sent and compared with booking blood where possible. A risk assessment based on her exposure to the rash and clinical characteristics of the illness should be made. Diagnosis cannot be made based on the presence of a single positive IgM and should be confirmed by demonstrating sero-conversion during pregnancy or the presence of viral DNA in the blood sample.

Management of women with confirmed parvovirus infection

Women found to have been recently infected with parvovirus should have regular ultrasound scans (as per local guidance) for 12 weeks following the confirmation of infection to look for early signs of hydrops or fetal anaemia. Referral to a fetal medicine unit should be made if the ultrasound scans identify the early sign of hydrops.

3.7 Rubella[51, 52]

Rubella is normally a mild infection in children. If the infection is acquired in pregnancy, particularly if it is a primary infection in the first 16 weeks of pregnancy, the consequences for the fetus of congenital rubella syndrome (CRS) can be severe. CRS is more likely if the infection is in the first trimester of pregnancy. CRS can cause abnormalities including cataracts and eye defects, deafness, cardiac abnormalities, microcephaly, intrauterine growth restriction (IUGR) and inflammatory lesions of the brain, liver and lungs.

There were three reported CRS births between January 2014 and March 2015 in the UK, following two years without any confirmed cases[53]. Reported cases tend to be women born abroad who were not immunised as children and the women themselves have often acquired infection abroad.
The epidemiology of rubella infection changed dramatically following vaccination, currently via the MMR. Since the early 1990s rubella has largely affected young adult males with only a few cases confirmed in pregnant women and a significant proportion of all cases being in people from endemic areas of the world.

Incubation Period	14 - 21 days with a mean of 17 days
Routes of Transmission	Respiratory droplets or direct contact with contaminated surfaces or infected individuals Individuals are regarded as infectious 7 days prior to the onset of the rash until 4 days after rash appears
Presentation	Usually mild or asymptomatic in adults Low grade fever and rash with occipital lymphadenopathy Arthritis and arthralgia have also been reported post infection sometimes chronically
Implications for Pregnancy	Infection in the mother is mild and self limiting The unborn baby is at risk of developing CRS. This causes severe abnormality. The risk of CRS is related to the timing of the primary maternal infection • Less than 10 weeks: 80 – 90% • 11 – 16 weeks: 10 – 20% • 16 – 20 weeks: 20% (deafness) • Greater than 20 weeks: less than 1%
Incidence in Pregnancy (UK)	Infection with rubella in the UK is extremely rare
Infection Control Precautions	Respiratory infection control precautions should be taken for symptomatic individuals
Notifiable	Yes

51 Department of Health (2006), Immunisation Against Infectious Diseases – 'The Green Book'. Available at: www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/DH_4097254

52 Public Health England (2016) Guidance on Viral Rash in Pregnancy. Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

53 British Paediatric Surveillance Unit (BPSU). Annual Report 2014 – 2015.Avaiable at http://www.rcpch.ac.uk/improving-child-health/research-and-surveillance/british-paediatric-surveillance-unit/publications

Consequence of re-infection with rubella during pregnancy

Rubella re-infection is defined as rubella infection in someone who has previously had either documented natural rubella virus infection or successful rubella immunisation. It is rarely diagnosed. Re-infection is usually subclinical and diagnosed by changes in antibody concentration. The risk to the fetus of subclinical maternal re-infection in the first 16 weeks gestation has not been precisely determined, but an overview would suggest the risk of congenital damage is less than 10% and probably less than 5%.

Management of pregnant woman exposed to rubella (contact with maculopapular rash)

- Women who have been exposed to rubella should have their immunity to rubella infection reviewed. Immunity can be assumed if the woman has a confirmed history of either: two doses of MMR, one dose of MMR and a rubella specific antibody level greater than 10IU/ml, or two rubella specific antibody levels greater than 10IU/ml
- If required the presence of rubella IgG can be looked for in a blood sample. This investigation can be performed on either a fresh sample or the booking blood sample
- If immunity cannot be established or the IgG is absent a repeat sample should be sent after one month looking for evidence of sero-conversion.

See flow chart on page 39.

Management of pregnant women with suspected rubella

If a woman is suspected of having rubella a blood sample should be sent at presentation and compared with booking blood where possible. Note that a rubella IgG in the absence of IgM does not exclude rubella as a cause of the woman's symptoms if there has been a delay in testing. The risk assessment should take into account vaccination, community cases of rubella and clinical characteristics of the illness. Diagnosis cannot be made on the presence of a single positive IgM and should be confirmed either by demonstrating sero-conversion during pregnancy or with avidity testing (strength of binding of specific IgG). IgG binding is weak if the sample is taken within a few weeks of a primary infection (low avidity) but matures over weeks/ months to become more strongly bound (high avidity) if the infection occurs six months or more before the sample was taken.

Management of pregnant women with confirmed rubella

If a woman is confirmed as having rubella infection during pregnancy referral to a Fetal Medicine unit should be considered in order that any relevant investigations can be undertaken and that the woman can discuss the management of the pregnancy following the results of those additional investigations.

3.8 Streptococcal Disease/ Group A Streptococcus/ Scarlet Fever[54]

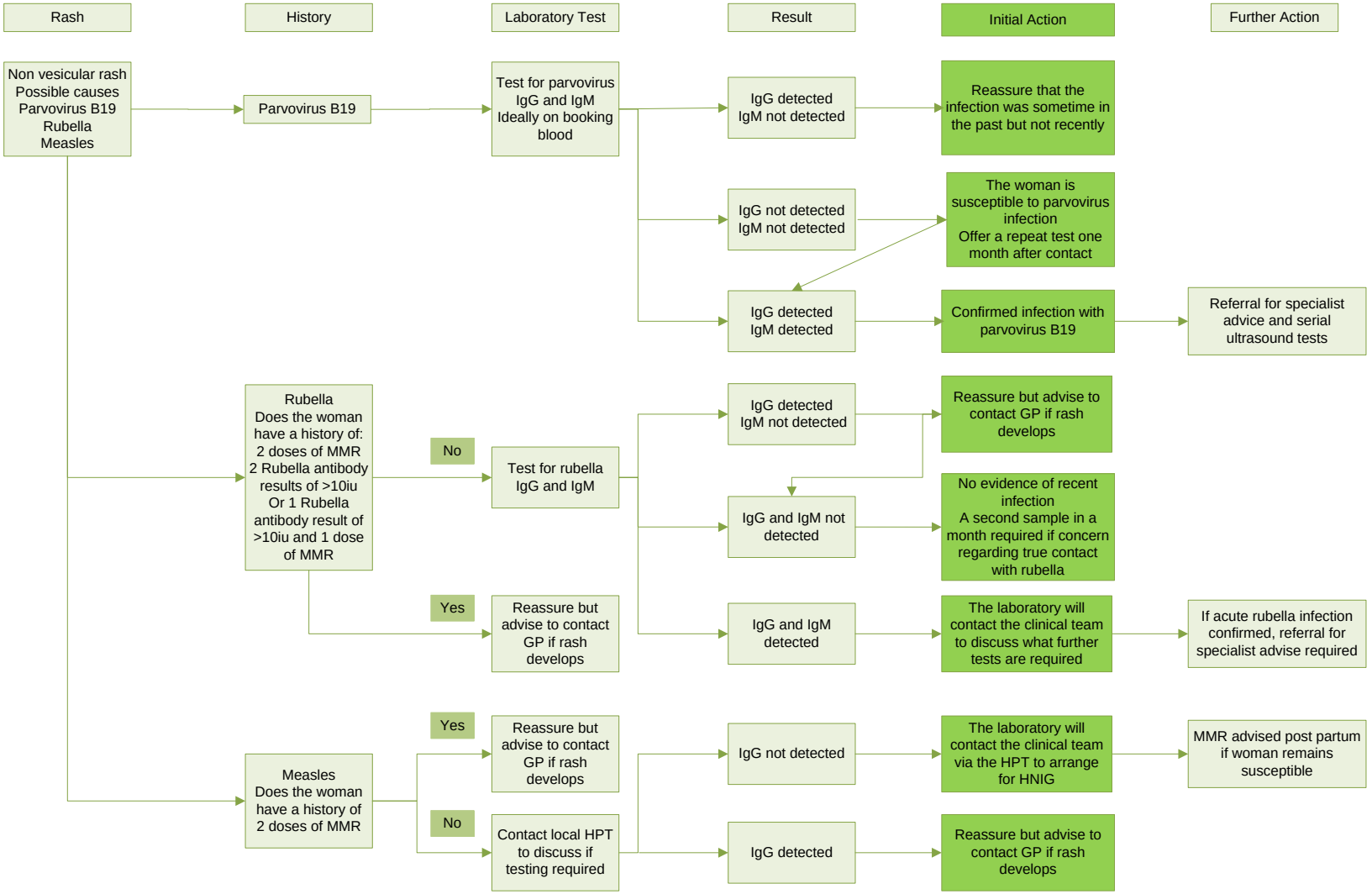
Scarlet fever is an acute bacterial infection caused by toxigenic strains of the bacteria *Streptococcus pyogenes/* group A streptococcus.

Routine testing is not available. There is no vaccine and prophylactic treatment for contacts is not routinely recommended (including pregnant contacts). The advice for pregnant women exposed to a case of scarlet fever therefore would be to monitor and treat if symptoms develop.

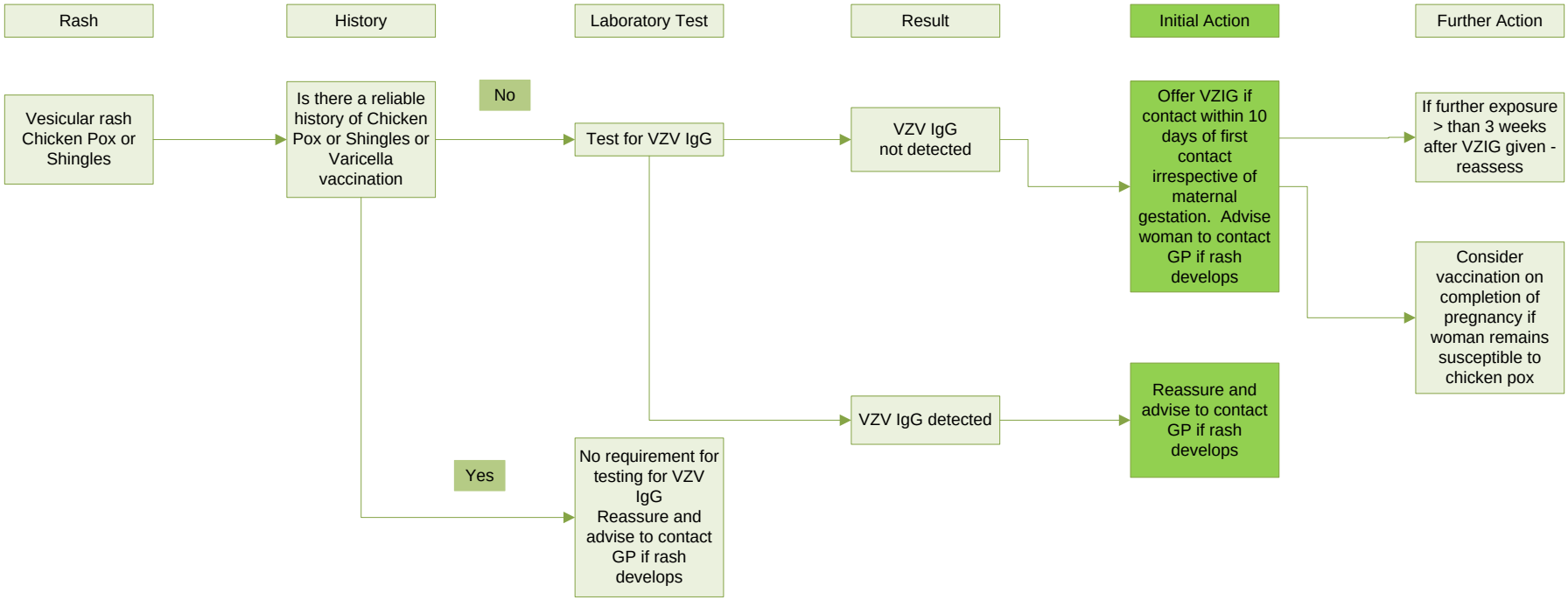
Incubation Period	Range 1 - 7 days, with a mean of 2 - 5 days
Routes of Transmission	Contact with respiratory droplets from an infected individual
Presentation	Fine erythematous blanching rash (like sandpaper) on the neck and torso Can be accompanied by high fever, exudative tonsillitis and desquamation of the hands and toes Usually self limiting
Implications for Pregnancy	There are no known implications for scarlet fever in pregnancy
Incidence in Pregnancy (UK)	Unknown
Infection Control Precautions	Respiratory infection control precautions should be taken for symptomatic individuals admitted to hospital Individuals can remain infectious for up to 2 weeks if untreated, but are regarded as non infectious 24 hours after appropriate antibiotics have been started (penicillin/ cephalosporins)
Notifiable	Yes

[54] Public Health England (2016) Guidance on Viral Rash in Pregnancy. Available at: https://www.gov.uk/government/publications/viral-rash-in-pregnancy

Algorithm for the follow up of women exposed to an infectious cause for a macular papular rash in pregnancy



Algorithm for the follow up of women exposed to an infectious cause for a vesicular rash in pregnancy



Section 4: Abnormal Antenatal Ultrasound Findings and Serological Testing

Women are offered two ultrasound scans in pregnancy; the first is usually between 11 and 14 weeks and the second, the anomaly scan, is at 18 to 20 weeks. While most abnormalities are because of a structural or genetic cause some abnormalities can have an infectious cause.

In order to ensure that women have equitable care the table below highlights common abnormalities seen on ultrasound scan and summarises the infections that are thought to be associated with these abnormalities.

The table has been updated following the recent review by Antenatal Screening Wales and CARIS looking at the presence of, and the outcome for, abnormal ultrasound findings. It is important that women across Wales receive consistency in the management of these abnormalities.

In order to ensure that reference laboratory tests are accessible when required we would recommend that serological tests performed on the maternal screening blood sample and compared with a current sample are used to guide the use of more invasive and expensive investigations.

For the most accurate diagnosis, obtaining the maternal history and vaccination history, are essential and will provide information regarding likely causes.

Serological tests can be requested and completed prior to referral to a specialist unit but a full discussion with the woman is required.

Dialogue between laboratory and clinical staff is encouraged in complex cases, to ensure that any new and emerging tests are made available when appropriate and that the limitation of these tests can be discussed in the context of the history.

A summary of the limitations of tests currently available follows the table.

Specific serological investigation on maternal serum (booking and current sample) following the detection of fetal abnormality diagnosed by the 18 - 20 weeks fetal anomaly ultrasound scan (ASW guidelines)

	Rubella**	CMV	Toxoplasmosis	Parvovirus	Syphilis†	VZV††
Severe fetal growth (SFG) restriction <5th centile	Yes	Yes	Yes	No	Yes†	Yes
Microcephaly∞ head circumference <5th centile	Yes	Yes	Yes	No	No	Yes
Ventriculomegaly*	Yes	Yes	Yes	No	No	No
Echogenic Bowel*	No	Yes	No	No	No	No
Intra-cranial/ Liver calcification	No	Yes	Yes	No	No	No
Structural cardiac abnormality (associated with congenital rubella syndrome e.g. branch pulmonary artery stenosis and patent ductus arterious)	Yes	No	No	No	No	No
Non immune hydrops	No	Yes	No	Yes	Yes †	No
Multiple abnormalities	Yes	Yes	Yes	No	No	Yes
Limb contraction/ skin contraction due to scarring	No	No	No	No	No	Yes

Yes = consider investigating for. No = investigations not indicated.

** Determine history of MMR vaccination and any previous test results in earlier pregnancies – MMR vaccination is not indicated in pregnancy but should be given post partum if indicated.

† Compare with booking blood results. Also consider repeat tests for communicable diseases performed at booking if risk factors, particularly HIV

†† Consider if a recent history of chickenpox (during or immediately prior to pregnancy)

∞ Ensure a travel history which included partners travel history for 3 months prior to and duration of pregnancy. Discuss with local microbiologist any additional tests which may be indicated as a result of travel history

* Tests required as per ASW pathways for ultrasound observations to be implemented in 2016 - 2017

Additional investigations should be considered in the following:	Rubella**	CMV	Toxoplasmosis	Parvovirus	Syphilis†	VZV††
Fetal death at >24 weeks gestation[55] - fetal demise viral screen (FDVS)	Yes	Yes	Yes	Yes	Yes	Yes
Severe fetal growth restriction (diagnosed by ultrasound) warranting investigation diagnosed after the 18 - 20 anomaly scan	Yes	Yes	Yes	No	Yes†	Yes

There is insufficient evidence to, or no proven association with, an infectious cause for the ultrasound anomalies listed below.

- Raised nuchal measurement
- Nuchal thickening greater than 6.1mm at 18 - 22 weeks
- Cystic hygroma
- Oligohydramnios
- Polyhydramnios
- Recurrent miscarriage

Investigations for infectious causes will not be routinely tested without discussion.

[55] RCOG (2010). Late intrauterine Fetal Death and Stillbirth Green–top Guideline No. 55. Available at: https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg55/

General guidance on laboratory investigations in pregnancy

The results of laboratory tests on pregnant women may be relevant to the mother only, have implication for the fetus only or be relevant to both mother and fetus.

It is often a complex situation and requires knowledge about the limitations of the various tests in a field that is rapidly changing and improving.

The following aims to try and inform the clinical teams about the limitations and interpretations of the various tests and the relevance to each individual within the pregnancy.

Principles of targeted investigations

Maternal serological investigations provide information that relates predominantly to the woman. The value of maternal investigations is to identify recent maternal infections thereby allowing more targeted investigations of the neonate or fetus.

Investigations for fetal infection will require invasive samples such as amniotic fluid, chorionic villus sampling (CVS) or fetal blood. These investigations carry a risk of miscarriage and also may be expensive and only available from reference laboratory services. It is helpful to exclude maternal infections by serological testing of the mother. Fetal samples can then be properly focused and sent appropriately to the reference facilities.

Serological investigations of the neonate also require careful interpretation due to the presence of passive maternal IgG and the inability of many neonates to make IgM antibodies in early life.

Interpretation of test results

IgG: This antibody is often present when an individual has had an infection in the past.
In pregnancy it is often used as a marker of immunity, for example chickenpox.

It is not useful in determining when that infection occurred and IgG is not always present in very early infection i.e. at the time of the rash or symptoms.

The absence of this marker in pregnancy in the presence of fetal abnormality excludes that infection as being the cause of the abnormality. For example, in echogenic bowel if the maternal blood is CMV IgG negative, then CMV is not the cause for the echogenic bowel.

IgG is passively transferred from mother to baby after 28 weeks gestation and so results in the neonate should be viewed with caution.

The most effective way to demonstrate that an infection has occurred during that pregnancy is to look for changes in maternal IgG status between the booking blood sample and a later sample.

IgM: This antibody is produced when a recent infection has occurred. It persists for at least a month but usually longer. It usually develops several days after the symptoms as with IgG. It can, however, be detected when latent infections re-activate, such as CMV or VZV (chickenpox/ shingles).

It should be regarded as a marker of current, recent infection or active infection but as it is a large molecule, non specific reactivity can occur resulting in false positive results. At least 1/3 of neonates will not produce IgM, leading to false negative results.

The detection of IgM usually indicates the need for further investigations.

Avidity tests: These can be used to try and demonstrate that an infection has occurred recently. It looks at the strength of binding of antibody to the infective agent. In early infections an antibody binds weakly and is easily displaced, giving rise to weak avidity.

Avidity testing is available for CMV and rubella

Molecular investigations: These are commonly referred to as PCR, nucleic acid amplification test (NAAT) or molecular tests. Molecular tests look for presence of DNA or RNA from the infectious agent, these indicate that the infection is acute or ongoing.

These tests are very specific and have to be targeted. It is important to know what infections have been excluded by maternal serological tests. Tests for CMV, VZV and HSV are readily available in Wales. If any other tests are required they will need to be discussed with your local microbiologist/ virologist.

Molecular tests can be performed on a number of different sample types such as amniotic fluid, urine, EDTA blood, faecal samples and dry swabs.

Common sample types

Blood samples: Many of the investigations requested by the laboratory are blood samples. As general rule immunity screens and antenatal samples for communicable diseases require a clotted sample (yellow or red topped tubes).

Blood samples for molecular investigations generally require an EDTA sample bottle (purple topped).

Specific sample types are important as the additives in these blood bottles can interfere with the diagnostic tests, meaning that the samples cannot be tested.

Details of which sample types are required are detailed in the laboratory user manuals and via the ward based requesting systems.

Amniotic fluid samples: Amniotic fluid is most useful for investigating fetal infections. The presence of the virus itself can be determined using specific molecular probes. The presence of the virus in amniotic fluid is the best indicator of fetal infection. Not all fetal infections are symptomatic, false negative results can occur if sampling occurs before 21 weeks gestation[56].

Many molecular tests in amniotic fluid will need to be sent to a reference laboratory as they cannot be provided by the local laboratory. CMV is available locally; any other tests will require discussion with your local microbiologist/ virologist.

Fetal blood samples: Often of less clinical value than amniotic fluid and requires prior discussion with laboratories to ensure that this sample is appropriate.

Chorionic villus sample (CVS): The laboratory is unable to process these tissue samples for molecular tests as they require a digestive process which can inhibit the amplification process. If a CVS sample is being taken please telephone the laboratory in order that the most appropriate use can be made of this sample type.

Urine samples: These are routinely processed using molecular tests.

[56] Bonalumi S, et al, (2011). Cytomegalovirus Infection in Pregnancy: review of the literature. Journal of Prenatal Medicine. 5 (1), 1-8

Swabs: Dry swabs are routinely processed for HSV, VZV, enterovirus and respiratory viruses.

Placental swabs: There is currently no validated molecular test for viruses on placental swabs.

Neonatal blood samples: Serological investigations in neonates are difficult to interpret because of passive maternal IgG and the limited production of IgM. Transfusions and receipt of blood products also complicate interpretation.

EDTA neonatal blood samples are useful for molecular investigations, but require targeting. It is often useful to exclude recent infections during the pregnancy by investigating the mother.

NAAT for chlamydia trachomatis (CT) and gonorrhoea (GC)
Currently in Wales all samples for genital infection for CT and GC are tested by the same method and the sample should be submitted in the appropriate Cobas® collection kits*. You should discuss how you obtain the correct sampling tubes from your local laboratory if this is a test you do not routinely use**.**

Samples which can be processed are urine, cervical/ high vaginal swabs or urtheral swabs.
Eye swabs and throat swabs can be tested but are not validated sample types for the assay.

Section 5: Other Infections

5.1 Asymptomatic Bacteriuria (ASB) in Pregnancy and Urinary Tract Infections (UTI)

UTI's are common in both pregnant and non pregnant women. Urine is a sterile fluid and a UTI results when bacteria from the skin or bowel gain access to the urinary tract and replicate. It is estimated that up to 50% of women will have a UTI at least once in their life time.

Although the incidence of bacteriuria in pregnant women is similar to that in non pregnant women[57], the incidence of acute pyelonephritis in pregnant women with untreated asymptomatic bacteriuria is significantly increased to between 20 to 40%[58].

Incubation Period	N/A
Routes of Transmission	N/A
Presentation	Asymptomatic bacteriuria is the presence of significant bacterial growth from urine without the symptoms of a UTI A symptomatic UTI presents with pain or burning when passing urine. Pain in the lower back or abdomen may also be present
Implications for Pregnancy	There is an increase in acute pyelonephritis in pregnant women with untreated asymptomatic bacteriuria and pyelonephritis is associated with an increased risk of pretem labour[59, 60, 61, 62]
Incidence in Pregnancy (UK)	Asymptomatic bacteriuria occurs in 2 - 5 percent of pregnant women[63]
Infection Control Precautions	Good hand hygiene
Notifiable	No

How to avoid infection in pregnancy

Women are at greater risk of UTI's during pregnancy because of the hormonal changes and the growing uterus preventing the complete emptying of the bladder. It is impossible to completely prevent UTI's but the incidence can be reduced if women practice good hygiene such as wiping from front to back after urinating, maintaining good levels of hydration and frequent urination, particularly before and after sexual intercourse.

---

57 Nicolle LE. (2003) Asymptomatic bacteriuria: When to screen and who to treat. Infect Dis Clin North Am; 17:367-94.

58 Smaill FM, Vazquez JC. (2015). Antibiotics for asymptomatic bacteriuria in pregnancy. Cochrane Database Syst Rev; 8:CD000490

59 Wing DA, et al (2006). Acute pyelonephritis in pregnancy: an 18-year retrospective analysis. Am J Obstet Gynecol 2006; 194:1366
Delzell JE Jr, Lefevre ML. Urinary tract infections during pregnancy. Am Fam Physician 2000: 61:713

60 Kazemier BM, et al. (2015). Maternal and neonatal consequences of treated and untreated asymptomatic bacteriuria in pregnancy: a prospective cohort study with an embedded randomised controlled trial. Lancet Infect Dis 15:1324

61 Kass EH. (1960). Bacteriuria and pyelonephritis of pregnancy. Arch intern Med; 105:194

62 Delzell JE Jr, Lefevre ML. (2000). Urinary tract infections during pregnancy. Am Fam Physician: 61:713

63 Kincaid-Smith P, Bullen M. (1965). Bacteriuria in pregnancy. Lancet 1:395-9

Testing in pregnant women

Screening for bacteriuria in early pregnancy has become a standard of care in antenatal clinical guidance[64]. In addition women who present with the symptoms of a UTI should have a mid stream urine sample (MSU) collected for testing. Dipstick testing is not sufficiently sensitive to be used as a screening test and urine culture is the investigation of choice. The dipstick test should only be used to detect proteinuria or glucosuria. This does not correlate with the presence or absence or asymptomatic bacteriuria (ASB) and no treatment should be started based on positive dipstick findings.

NICE guidelines recommend treating any case of ASB identified through culture although there may be instances where the microbiology report recommends a second sample, for example where there is mixed growth or other features on the sample consistent with a high likelihood of contamination. In this case the sample should be repeated and treatment deferred unless symptoms have developed.

It is important that a good quality urine sample be collected in order to reduce the need for repeat tests.

How to take a MSU

Urinary sampling should be done in a way that minimizes the chance of contamination. Cleaning of the perineum prior to sampling has been shown to make minimal difference to contamination rates but strength of the urine stream is important and samples should therefore be taken on as full a bladder as possible[65]. Hands should be cleaned with either warm water and soap, or alcohol gel if not visibly contaminated, prior to collection. The woman should begin to void into the toilet and then, without breaking the stream, place a sterile receptacle preferably a wide necked container used for laboratory specimens into the urine stream. This can then be removed and voiding completed. The specimen should be transferred into a sample pot containing boric acid and hands disinfected. The MSU should be dispatched to the laboratory immediately or refrigerated according to local policy if this is not possible. If there is no bacterial growth after culturing the urine consider an alternative cause for symptoms (false negative culture results may result from prior antibiotic treatment).

Management in pregnancy

If ASB is confirmed treat for seven days with an antibiotic to which the organism is sensitive.

UTI in pregnancy

All women with symptomatic urinary tract infections should be treated with empiric antibiotics. Sampling prior to the antibiotics being started is important to identify resistant pathogens and to narrow the spectrum of antibiotic treatment where possible. Antibiotics should be as per local antimicrobial guidelines or if unavailable suitable antibiotics may be prescribed as per the recommendations above for ASB. Treatment is for seven days regardless of pyuria.

Advise women to seek medical attention if they develop fever, loin pain or do not respond to treatment. If loin pain or fever develops in association with a UTI treatment should be altered as per local guidelines for complicated UTI.

Repeat the urine culture seven days after finishing antibiotic treatment to ensure infection is clear.

---

64 NICE guideline (2008): Antenatal Care for Uncomplicated Pregnancies: CG62. Available at: https://www.nice.org.uk/guidance/CG62/chapter/1-Guidance#clinical-examination-of-pregnant-women

65 Lifshitz E, Kramer L. (2000). Outpatient urine culture: does collection technique matter? 11;160(16):2537-40

Complicated UTI

A complicated UTI includes cases of abnormal renal anatomy, evidence of pyelonephritis clinically or on imaging, or a bacteraemia resulting from a urinary source.

Treatment is for a minimum of 14 days.

Antibiotics should be as per local microbiology guidelines and a MSU prior to antibiotic therapy is essential to confirm the diagnosis and obtain sensitivities for the relevant pathogen.

If unable to obtain local microbiological guidance reasonable empiric therapy includes:

- Ceftriaxone (2g IV once a day)

Plus

- Gentamicin 6mg/kg, dosed according to current weight of the mother (if obese prior to becoming pregnant use ideal body weight plus weight gained in pregnancy). Gentamicin should be given for a maximum of five days.

Review and convert to oral antibiotics when clinically appropriate and using sensitivities obtained from urine culture if applicable.

Managing incidentally found group B streptococcus infection

Growth of a group B streptococcus (GBS), also known as *Streptococcus agalactiae*, when isolated in urine, will be reported. GBS bacteriuria, even if treated, may be associated with increased risk of neonatal GBS disease. Women should be offered antibiotic prophylaxis during delivery to reduce this risk as per the guidelines on GBS in high vaginal samples[66].

Management of the neonate

There are no implications for the neonate with UTI or asymptomatic bacteriuria in pregnancy.

[66] RCOG (2012) The Prevention of Early-onset Neonatal Group B Streptococcal Disease. Available at: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg_36.pdf

5.2 Chlamydia Trachomatis or Genital Chlamydia Infections[67]

This is a common, curable, sexually transmitted infection caused by *chlamydia trachomatis (CT)* which is very common in young sexually active adults. The highest prevalence rates are in the 15 to 24 year olds and are estimated to be 1.5 to 4.3%. It is estimated that up to 16% of untreated women would be expected to develop clinical pelvic inflammatory disease. This can lead to infertility.

Incubation Period	Usually 1 – 3 weeks following exposure but can be longer
Routes of Transmission	Through sexual contact with an infected person The baby can be infected if the mother is infected at the time of delivery
Presentation	The majority of infections in women are asymptomatic Symptoms if present include; • Increased vaginal discharge • Post coital and intermenstral bleeding +/- deep dyspareunia • Dysuria • Lower abdominal pain On examination there may be mucopurulent cervicitis, pelvic tenderness and cervical motion tenderness Complications of genital chlamydia infections include: • Pelvic inflammatory disease • Endometritis • Salpingitis • Ectopic pregnancy • Perihepatitis
Implications for Pregnancy	Chlamydia infection is not associated with fetal abnormality and is not thought to pose an additional risk to the pregnancy, however the infection can be transmitted to the baby during the birth process
Incidence in Pregnancy (UK)	In 2014 over 1.6 million chlamydia tests were carried out in England among young people aged 15 - 24 years. A total of 137,993 chlamydia diagnoses were made among this age group, equivalent to a detection rate of 2,012 per 100,000 population (2%)[68]
Infection Control Precautions	Good hand hygiene
Notifiable	No

[67] BASHH (2015) UK national guideline for the management of infection with Chlamydia trachomatis http://www.bashh.org/documents/UK%20guideline%20for%20the%20management%20of%20%20Chlamydia%20trachomatis%20(8-06-15%20v4)%20submitted%20to%20IJSA.pdf

[68] PHE (2016), Sexually transmitted infections1 and chlamydia screening in England, 2015 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/534601/hpr2216_stis.pdf

How to avoid infection in pregnancy

Pregnant women should be advised that if they change their sexual partner in pregnancy they should use protection.

Testing in pregnant women

This infection is not part of routine antenatal screening tests but should be considered in women who have symptoms or whose lifestyle choices put them in a risk group.

Within Wales all testing for genital chlamydia infection in NHS laboratories are by nucleic acid amplification test commonly referred to as NAAT tests. These currently require samples to be collected using Roche Cobas® Collection kits.

Sample type:

- Vulvo vaginal swab is the best sample and women can take these themselves. Once taken the swab should be placed in the collecting tube to ensure stability of the sample. There are no special storage requirements and samples are stable for many days
- First catch urine samples can also be collected and again they need to be added to the collecting tubes so that the top of the liquid is visible in the sample tube window. It is important that these sample bottles are not over or under filled as the testing machine will not be able to process them.

Urine samples are not as good as the vulvo vaginal swabs as it is a less sensitive sample type in women. Wherever possible, vulvo vaginal swabs should be taken in preference to urine samples.

Management in pregnancy

Recommended regimens

- Azithromycin 1g as a single dose

Doxycycline and ofloxacin are contraindicated in pregnancy.

Clinical experience and published studies suggest that azithromycin is safe and efficacious in pregnancy. Full details of treatment options are documented in the BASHH guideline.

It is recommended that women treated for chlamydia in pregnancy undergo a test of cure (which should be performed no earlier than three weeks after completing treatment).

Management of the neonate

Neonatal infection

Neonatal chlamydia infection is a significant cause of neonatal morbidity. The infection is transmitted to the neonate during the birth process and commonly causes conjunctivitis and/ or pneumonitis. Infection can also be present in the oropharynx and rectum but, as with adults, infection in the neonate can be asymptomatic.

Conjunctivitis and pneumonitis

This usually presents between five to 12 days after birth. This is part of the spectrum of infection that is called ophthalmia neonaturum and is a notifiable infection (Public Health Protection Teams have to be informed). Any chlamydia infection should be considered in any case of conjunctivitis in babies less than 30 days old. If untreated complications including pneumonitis can occur. Pneumonitis usually develops between one to three months of age.

Diagnosis

Swabs from the everted eyelids should be taken and placed in the Roche collecting tubes. At the present time there is no validated assay for the detection of *chlamydia trachomatis* in Wales from respiratory secretions but testing options can be discussed with the laboratory.

Treatment

Systemic infection is common following neonatal conjunctivitis and therefore systemic treatment is recommended. Oral erythromycin 50mg/kg/day in four divided doses for 14 days is currently recommended.

In cases where chlamydia infection is diagnosed in the neonate the biological mother and her partner should be referred to Integrated Sexual Health for testing and treatment.

5.3 Cytomegalovirus (CMV)[69, 70, 71, 72]

CMV is a member of the herpes virus family. It is a common viral infection and about fifty per cent of the population of Britain have been infected. It is now the leading cause of congenital infections in the UK.

CMV like all herpes viruses can be latent which means that the infection is never cleared and the virus can reactivate at a later date.

Incubation Period	Up to 8 weeks
Routes of Transmission	CMV is not spread by casual contact but requires prolonged intimate exposure as it is spread through bodily fluids such as urine, saliva and semen
Presentation	Asymptomatic infection is very common Occasionally mild flu like symptoms with lymphadenopathy will be seen Rashes are rarely a feature
Implications for Pregnancy	Transplacental transmission in pregnant women with primary CMV infection is approximately 40% • 75% of the babies infected in utero will have no consequence • 10% will have severe multiple abnormalities such as IUGR, hepatosplenomegaly and microcephaly • 15% will develop sensorineural deafness this can present later in childhood
Incidence in Pregnancy (UK)	Estimated to be 6/1000 but out of 1000 live births only 1 - 2 babies will have a problem relating to CMV
Infection Control Precautions	Hand washing is an effective way of reducing transmission
Notifiable	No

How to avoid infection in pregnancy

It is not possible to completely prevent the spread of CMV but the risks can be reduced by practicing good hygiene and regular and thorough hand washing particularly after changing children's nappies.

There are currently no available vaccines or prophylactic therapies for the prevention of transmission.

---

69 Revello, M. G. and Gerna, G. (2002), Diagnosis and Management of Human Cytomegalovirus Infection in the Mother, Fetus, and Newborn Infant. Clinical Microbiology Reviews. 15 (4). pp. 680–715.

70 Kimberlin, D. W., et al (2000). Ganciclovir (GCV) Treatment of Symptomatic Congenital Cytomegalovirus (CMV) Infections: Results of a Phase III Randomized Trial. Abstract Interscience Conference on Antimicrobial Agents and Chemotherapy. 40. p. 274.

71 Bonalumi S. et al (2011). Cytomegalovirus in pregnancy: Review of the Literature. Journal of Prenatal Medicine. 5(1): 1-8.

72 Kadamban S. (2011). Evidence based management guidelines for the detection and treatment of congenital CMV. Early Human Development 87: 11. 723-728.

Testing in pregnant women

Antenatal screening for CMV is not recommended by the National Screening Committee as it is not possible to determine accurately which pregnancies are likely to result in the birth infected infant. 75% of babies infected in utero will be normal. It remains difficult to determine which infected infants will develop abnormalities as a result of CMV infection therefore routine antenatal screening or routine testing of groups perceived to be at higher risk of contracting CMV is not advised.

Serological tests should be performed following abnormal fetal ultrasound (see section 4). As detailed in that section the purpose of a serology investigation is to investigate whether the pregnant woman has ever been infected with CMV and, if so, to try to determine when.
If at the time fetal abnormality is observed, the maternal IgG is negative then CMV can be excluded as a cause of the abnormality and further investigations for this infection are not required.

If the mother demonstrates the presence of CMV IgG then both the booking and the current blood samples should be tested together for both IgG and IgM. Avidity tests may be useful on occasions.

If an amniocentesis is planned as part of the investigative process for fetal abnormality, then an aliquot for molecular tests should be taken. Molecular tests for CMV DNA may be required following the results of the serological investigations on the mother. False negative results can occur if the amniotic fluid sample is taken before 21 weeks gestation.

Infection during pregnancy

During a primary infection there are no innate defences against the organism, such as antibodies. There is a greater risk of the virus crossing the placenta if it is a primary infection.

Re-infection or reactivation of latent infection

As CMV is a herpes virus reactivation or re-infection with different strain of the virus can occur. The risk of fetal infection resulting in fetal damage following this is much lower than with a primary infection.

Risk of vertical transmission related to the timing of maternal infection

It is only the risk of transplacental transmission that is affected by the maternal infection being a primary infection or reactivation/ re-infection. If fetal abnormality is present the nature of the maternal infection has no impact on the fetal condition.

The risk of transmission is distributed equally between the three trimesters. However:

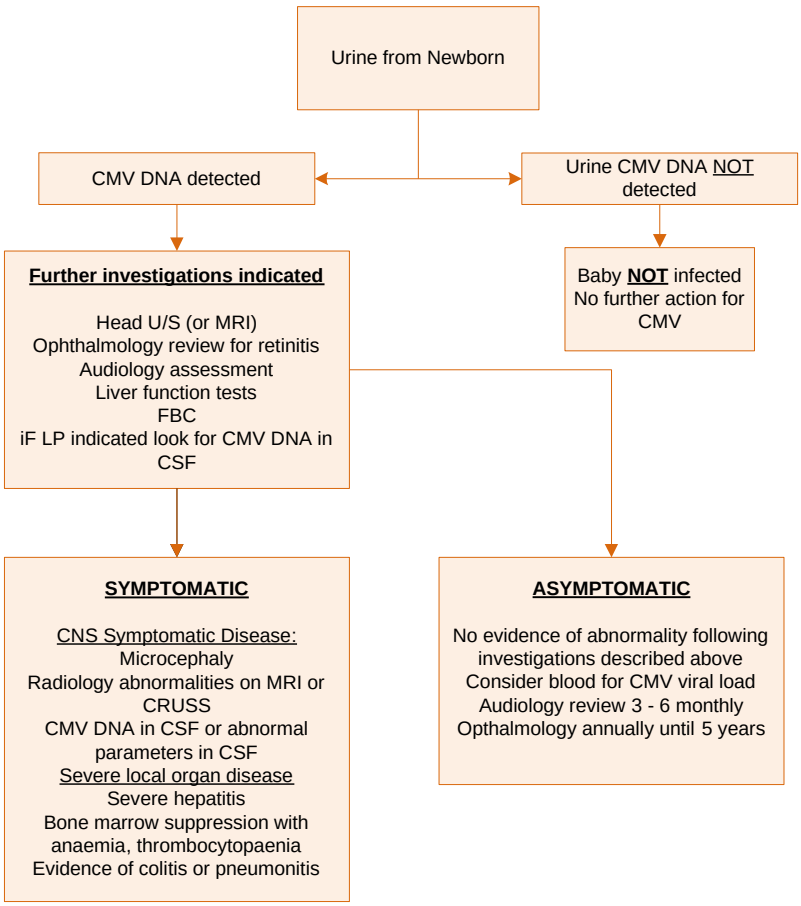
- Risk of severe adverse neurological outcome is more likely in primary infection in the first half of pregnancy
- A fetus affected late in pregnancy is more likely to have acute visceral disease (hepatitis, pneumonia, purpura and severe thrombocytopenia).

Management in pregnancy

Treatment with ganciclovir is not recommended in pregnancy at this time as not all women who become infected during pregnancy will pass CMV onto the fetus and not all fetal infections will result in abnormality. The decisions regarding management of the pregnancy should consider the results of the ultrasound scans, the maternal serological results and the detection of CMV DNA in the amniotic fluid (if amniocentesis is performed). These results should inform the discussion with the mother and the consultant obstetrician.

Management of the neonate

If the woman chooses to continue with the pregnancy a urine sample should be sent from the baby as early as possible in life to determine if the baby is infected with CMV (see algorithm below). Urine samples taken before three weeks of life that demonstrates the presence of CMV DNA are diagnostic of a congenital CMV infection. If the sample is taken later than three weeks perinatal infection cannot be excluded.



Referral and follow up

- All infected children (both symptomatic and asymptomatic) should have paediatric follow up, audiology three to six monthly for three years then annually until six years and ophthalmology annually for five years
- Babies with symptoms should be referred to a paediatrician with an interest in infectious diseases for investigations and monitoring which should include FBC, LFT and U+E's monitored weekly
- Treatment is recommended with intravenous ganciclovir (6mg/kg IV 12 hourly for six weeks) OR if oral medication is tolerated oral valganciclovir 16 mg/kg/dose 12 hourly for six months[73].

[73] Kimberlin et al (2015) Valganciclovir for Symptomatic Congenital Cytomegalovirus Disease. New England Journal of Medicine; 372:933-43.)

5.4 Gonorrhoea[74]

Gonorrhea is a sexually transmitted infectious disease caused by the bacteria *Neisseria gonorrhoeae*. It tends to infect warm moist areas of the body such as the urethra, eyes, throat, vagina, anus and the female reproductive tract i.e. the cervix, uterus and fallopian tubes.

Incubation Period	This is 2 - 7 days following sexual exposure In neonates usually 1 - 5 days after birth but can be up to 14 days
Routes of Transmission	Infection is spread through sexual contact with an infected person. Mothers can transmit to the baby during birth
Presentation	Asymptomatic infection is very common particularly in women In symptomatic infection: • increased or altered vaginal discharge is common (up to 50%) • lower abdominal pain may be present (25%) • dysuria (painful urination) • pain on intercourse
Implications for Pregnancy	Gonorrhoea infection is not associated with fetal abnormality and is not thought to pose an additional risk to the pregnancy Infection can be transmitted to the baby during the birth process
Incidence in Pregnancy (UK)	This is a rare infection in pregnant women in the UK
Infection Control Precautions	Standard precautions and/ or transmission based precautions
Notifiable	No

How to avoid infection in pregnancy

Pregnant women should be advised that if they change their sexual partner in pregnancy they should use protection.

Testing in pregnant women

This infection is not part of routine antenatal screening tests, but should be considered in women who have symptoms or whose lifestyle choices put them in a risk group.

Discussion with your local consultant microbiologist is recommended if this infection is suspected in a pregnant woman to ensure that the most appropriate samples are taken.

Management in pregnancy

Women who test positive for this infection should be referred to Integrated Sexual Health Services for treatment. Other infection may require excluding and contact tracing of partners is also desirable.

---

[74] BASSH (2011). UK national guideline for the management of gonorrhoea in adults. Available from: http://www.bashh.org/documents/3920.pdf)

The usual antibiotics used for this infection may be different in pregnant women and breast feeding women as quinolone or tetracycline antimicrobial should not be given. Azithromycin should only be used if adequate alternatives are not available. Pregnancy does not diminish treatment efficacy. Treatment doses and length of treatment are found in the latest BASSH guidance.

There is no additional risk to the baby during pregnancy but there is a risk of transmission to the baby during birth in untreated infection.

Breast feeding is not contraindicated.

Management of the neonate

Conjunctivitis in the neonate caused by gonorrhea is often referred to as gonorrhoeal opthalmia neonatorum. This requires antibiotic treatment and the biological mother and her partner should be referred to the Integrated Sexual Health Service for assessment and treatment.

The recommended antibiotic is ceftriaxone and a single dose is usually sufficient but discussion with a consultant microbiologist is recommended.

5.5 Group B Streptococcus in Pregnancy (GBS)[75]

GBS, also known as *streptococcus agalactiae,* is a bacterium which forms part of the normal flora of the bowel or genital tract. It infrequently causes infection in healthy adults but is recognised as the most commonly identified cause of severe early onset (age less than seven days) neonatal infection.

Incubation Period	N/A in pregnancy In neonates see management of neonates
Routes of Transmission	This bacteria is part of the normal flora of the bowel or genital tract of 10 - 40% of women
Presentation	Adults: Asymptomatic. Symptomatic infection often presents as a UTI
Implications for Pregnancy	There is no additional risk to the pregnancy if a woman is shown to have GBS Women wishing to give birth at home or in a Midwifery Led Unit with a GBS positive culture in their current pregnancy should be referred to a consultant midwife clinic for discussion[76]
Incidence in Pregnancy (UK)	Following the pregnancy, babies born to women with confirmed GBS in their current pregnancy show an increased incidence of early onset GBS disease. This rises from 0.5 cases/1000 live births to 2.3 cases/1000 live births
Infection Control Precautions	Good hand hygiene
Notifiable	No

How to avoid infection in pregnancy

Women can be colonised with GBS as it is part of the normal vaginal flora.

Testing in pregnant women

The UK NSC currently recommends against universal screening for GBS in all pregnant women[77]. However at the time of this consultation the NSC is reviewing the evidence.

Some pregnant women may have GBS detected incidentally on a urine sample or vaginal swab during pregnancy. These women should be offered antibiotic prophylaxis during labour as described below. The woman's labour plan must be documented in the hand held/ hospital notes under special considerations/ intrapartum plan of care section.

Women who had GBS detected during a previous pregnancy do not have a significantly increased risk of GBS in subsequent pregnancies and should be treated no differently to other pregnant women, i.e. there is no need for screening, but antibiotic prophylaxis should be offered if GBS is detected incidentally.

---

75 RCOG. (2012). The Prevention of Early-onset Neonatal Group B Streptococcal Disease. Green-Top Guideline No. 36. Available from: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg_36.pdf

76 Davies EM, Lewis M (2016). All Wales Midwifery Led Guidelines 4th Ed.

77 UKNSC (2012). The UK NSC recommendation on Group B Streptococcus screening in pregnancy. Available at: **http://legacy.screening.nhs.uk/groupbstreptococcus**

Management in pregnancy

Maternal infection with GBS

The most common symptomatic infection caused by GBS in pregnant women is a UTI. Women whose urine sample cultures GBS should be treated appropriately for their UTI and the midwifery/ obstetric team should be notified of the growth of GBS to ensure that appropriate antibiotic prophylaxis can be offered at the time of delivery.

GBS can cause other symptomatic infections but these are uncommon in otherwise healthy pregnant women and are beyond the scope of this guideline. Questions about infections associated with GBS in pregnant women should be directed to your local medical microbiology team.

Management of maternal GBS carriage

Women with GBS bacteriuria or evidence of vaginal GBS carriage should be offered intrapartum antibiotic prophylaxis (IAP) to decrease the risk of early onset GBS (EOGBS) disease in the neonate. Women with GBS undergoing planned caesarean section, in the absence of labour or ruptured membranes, do not require IAP as the risk of EOGBS is extremely low.

Pyrexia (greater than 38°C) in labour is associated with an increased risk of EOGBS disease (5.3 cases/1000 live births), and women who become pyrexial should be offered IAP regardless of their GBS status.

Women with a previous baby with neonatal GBS disease are at an increased but unquantified risk of GBS disease in subsequent infants. These women should be offered IAP in all subsequent pregnancies.

Pre-labour rupture of membranes

Women with preterm pre-labour rupture of membranes (PPROM) should be offered oral erythromycin for 10 days to decrease the likelihood of chorioamionitis and neonatal infection. Women with PPROM known to be colonised with GBS should be offered standard IAP once they are in labour, but no extra measures are required.

Women with term pre-labour rupture of membranes (PROM) known to be colonised with GBS should be admitted as soon as possible for induction of labour and IAP should be started once labour is established.

Intrapartum antibiotic prophylaxis

Women who accept the offer of IAP should be given high dose intravenous benzylpenicillin, ideally starting two hours before delivery. The current recommended regime is benzylpenicillin 3g IV as soon as possible after onset of labour and thereafter 1.5g IV every four hours until birth.

Women with a history of allergy to penicillin should be offered intravenous clindamycin. Clindamycin resistance in GBS in England and Wales stands at around 10%, potentially making clindamycin therapy less effective. A careful allergy history including the nature of the reaction, the speed of onset and the medical interventions required to treat the reaction, is therefore very important to ensure that the most appropriate antibiotic can be given. The current recommended regime is clindamycin 900mg IV every eight hours until birth.

IAP should not be viewed as a contraindication to use of the birthing pool for labour and birth.

Management of the neonate

The majority of infants (89 to 94%) who develop EOGBS infection develop signs within the first 24 hours after birth 65 to 67% of these infants will have had one or more conventional risk factors evident in or before labour. A significant number will also have had signs of fetal distress, an emergency delivery and low Apgar scores.

Any newborn infant with clinical signs compatible with infection should be investigated and treated promptly with antibiotics which are narrow spectrum but provide cover against GBS and other common pathogens. Blood cultures should always be obtained before antibiotic treatment is commenced and cerebrospinal fluid cultures should be considered unless the clinical condition precludes a lumbar puncture. A lumbar puncture should be obtained at the earliest opportunity once the clinical condition has stabilised.

For a well infant whose mother has had a previous infant with GBS disease, either clinical evaluation after birth and observation for around 24 hours is necessary, or blood cultures need to be obtained and the infant treated with benzylpenicillin until the culture results are available. It is unclear whether further action is necessary for the well infant.

Well infants at risk of EOGBS should be observed for the first 12 to 24 hours after birth with regular assessments of general wellbeing, feeding, heart rate, respiratory rate and temperature. Postnatal antibiotic prophylaxis is not recommended for asymptomatic term infants without known antenatal risk factors. It is not necessary to perform routine surface cultures or blood cultures on well infants.

5.6 Hepatitis C (HCV)

HCV is a blood borne virus (BBV) infection that infects the liver. Current estimates are that 12,000 people are infected with hepatitis C in Wales.

There is currently no vaccine for hepatitis C infection or treatment to prevent infection.

Patients who are diagnosed with active hepatitis C infection can be referred to secondary care for treatment. Treatment is very easy to take and will cure in more than 90% of cases.

Incubation Period	The incubation period is long and is estimated to be between 14 - 180 days Antibodies in the blood are often not detectable until 3 months after infection
Routes of Transmission	Transmitted through: • Drug taking equipment • Blood transfusion (before 1989) • Poor healthcare practice • Sexual intercourse
Presentation	Only 25 - 35% symptomatic Symptoms are vague and include: • Tiredness • Nausea • Low grade temperate • Abdominal pain • Very few present with jaundice Following infection with HCV 20% of patients are able to clear the virus completely within 6 months In the majority of patients chronic infection occurs which over time can lead to cirrhosis, liver failure and hepatocellular carcinoma (HCC)
Implications for Pregnancy	There is no additional risk to the pregnancy but women who have an ongoing HCV infection are at risk of transmitting the infection to the baby
Incidence in Pregnancy (UK)	Approximately 0.4% of the Welsh population are infected with hepatitis C This increases with risk factors and can be up to 20% in certain high risk groups
Infection Control Precautions	Standard precautions and/ or transmission based precautions
Notifiable	Yes for acute hepatitis (jaundice is notifiable at presentation) No for chronic infection

How to avoid infection in pregnancy

The hepatitis C trust (http://www.hepctrust.org.uk/) provides details about the risk of sexual transmission. This is thought to be very low in monogamous partnerships.

Testing in pregnant women

Hepatitis C testing is not part of any antenatal screening programme however a number of women whose lifestyle choices put them at risk of acquiring this infection should be offered testing during pregnancy.

Who should be tested?

Hepatitis C testing should also be offered to women who:

- Have unexplained abnormal liver function tests (e.g. elevated ALT) or unexplained jaundice
- Have ever injected drugs in the past (including anabolic steroids) using shared equipment, however long ago, even if this was only once or twice
- Have had a blood transfusion in the UK before September 1991 or received any blood products before 1986
- Have received medical or dental treatment in countries where infection control may be poor
- Are the child of a mother with HCV
- Are a regular sexual partner of someone with HCV
- Have been accidentally exposed to blood where there is a risk of transmission of HCV
- Have had tattoos, piercings, acupuncture or electrolysis where there are poor infection control procedures.

Antibody tests are the first line test for hepatitis C infection. This will indicate if the patient has ever had hepatitis C infection but does not distinguish current from past infection. If this is found to be positive three 5ml bottles of EDTA blood (purple topped) are needed to perform a HCV PCR investigation which looks for the presence of the virus in the blood.

Mode of delivery

Normal vaginal delivery is the recommended mode of delivery in the presence of ongoing HCV infection. There is no evidence to suggest that delivery by caesarean section has demonstrated a beneficial outcome for transmission.

Breast feeding is not contraindicated in maternal hepatitis C infection[78].

Management in pregnancy

The treatments available for hepatitis C infection have greatly improved in the last few years. Whereas previous treatment was prolonged (24 to 48 weeks) and involved injections, new therapies require a shorter course (12 to 24 weeks) of oral tablets only with an overall success rate in excess of 90% in most circumstances. Treatment is not usually offered in pregnancy at this time but women should be referred to the hepatology/ gastroenterology team to ensure that they can be treated once the pregnancy is complete and before the next pregnancy.

---

[78] Tovo PA. et al (2001). Effects of mode of delivery and infant feeding on the risk of mother-to-child transmission of hepatitis C virus: European Paediatric Hepatitis C Virus Network. British Journal of Obstetrics and Gynaecology. Vol 108 pp 371-377

Management of the neonate

The infection can be transmitted to the baby during the birth process. Very occasionally the virus can cross the placenta but this is rare.

The infection is only transmitted if the woman has virus in her blood during the birth process. Women who have cleared the infection do not transmit the virus to the baby. Approximately 5% of woman with the virus in their blood transmit the infection to the baby however babies who are infected are at risk of developing the complications of infection such as liver cirrhosis and hepatocellular carcinoma in later life.

All babies born to hepatitis C infected women should be offered hepatitis B vaccination at birth. Although this vaccine does not protect against hepatitis C, hepatitis B infection is also commonly seen in some of the patients groups where hepatitis C infection is prevalent.

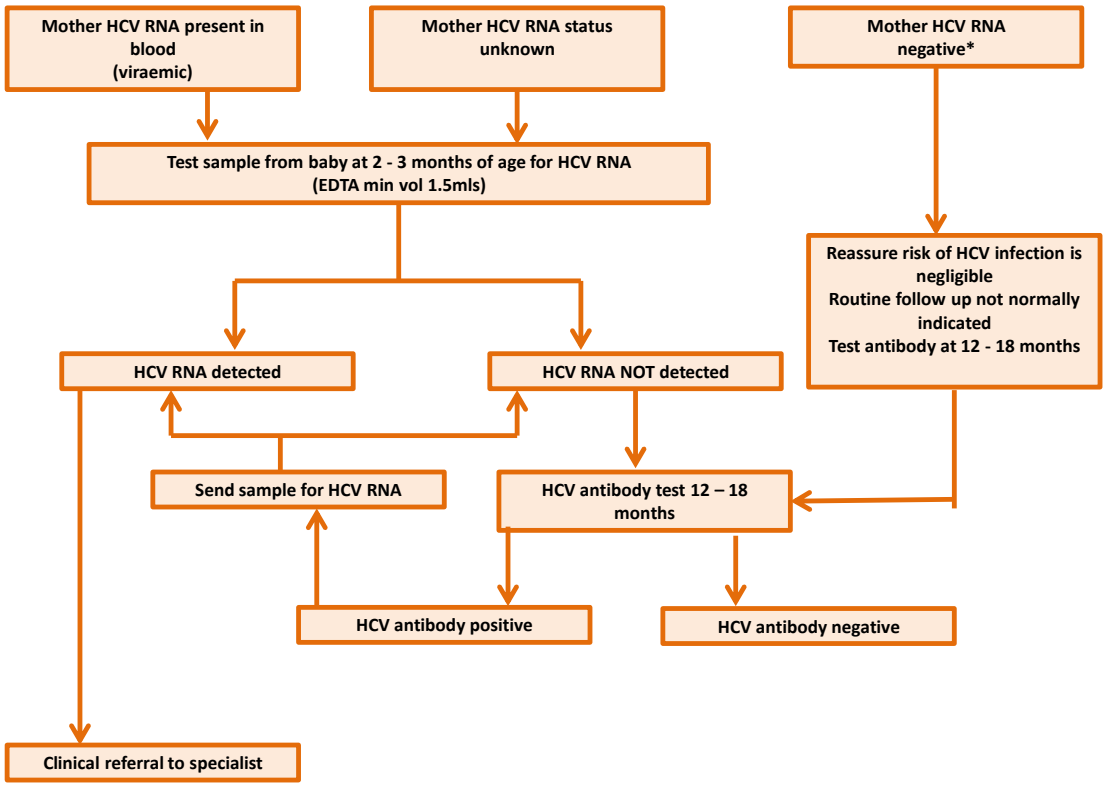
Diagnosis of hepatitis C infection in the baby

As the infection is transmitted during the birth process, taking a sample too early can lead to false negative results. Where the maternal RNA status is unknown these babies should also be tested. If the mother is known to have cleared the infection a sample at 18 months of age from the child will be sufficient to demonstrate the absence of infection.

For testing of the baby see the flowchart on the next page.

Treatment is not offered to children in the first year of life and there are no early interventions currently available to prevent transmission. The benefit of testing the baby to confirm or exclude an early diagnosis should be considered particularly as a large volume of blood is required for HCV RNA (1.5mls). However follow up of babies can be difficult if they are not tested and identified in the first 18 months of life.

Algorithm for testing babies born to mothers infected with or at high risk of hepatitis C infection*



***** Consider whether the mother is at ongoing/ recurrent risk of acquiring HCV, or is within the window period, at the time of the original RNA test. If so, a repeat RNA test of the mother and/or follow up of infant as per "mother status unknown" may be indicated**.**

5.7 Genital Herpes Simplex Infection[79]

Genital herpes simplex virus (HSV) infection is one of the most common, viral, sexually transmitted infections. HSV can cause cold sores on the face and lips (HSV 1 usually) or sores on the genitals (HSV 2 usually). Once infected with either type the virus remains within the body for life and the symptoms can recur. The majority of women with genital herpes will have a recurrence during pregnancy. Transmission of the virus from mother to fetus typically occurs by direct contact with the virus in the genital tract during birth.

Neonatal HSV is very rare but is a serious viral infection with a high morbidity and mortality. Surveillance suggests that the incidence may be increasing. This has been attributed to the prevalence of sexually transmitted infections, demographic and social changes within the general population and improvements in diagnostic techniques. The majority of women with genital herpes give birth to healthy babies.

Incubation Period	For primary genital herpes is 1 - 3 days Range 1 day to 3 weeks
Routes of Transmission	Mothers can become infected through sexual contact with individuals who have genital herpes. Transmission will depend on maternal antibody Babies can be infected during the time of delivery
Presentation	The symptoms of primary genital herpes can include: • Fever and flu-like symptoms • Nausea • Muscle aches • Painful urination • Tingling, burning or itching sensation in the area where painful blisters/ ulcers will appear
Implications for Pregnancy	There is no additional risk to the pregnancy A primary infection in the last trimester of pregnancy can result in neonatal HSV Recurrent genital infection rarely causes problems in pregnancy Intrauterine infection is extremely rare. There are only a few case reports of this in the literature
Incidence in Pregnancy (UK)	Between 1986 and 1991 there were 76 neonatal infections Incidence: 1.65 per 100 000 live births Subsequent surveillance from 2004 to 2006 showed an approximate doubling of this incidence
Infection Control Precautions	Good hand hygiene, isolate neonates with HSV
Notifiable	No

79 RCOG, BASSH (2014). Management of Genital Herpes in Pregnancy. Available from: https://www.rcog.org.uk/en/guidelines-research-services/guidelines/genital-herpes/

How to avoid infection in pregnancy

Pregnant women should be advised that if they change their sexual partner in pregnancy they should use protection.

Testing in pregnant women

Routine testing for genital herpes is not a recommended as part of routine antenatal screening tests. Testing should be informed by the maternal history. If a primary genital herpes infection is suspected during pregnancy dry red top swabs must be taken to confirm the presence of the virus.

Consequences of infection during pregnancy

The consequence of genital herpes in pregnancy depends on whether the infection is primary or recurrent:

- A primary infection of genital herpes is when the mother becomes infected for the first time with any HSV virus. The risk of transmission of HSV infection to the newborn is estimated to be 41% if the woman becomes infected in the third trimester of pregnancy. (See scenarios A and C below for management)
- First episode of HSV genital infection. If the woman has been previously infected with an HSV 1 virus and she subsequently acquires a genital infection with the HSV 2 virus these women are described as having a first episode genital infection. (See scenarios A and C below, for management)
- Recurrent infection. Women with a history of recurrent genital HSV infection have a much lower risk of transmitting the infection. This risk is estimated to be between 0% and 3% for vaginal delivery if there are genital lesions present at the time of delivery and is as low as 0.04% in the absence of lesions. (See scenarios B and D for management).

Management in pregnancy

Difficulties arise in identifying patient groups. Detailed history taking is essential. There are serological tests that can differentiate between HSV 1 and HSV 2 antibodies however, these are not readily available and accessing these investigations requires a discussion with virologist at a national centre. There is a long turnaround time for these results.

N.B. Scenarios below may be useful in guiding management however discussion with a consultant in sexual health and a consultant microbiologist/ virologist is recommended.

*Scenario A: Genital herpes: **primary infection** or first episode genital herpes*

- ***Lesions within 6 weeks of expected date of delivery or present at onset of labour*:**
  - Caesarean section (CS) is recommended
  - If the woman chooses a vaginal delivery, invasive procedures such as fetal scalp electrodes, artificial rupture of membranes, instrumental deliveries or fetal blood sampling should be avoided. Where primary episode genital herpes lesions are present at the time of delivery and the baby is delivered vaginally, the risk of neonatal herpes is estimated to be 41%
- ***Lesions more than 6 weeks before expected onset of labour***:
  - CS not indicated
- ***Maternal treatment:***
  - Treat with aciclovir 400mg three times a day for 5 days. Topical lidocaine 2% can be used for symptoms. Consider aciclovir 400mg three times a day from 36 weeks gestation. IV aciclovir may be considered in women who present in labour.

Scenario B: Recurrent genital herpes with active lesions

- **Lesions at onset of labour**
  - Vaginal delivery should be offered. CS can be considered but the risk is small (0 - 3%) and so this should be considered against the risk of a CS to the mother
  - Invasive procedures such as fetal scalp electrodes, artificial rupture of membranes, instrumental deliveries or fetal blood sampling should be avoided
- **Lesions before onset of labour**
  - No indication for CS
- **Maternal treatment**
  - Consider suppressive aciclovir 400mg three times daily from 36 weeks of gestation.

Scenario C: Primary genital herpes in preterm prelabour rupture of membranes (PPROM)

There is limited evidence to inform best obstetric practice when PPROM is complicated by primary HSV infection. If time allows a multidisciplinary team (MDT) is best practice to include obstetricians, neonatologist and Integrated Sexual Health physicians

- Management should be guided by MDT discussions and will depend on the gestation that PPROM occurred and the risk to benefit ratio between conservative management and immediate delivery
  - Decision for immediate delivery should be taken by a senior member of the obstetric team, as the anticipated benefits of caesarean section remain. Maternal treatment with aciclovir should be considered (orally 400mg three times a day or IV if indicated)
  - If there is initial conservative management, the mother should be **recommended** to receive intravenous (IV) aciclovir 5mg/kg every 8 hours and prophylactic corticosteroids should be considered. If delivery is indicated within 6 weeks of the primary infection delivery by caesarean section may still offer some benefit despite the prolonged rupture of membranes.

Scenario D: Recurrent genital herpes in PPROM

- The risk of neonatal transmission is very small in such a scenario and may be outweighed by the morbidity and mortality associated with premature delivery
- In the case of PPROM before 34 weeks consider expectant management including oral acyclovir 400mg three times daily for 5 days for the mother
- After 34 weeks treat the mother with oral acyclovir 400mg 3 times daily for 5 days. Consider antenatal corticosteroid administration and follow the relevant RCOG guidelines on PROM, as the management is not materially influenced by the presence of recurrent genital herpes lesions.

Management of HIV positive women with HSV infection

- If primary HSV infection in the last trimester of pregnancy, manage according to the recommendations for all women with primary genital HSV infection
- Recurrent HSV infection. Offer HIV positive women with a history of genital herpes daily suppressive aciclovir 400mg three times daily from 32 weeks of gestation to reduce the risk of transmission of HIV infection, especially in women where a vaginal delivery is planned. The mode of delivery should be in line with the BHIVA HIV in pregnancy guideline recommendations according to obstetric factors and HIV parameters such as HIV viral load.

Neonatal HSV

Neonatal HSV infection can present as:

- Disease localized to skin, eye and/ or mouth which accounts for approximately 30% of all neonatal herpes infections
- Local central nervous system (CNS) disease (encephalitis alone) and disseminated infection with multiple organ involvement accounts for approximately 70% of all neonatal herpes infections.

Management of babies suspected of having neonatal HSV infection

- Treatment with high dose aciclovir (ACV) is recommended (20mg/kg three times a day) for 21 days (for CNS and disseminated disease) and 14 days (local disease) or until HSV as a cause is excluded
- The local laboratory should be contacted to ensure that appropriate samples are taken. The recommendations are usually:
    - Dry swabs from nose, throat, ear, axilla, umbilicus and any lesions plus nasopharyngeal aspirate (NPA)
    - Cerebral spinal fluid (CSF) for PCR
    - EDTA blood for HSV PCR

Management of well babies born to mothers with HSV infection

Neonatal scenario 1: Well baby born via CS to a mother with primary or first episode of genital HSV in third trimester

- Considered to be at low risk and conservative management recommended
- Parents should be advised on good hand hygiene and advised to seek medical help if the baby demonstrates poor feeding, lethargy/ irritability or lesions on skin, eyes or mucous membranes.

Neonatal scenario 2:
a) Vaginal delivery, well baby but mother with primary or first episode of genital HSV

b) Caesarean section, with spontaneous rupture of membranes greater than 4 hours, but mother with primary or first episode of genital HSV

- Isolate baby and observe
- Send samples from baby (detailed above) 48 hours after delivery
- Aciclovir 20mg/kg IV three times a day until infection excluded
- Breastfeeding is not contraindicated except if the mother has lesions on the breast.

Neonatal scenario 3: Well baby, mother with recurrent genital herpes with active lesions at delivery

- Isolate baby and observe
- No special management required, although swabs can be sent if required (as detailed above) 48 hours after delivery
- Breastfeeding is not contraindicated except if the mother has lesions on the breast.

Neonatal scenario 4: Well baby but mother with past history of genital HSV but no evidence of current active infection

- No special management required
- Breastfeeding is not contraindicated except if the mother has lesions on the breast.

It is recommended that all babies with neonatal sepsis are discussed with the local consultant microbiologist.

Prevention of postnatal transmission

In 25% of cases the source of postnatal infection is usually a maternal relative. Transmission via this route can be prevented by individuals with herpetic lesions practicing good hand hygiene and those with cold sores (oral lesions) should not kiss the neonate.

5.8 Listeriosis in Pregnancy[80]

Listeriosis is a food borne illness caused by the bacterium *listeria monocytogenes*. It is a rare and severe infection predominantly affecting the elderly, people with weakened immunity, pregnant women and their unborn or newborn babies. In England and Wales it is one of the major causes of death by food borne illness.

Incubation Period	Variable estimates between 1 - 90 days Mean 30 days
Routes of Transmission	By ingesting contaminated food Infected pregnant women can pass on the infection to their baby
Presentation	May be asymptomatic If symptoms are present they include non specific flu like illness with fever, myalgia and headache, often proceeded with diarrhoea or other gastrointestinal symptoms
Implications for Pregnancy	Maternal infection can result in fetal loss, preterm labour, neonatal sepsis, meningitis and neonatal death
Incidence in Pregnancy (UK)	169 cases of listeriosis were reported in England and Wales in 2014, 21 of these cases were associated with pregnancy
Infection Control Precautions	Good hand hygiene
Notifiable	Food poisoning is notifiable. Laboratories will report if this organism is found

How to avoid infection in pregnancy

Maintaining good food hygiene standards and avoiding foods with a high risk of contamination with *listeria* are recommended to reduce the likelihood of contact with listeria during pregnancy. These include:

- Peeling raw vegetables, salads or fruit or washing them thoroughly before eating
- Washing your hands before preparing food, before eating and after going to the toilet
- Washing kitchen surfaces and utensils regularly particularly after preparing raw meat, poultry and eggs
- Always separating raw foods from ready to eat foods
- Always cook food thoroughly and check cooking instructions carefully, including the cooking time.

[80] ACOG (2014). **Management of Pregnant Women With Presumptive Exposure to Listeria monocytogenes. ACOG. No.614. Available from: https://www.acog.org/-/media/Committee-Opinions/Committee-on-Obstetric-practice/co614.pdf?dmc=1&ts=20160715T0753498454**

Foods to avoid in pregnancy due to high risk of listeria contamination include:

- Soft mould-ripened cheese such as brie, camembert and chèvre (a type of goat's cheese)
  Soft blue-veined cheese such as danish blue and gorgonzola
- All types of pate including vegetable pate
- Unpasteurised milk
- Undercooked food.

Testing in pregnant women

There is no routine testing recommended for this infection. The mainstay of diagnostic tests is a blood culture which should be taken at the time of the febrile illness. Women with the following diagnosis should have blood cultures taken and empirical treatment should be considered (see management below):

- With a dietary history as above
- Who present with fever higher than 38°C
- Signs and symptoms consistent with listeriosis
- There is no known cause for the illness.

Diagnosis is primarily made by isolation of listeria from blood cultures. If infection with listeria is suspected placental samples should also be sent for culture once the fetus is delivered. Discussion with the laboratory in these cases is recommended.

Management in pregnancy

Pregnant women with presumptive exposure to listeria can be managed based on three clinical scenarios:

- Asymptomatic
- Mildly symptomatic but afebrile
- Febrile with or without other symptoms of listeriosis.

Asymptomatic

Asymptomatic women should not be offered testing for listeria but should seek medical attention if they develop signs or symptoms of listeriosis within two months of consumption of the product of concern.

Mildly symptomatic but afebrile

Potentially exposed pregnant women with symptoms consistent with listeriosis but who are afebrile should have blood cultures taken but these are often negative. It may be appropriate to start antibiotic treatment for listeria pending blood culture results following a full clinical assessment. Assessment of fetal well-being should be discussed with the woman’s obstetrician.

Febrile with or without other symptoms of listeriosis

Decisions about ongoing treatment of the woman and management of the fetus should be made in conjunction with microbiology/ infectious diseases and the obstetric team, ideally including a fetal-maternal medicine specialist.

Management of the neonate

This is a rare infection and if suspected in the neonate discussion with your local microbiologist is required to ensure that the most appropriate investigations are taken and that antibiotics are used appropriately.

5.9 Malaria in Pregnancy[81]

Malaria is the most important parasitic infection in humans and is the tropical disease most commonly imported into the UK with approximately 1500 cases reported each year and rising, apart from 2008. Approximately 75% of cases are caused by *plasmodium falciparum* and there is an average of 5 to 15 deaths a year (mortality rate approximately 0.5 to 1.0%).

There are only five plasmodium parasites which cause malaria in humans these are:

- *Plasmodium falciparum* mainly found in Africa and the most common type of malaria parasite responsible for most malaria deaths worldwide. Incubation period 9 to 14 days
- *Plasmodium vivax* mainly found in Asia and South America, this parasite causes milder symptoms than plasmodium falciparum, but it can stay in the liver for up to three years which can result in relapses. Incubation period 12 to 18 days
- *Plasmodium ovale* fairly uncommon and usually found in West Africa, it can remain in your liver for several years without producing symptoms. Incubation period 12 to 18 days
- *Plasmodium malariae* is quite rare and usually only found in Africa. Incubation period 18 to 40 days
- *Plasmodium knowlesi* is very rare and found in parts of southeast Asia.

Incubation Period	Typically ranges from: • 9 - 40 days (see above)	
Routes of Transmission	The parasite is spread by the female Anopheleles mosquito which commonly bite between dusk and dawn There is no person to person transmission of malaria	
Presentation	**Symptoms:** • Fever/ chills/ sweats • Headache • Muscle pain • Nausea • Vomiting • Diarrhoea • Cough • General malaise	**Signs:** • Jaundice • Elevated temperature • Perspiration • Pallor • Splenomegaly • Respiratory distress
Implications for Pregnancy	Can result in maternal death, maternal and fetal anaemia, miscarriage, fetal growth restriction, low birth weight, stillbirth and premature birth and neonatal death	
Incidence in Pregnancy (UK)	The incidence in pregnant women is rare in the UK	
Infection Control Precautions	Standard precautions and/ or transmission based precautions	
Notifiable	No	

[81] RCOG (2010). The prevention of malaria in pregnancy. Green-top Guideline No. 54A. Available from: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg54apreventionmalariapregnancy0410.pdf

How to avoid infection in pregnancy

The recommendation is that pregnant women should consider postponing their trip unless travel is unavoidable.

Anti malarial drugs

Women planning pregnancy and travelling to a destination where there is a risk of contracting malaria should be advised there may be harmful consequences for the pregnancy. Prophylaxis is not 100% effective. If travel is unavoidable advice from a specialist with current experience of malaria should be sought as there is increasing resistance to prophylactic drugs which are safer to take during pregnancy.

To completely avoid any potential adverse drug effects from taking anti malarial prophylaxis it is advisable to wait for complete excretion of the drug before becoming pregnant. Unplanned conception while taking malaria prophylaxis is not considered a reason to recommend termination of pregnancy owing to the low risk of teratogenicity.

Bite Prevention

Mosquito bite avoidance is essential as no malaria tablet is considered 100% effective. Practical measures to avoid mosquito bites are:

- Mosquitoes that transmit malaria typically bite after sunset however, day biting mosquitoes transmit other diseases. Bite avoidance should therefore be practiced at all times
- Wearing loose long sleeved clothing and long trousers can help prevent bites
- Mosquitoes may bite through thin clothing so spray an insecticide or repellent on them
- Insect repellents should be used on exposed skin. There is no specific data on the safety of DEET in pregnancy however it has been used since 1956. 50% DEET solutions are known to be effective in preventing bites
- Spraying insecticides in the room, burning pyrethroid coils and heating insecticide impregnated tablets all help to control mosquitoes
- If sleeping in an unscreened room or out of doors, a mosquito net impregnated with insecticide is a sensible precaution
- **Garlic, vitamin B and ultrasound devices do not prevent bites.**

Testing in pregnant women

There is no routine testing in pregnancy. Diagnostic tests should be performed when the symptoms and travel history indicate that malaria may be a cause. Suspicion of malaria requires prompt confirmation by malaria a blood film, as there are no clinical algorithms that permit accurate diagnosis by signs and symptoms. The diagnosis of malaria in pregnancy relies on microscopic examination of thick and thin blood films for parasites or the use of rapid diagnostic tests which detect specific parasite antigen or enzyme. Rapid diagnostic tests are less sensitive than malaria blood films. These tests are usually accessed by the haematology service.

Management in pregnancy

The clinical condition is the most important indicator of severity and should be assessed promptly. The severity of malaria determines the treatment and predicts the fatality rate. In uncomplicated malaria fatality rates are low at approximately 0.1% for *P. falciparum*. In severe malaria, particularly in pregnancy, fatality rates are high (15 to 20% in non-pregnant women compared with 50% in pregnancy).

It is advisable to hospitalise all pregnant women with malaria, especially those with *P. falciparum*, as the clinical condition can deteriorate rapidly.

Advice on the diagnosis and management of all pregnant women with suspected malaria should be sought from your local microbiology or infectious disease departments.

Management of the neonate

Specialist advice regarding testing and treatment should be sought as this is a very rare occurrence.

5.10 Toxoplasmosis

Toxoplasmosis is an infection caused by a parasite called *toxoplasma gondii*. The organism lives in the muscle tissue of some animals. The cat is the definitive host of the parasite and therefore the organism is present in cat faeces.

There are around 350 cases reported in England and Wales each year but mostly it is undiagnosed as there are often no symptoms. It is estimated that up to a third of the UK population will be infected at some point in their lives.

Incubation Period	10 - 20 days from ingesting contaminated meat 5 - 20 days from contact with infected cat faeces
Routes of Transmission	Ingestion
Presentation	The majority of cases are asymptomatic 10 - 20% have mild flu like symptoms with lymphadenopathy
Implications for Pregnancy	Women can transmit the infection to the unborn baby
Incidence in Pregnancy (UK)	The incidence of congenital toxoplasmosis is very small: only 3 babies in every 100,000
Infection Control Precautions	Good hand hygiene
Notifiable	No

How to avoid infection in pregnancy

In addition to regular hand washing pregnant women should:

- Avoid eating unwashed fruits and vegetables, undercooked meat and unpasteurized milk
- Ensure good hand washing when preparing raw meat and vegetables
- Wear gloves for gardening
- Avoid changing cat litter or change it daily and wear gloves

Testing in pregnant women

Routine antenatal screening or routine testing of groups perceived to be at higher risk of contracting toxoplasmosis, is not advised as primary infection in pregnancy is rare in the UK. Screening is neither cost effective nor viable, even in perceived high risk groups. Serological tests should be performed following abnormal fetal ultrasound (see section 4).

In these cases the purpose of a serology investigation is to investigate whether the pregnant woman has ever been infected with toxoplasmosis and, if so, to try to determine when. If at the time fetal abnormality is observed, the maternal IgG is negative, then toxoplasma can be excluded as a cause of the abnormality and further investigations for this infection are not required.

If the mother demonstrates the presence of toxoplasma IgG then the booking blood and the current blood sample should be tested together for both toxoplasma IgG and IgM. These samples should be submitted to the toxoplasma reference laboratory in Swansea. Health professionals will need to contact the local health board microbiologist in order to facilitate this.

If an amniocentesis is planned as part of the investigative process for the fetal abnormality then an aliquot for molecular tests should be taken. Molecular tests for toxoplasma DNA may be required following the results of the serological investigations on the mother.

Consequences of infection during pregnancy

There is a risk to the fetus if a mother becomes infected just before or during pregnancy.

Risk of vertical transmission related to the timing of maternal infection

The risk of transmission varies increasing with gestational age reaching 70 to 90% in the third trimester but most of these babies will not be affected. The risk of the neonate being affected is highest when the maternal infection occurs early in pregnancy but at this stage placental transmission is low, therefore the highest risk of developing early signs of congenital infection is about 10% when maternal infection occurs between 20 to 30 weeks gestation[82].

Management in pregnancy

If the infection is confirmed during pregnancy vertical transmission may be reduced by treating the pregnant woman with an antibiotic called spiramycin. Expert advice should be sought and this can be accessed by a consultant microbiologist.

Management of the neonate

The diagnosis is made by reviewing maternal serology and confirming the presence of the organism in the neonate. EDTA and urine samples are required and testing should be discussed with the local microbiologist to ensure the reference laboratory is aware of the case.

Treatment of congenitally infected neonates should always be initiated after detailed discussion with a microbiologist and a paediatric infectious disease specialist as optimum treatment regimen and duration are not well established.

82 Kravetz J. (2010). Congenital Toxoplasmosis. BMJ Clinical Evidence. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275329/