UK Standards for Microbiology Investigations

Investigation of exposure to vesicular and non-vesicular rash in pregnancy

This publication was created by Public Health England (PHE) in partnership with the NHS.

Issued by the Standards Unit, National Infection Service, PHE

Virology | V 30 | Issue no: 6 | Issue date: 09.03.21 | Page: 1 of 17

© Crown copyright 2021
Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of PHE working in partnership with the National Health Service (NHS), Public Health Wales and with the professional organisations whose logos are displayed below and listed on the website https://www.gov.uk/uk-standards-for-microbiology-investigations-smi-quality-and-consistency-in-clinical-laboratories. UK SMIs are developed, reviewed and revised by various working groups which are overseen by a steering committee (see https://www.gov.uk/government/groups/standards-for-microbiology-investigations-steering-committee).

The contributions of many individuals in clinical, specialist and reference laboratories who have provided information and comments during the development of this document are acknowledged. We are grateful to the medical editors for editing the medical content.

PHE publications gateway number: GW-1142
UK Standards for Microbiology Investigations are produced in association with:
Investigation of exposure to vesicular and non-vesicular rash in pregnancy

Contents

Acknowledgments .................................................................................................................................2
Amendment table ....................................................................................................................................4
1. General information ...............................................................................................................................5
2. Scientific information ...............................................................................................................................5
3. Scope of document .................................................................................................................................5
4. Safety considerations .............................................................................................................................6
5. Specimen processing and procedure .....................................................................................................6
Algorithm 1: Overview ...............................................................................................................................7
Algorithm 2: Investigation of parvovirus B19 (B19V) in immunocompetent people exposed to non-vesicular rash during pregnancy ..................................................................................................................8
Algorithm 3: Investigation of rubella in immunocompetent people exposed to non-vesicular rash during pregnancy (with no serological or vaccination evidence of past infection) .........................................................................................................................9
Algorithm 4: Investigation of measles in immunocompetent people exposed to non-vesicular rash during pregnancy .................................................................................................................................10
Algorithm 5: Investigation of chickenpox in immunocompetent people exposed to vesicular rash or confirmed chickenpox (who have no evidence of past infection or full immunisation) during pregnancy .................................................................................................................................11
Footnotes ..................................................................................................................................................12
6. Interpreting and reporting laboratory results ........................................................................................14
References .................................................................................................................................................17
### Amendment table

Each UK SMI has an individual record of amendments. The current amendments are listed on this page. The amendment history is available from [standards@phe.gov.uk](mailto:standards@phe.gov.uk).

New or revised documents should be controlled within the laboratory in accordance with the local quality management system.

<table>
<thead>
<tr>
<th>Amendment number/date</th>
<th>8/09.03.21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue number discarded</td>
<td>5</td>
</tr>
<tr>
<td>Insert issue number</td>
<td>6</td>
</tr>
<tr>
<td>Anticipated next review date*</td>
<td>09.03.24</td>
</tr>
</tbody>
</table>

**Section(s) involved** | **Amendment**
---|---
Whole document | Document written in the new UK SMI virology template. Document now includes investigation of pregnant people exposed to chickenpox or shingles.
Algorithm 1 | An overview algorithm has been added
Algorithm 5 | An algorithm describing VZV IgG quantitative testing has been added
Footnotes | Footnotes were updated
Interpreting and reporting tables | Interpreting and reporting tables were added to the document An extra table with VZV qualitative testing was added to the document

*Reviews can be extended up to five years subject to resources available.
1. **General information**

View general information related to UK SMIs.

2. **Scientific information**

View general information related to UK SMIs.

3. **Scope of document**

This document covers the investigation of samples from immunocompetent people exposed to certain vesicular and maculopapular rashes during pregnancy, and describes a laboratory procedure to investigate possible contact with the following viruses:

- Parvovirus B19 (fifth disease, erythema infectiosum, slapped cheek syndrome)
- Rubella virus (German measles)
- Rubeola virus (measles)
- Varicella zoster virus (chickenpox/shingles)

The recommendations assume that immunisation status has been determined from the vaccination record and/or serology results. A person is considered immune if they are immunocompetent and either have had two doses of a vaccine that protects against rubella, measles and chickenpox or have laboratory evidence of prior immunity or laboratory confirmed prior infection. Where immunisation history or prior tests suggest no immunity proceed to testing algorithms.

It is common not to know the cause of an infective maculopapular rash illness at the time of contact notification, and for limited information to be available. Whilst laboratory testing to determine the cause of the rash in the source of the contact is recommended, this may not occur or may occur too slowly. Therefore, for pregnant contacts of maculopapular rash illness, investigation of parvovirus B19, rubella and measles immunity should be considered in parallel if indicated by clinical and epidemiological features. If the contact has a laboratory confirmed diagnosis, immunity testing of the contact is only necessary for that viral cause. Clinical features and local epidemiology can inform the likelihood of the viral cause, for example, in measles respiratory symptoms (coryza, sneezing, cough) are prominent, early features of infection in most patients and may be used to differentiate measles from parvovirus B19 and rubella infection. Regardless of a request for specific rubella or parvovirus B19 testing, PHE guidance recommends that pregnant people should be simultaneously investigated for immunity to both infections unless their immune status is already known.

If immunisation history or tests indicate immunity to all viruses under investigation, reassure risk of illness is remote. The patient should be advised to seek medical advice if they develop symptoms. All rashes should be reported during pregnancy, regardless of known immunity or vaccination status.

This document is restricted to viruses with clear management intervention during pregnancy; bacterial rashes such as scarlet fever and syphilis have not been
considered. Many viral pathogens can cause illness with rash, but are not included in this document; some examples of these include:

- Enterovirus
- Herpes Simplex Virus (HSV)
- Human Herpesvirus 6 and 7 (HHV 6 and 7)
- Cytomegalovirus (CMV)
- Epstein-Barr Virus (EBV)
- Zika virus

Enterovirus, human herpes virus 6 and 7, and Epstein-Barr virus are not associated with congenital infection syndromes. Herpes simplex virus and cytomegalovirus are associated with congenital infection and HSV is much more associated with perinatal infections\(^3,4\).

For more information on Epstein-Barr Virus and cytomegalovirus investigation, please refer to: [UK SMI V 26: Epstein-Barr virus serology](https://www.gov.uk/government/publications/epstein-barr-virus-serology) and [UK SMI V 28: investigation of cytomegalovirus infection](https://www.gov.uk/government/publications/cytomegalovirus-infection).


### 4. Safety considerations

This guidance should be supplemented with local COSHH and risk assessments. Users are asked to refer to current guidance on the safe handling of the organisms mentioned in this UK SMI.

### 5. Specimen processing and procedure

#### 5.1 Specimen type

<table>
<thead>
<tr>
<th>Serology: Blood, serum</th>
</tr>
</thead>
<tbody>
<tr>
<td>For NAAT: oral fluid, throat swab, vesicle swab, urine</td>
</tr>
</tbody>
</table>

#### 5.2 Specimen transport and storage conditions

Specimens should be collected in appropriate CE marked leak proof containers and transported in sealed plastic bags.

Specimens should be transported and processed according to manufacturer’s instructions or local validation data\(^8\).

Samples should be retained in accordance with The Royal College of Pathologists guidelines ‘The retention and storage of pathological records and specimens’\(^9\).
Algorithm 1: Overview

A text description of this algorithm is provided with this document.

Non-vesicular rash, consider:

- **Parvovirus**
  - Non-vesicular rash: consider:
    - Measles *
      - History of 2 doses of measles containing vaccine, or known to be immune
        - YES
          - Measles risk is remote. Advise to contact healthcare services if rash develops. Refer to PHE guidance**
        - NO
          - Is the index case a likely case of measles?
            - NO
              - Parvovirus B19 IgM and IgG testing (Algorithm 2)
            - YES
              - Measles IgG testing (Algorithm 4)

- **Rubella ***
  - History of 2 doses of rubella containing vaccine, or one rubella antibody test where rubella antibody was detected
    - NO
      - Rubella risk is remote. Advise to contact healthcare services if rash develops. Refer to PHE guidance**
    - YES
      - Rubella IgG and IgM testing (Algorithm 3)

- **Chicken pox or Shingles**
  - Reliable history of chicken pox, shingles, previous IgG or 2 doses of varicella vaccine?
    - NO
    - YES

Vesicular rash: consider:

** Measles and rubella testing will be subject to local epidemiology and decision

** Public Health England. Guidance on the investigation, diagnosis and management of viral illness, or exposure to viral rash illness, in pregnancy².
Algorithm 2: Investigation of parvovirus B19 (B19V) in immunocompetent people exposed to non-vesicular rash during pregnancy

This information is also presented in Table 1

Test for parvovirus B19 IgM and IgG on blood taken soon after contact (as soon as possible, ideally within 4 weeks)\(^a, b, c, d\)

- **B19V IgG Not reactive or Equivocal; B19V IgM Not reactive**
  - **Report:**
    - “Susceptible to Parvovirus B19. Please send further serum one month after last contact even if asymptomatic, or earlier if illness develops. Advise patient to contact healthcare services if rash and/or symptoms develop”\(^k, l\)

- **B19V IgG Reactive; B19V IgM Not reactive**\(^d, e\)
  - **Report:**
    - “Evidence of past (not recent) Parvovirus B19 infection, indicating immunity. Advise patient to contact healthcare services if rash and/or symptoms develop.”

- **B19V IgG Reactive or Not reactive; B19V IgM Reactive**\(^f, g\)
  - **Report:**
    - “Confirmed IgM Reactive. Evidence of recent parvovirus B19 infection. If pregnancy ongoing, refer to obstetrician for fetal monitoring.”
  - **Consider B19V NAAT or alternative IgM format assay.**
  - **Consider testing an earlier sample, or alternatively obtain further serum 7 to 10 days after the initial sample, to confirm for IgG seroconversion if the initial sample is IgG negative.**
  - **Report indicated by results of additional testing**\(^h\)
Algorithm 3: Investigation of rubella in immunocompetent people exposed to non-vesicular rash during pregnancy (with no serological or vaccination evidence of past infection)

This information is also presented in Table 2.

- Test for rubella-specific IgM and IgG on blood taken soon after contact (as soon as possible, ideally within 4 weeks) \(^{c, d, f, j, k}\)

  - **Rubella IgG Not reactive or**
    - **Equivocal;**
    - **Rubella IgM Not reactive**

    **Report:**
    
    "No evidence of immunity to rubella. Regard as susceptible. Test serum one month after last contact or earlier if illness develops. Advise patient to contact healthcare services if rash and/or symptoms develop." \(^{n, o}\)

  - **Rubella IgG Reactive;**
    - **Rubella IgM Not reactive**

    **Report:**
    
    "No evidence of recent primary rubella. Regard as immune, independently from vaccination status. Advise patient to contact healthcare services if rash and/or symptoms develop."

  - **Rubella IgG Reactive or**
    - **Not reactive \(^t\);**
      - **Rubella IgM Reactive \(^g, m\)**

    **Second confirmatory IgM test and/or Reference lab for confirmation \(^p\)**

    **Report:**
    
    As indicated by results from reference laboratory. Advise patient to contact healthcare services if rash and/or symptoms develop.
**Algorithm 4: Investigation of measles in immunocompetent people exposed to non-vesicular rash during pregnancy**

This information is also presented in table 3

---

**Test for measles-specific IgG on blood taken soon after contact** (as soon as possible, ideally within 6 days)

- **Measles IgG Not reactive**
  - Report: “Susceptible to measles. Consider HNIG prophylaxis and advise vaccination post pregnancy.”
  - Refer to ‘Immunisation against infectious disease (The Green Book)’ and PHE guidelines.

- **Measles IgG Equivocal**
  - Report: “Uncertain immunity status, prophylaxis not offered in accordance with PHE guidelines. Most patients with equivocal serology have adequate measles immunity; post-exposure prophylaxis is not indicated. Advise patient to contact healthcare services if rash and/or symptoms develop.”

- **Measles IgG Reactive**
  - Report: “Evidence of immunity from past infection or immunisation. Regard as immune. Advise patient to contact healthcare services if rash and/or symptoms develop.”

---
Algorithm 5: Investigation of chickenpox in immunocompetent people exposed to vesicular rash or confirmed chickenpox\(^t\) (who have no evidence of past infection or full immunisation) during pregnancy

This information is also presented in table 4.

Quantitative test for VZV-specific IgG on blood taken soon after contact (for qualitative IgG testing and interpretation, refer to reporting table 5)

- **VZV IgG <100 mIU/mL**
  - Report: "Susceptible to Chickenpox. Consider prophylaxis: VZIG or antiviral. Advise patient to contact healthcare services if rash and/or symptoms develop"

- **VZV IgG >100 mIU/mL**
  - Report: "Evidence of immunity from past infection or immunisation. Regard as immune. Advise patient to contact healthcare services if rash and/or symptoms develop"
Investigation of exposure to vesicular and non-vesicular rash in pregnancy

Footnotes

a) The infectious period of patients with parvovirus B19 is 7 to 10 days before the onset of rash, including the day of onset.2

b) The risks of fetal loss and hydrops fetalis are highest when parvovirus B19 infection occurs within the first 20 weeks of gestation. If exposed after 20 weeks of gestation the risks of fetal damage are low, but the testing algorithm should still be followed. Determining the date of infection can be difficult in the absence of maternal illness but may be possible when using retrospective testing of earlier samples.

c) If an earlier sample is available, such as an antenatal infectious disease screening (booking) blood taken ≥4 weeks before reporting rash contact, consider testing this for IgG rather than requesting a current sample. If IgG positive the risk of illness is remote.

d) If contact is declared ≥ 1 month after exposure, a negative IgM result may not exclude relatively recent infection. If possible, test earlier sample.

e) In some patients, testing an earlier sample and a current sample may detect unrecognised earlier infections in pregnancy through IgG seroconversion. Specialist advice should be sought if this occurs.

f) In some patients, IgM may be persistent. In these situations testing an earlier sample may assist diagnosis by demonstrating presence or absence of seroconversion.

g) Caution should be taken when interpreting IgM results; low reactivity is often non-specific. Consider testing for potential cross reacting IgM and for recent EBV infection.

h) If confirmation is delayed, an interim report may be required. Interim report based on low level activity IgM results should state that low reactivity may be non-specific.

i) Investigate later sample for parvovirus B19 IgG and IgM.

j) This algorithm refers to pregnant people whose immunisation status to rubella is unknown or unconfirmed.2 If a pregnant person is regarded as immune (see footnote c) the risk of rubella infection is remote but they are to return for testing if relevant illness (rash, arthralgia) develops.1,2

k) The risk of severe congenital defect with rubella virus occurs predominantly when infection happens within the first 16 weeks of gestation, although cases of deafness may result from infection occurring between 16 and 20 weeks. If exposed after 20 weeks, the risk is remote. However, continue testing to confirm the date of infection relative to gestational age.10

l) If an earlier sample has tested as IgG negative and seroconversion has occurred, further investigation is required.

m) Primary rubella is uncommon in the UK and most initial reactive IgM results are most likely false positive and should be referred for further testing. The clinical team should be contacted to establish the clinical setting and to ensure a follow
Investigation of exposure to vesicular and non-vesicular rash in pregnancy

up sample is received in good time. Interim reports should clearly state that IgM and IgG avidity confirmatory results are pending.

n) A two dose course of MMR vaccine is advised on completion of pregnancy and in the absence of any contraindication if the patient is confirmed as susceptible.

o) Investigate later serum for rubella IgG and IgM. Diagnose and advise on results and consider NAAT if illness develops or seroconversion is observed in follow up sample.

p) Obtain further serum 7 to 10 days after initial test, or test blood stored earlier for comparison. Serology test results compatible with rubella infection should always be referred to reference laboratory for confirmation of results and IgG avidity.

q) In susceptible pregnant people, human normal immunoglobulin (HNIG) prophylaxis will be issued up to 6 days after exposure.

r) Isolated IgG results from tests carried out ≥ 6 days after exposure cannot be interpreted in this clinical scenario. Refer to PHE guidelines for post-exposure prophylaxis for measles.

s) Varicella Zoster immune globulin (VZIG) should be issued for pregnant contacts in the first 20 weeks of pregnancy, ie up to and including 20+0 weeks who have <100 mIU/mL. For susceptible people exposed after 20 weeks (20+1) to delivery, either VZIG or oral aciclovir is recommended. Please refer to PHE guidance.

t) Hand, foot and mouth disease caused by enteroviruses have similar symptoms to chickenpox. It is recommended to send a throat or vesicle swab for laboratory confirmation by PCR when clinical features are not strongly consistent with chickenpox or VZV.
6. **Interpreting and reporting laboratory results**

Table 1: Interpretation and reporting table for parvovirus B19 IgM and IgG tests:

<table>
<thead>
<tr>
<th></th>
<th>B19 IgG</th>
<th>B19 IgM</th>
<th>Interpretative comment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not reactive or Equivocal</td>
<td>Not reactive</td>
<td>Susceptible to parvovirus B19. Please send further serum 1 month after last contact even if asymptomatic, or earlier if illness develop. Investigate later sample for parvovirus B19 IgG and IgM.</td>
<td>Advise to contact healthcare services if rash and/or symptoms develop</td>
</tr>
<tr>
<td>2</td>
<td>Reactive</td>
<td>Not reactive</td>
<td>Evidence of past (not recent) parvovirus B19 infection, indicating immunity</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Reactive/ Not reactive</td>
<td>Reactive</td>
<td>Report results from additional testing: Confirmed IgM reactive. Evidence of recent parvovirus B19 infection. If pregnancy ongoing, refer to obstetrician for fetal monitoring</td>
<td>Test earlier samples or obtain further serum 7 to 10 days after initial sample to look for seroconversion Consider B19 NAAT or alternative IgM assay</td>
</tr>
</tbody>
</table>

Table 2: Interpretation and reporting table for rubella-specific IgM and IgG tests:

<table>
<thead>
<tr>
<th></th>
<th>Rubella IgG</th>
<th>Rubella IgM</th>
<th>Interpretative comment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not reactive or Equivocal</td>
<td>Not reactive</td>
<td>No evidence of immunity to rubella. Regard as susceptible. Test serum one month after last contact or earlier if illness develops. Advise patient to contact healthcare services if rash and/or symptoms develop.</td>
<td>Consider NAAT (oral fluid, throat swab or urine) if illness develops or seroconversion is observed on later samples</td>
</tr>
<tr>
<td>2</td>
<td>Reactive</td>
<td>Not reactive</td>
<td>No evidence of recent primary rubella. Regard as immune, independently from vaccination status. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td>Test earlier samples or obtain further serum 7 to 10 days after initial sample to confirm finding. Refer to Reference laboratory for confirmation of results and avidity Consider public health notification of initial result, depending on local protocol</td>
</tr>
<tr>
<td>3</td>
<td>Reactive/ Not reactive</td>
<td>Reactive</td>
<td>Report results from reference laboratory Issue interim report Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td></td>
</tr>
</tbody>
</table>
Investigation of exposure to vesicular and non-vesicular rash in pregnancy

Table 3: Interpretation and reporting table for measles-specific IgG test:

<table>
<thead>
<tr>
<th>Measles IgG</th>
<th>Interpretative comment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Not reactive</td>
<td>Susceptible to measles. Consider HNIG prophylaxis and advise vaccination post pregnancy. Refer to &quot;Immunisation against infectious disease (The Green Book)&quot; and PHE guidelines</td>
<td>Prophylaxis (HNIG) is recommended, consider vaccination post pregnancy Advised to seek medical advice if rash and/or symptoms develop</td>
</tr>
<tr>
<td>2 Equivocal</td>
<td>Uncertain immunity status, prophylaxis not offered in accordance with PHE guidelines. Most patients with equivocal serology have adequate measles immunity; post-exposure prophylaxis is not indicated. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td>Do not offer prophylaxis (HNIG), consider vaccination post pregnancy Most patient with equivocal serology have adequate measles immunity. Consider vaccination post pregnancy.</td>
</tr>
<tr>
<td>3 Reactive</td>
<td>Evidence of immunity from past infection or immunisation. Regard as immune. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Interpretation and reporting table for VZV quantitative IgG test:

<table>
<thead>
<tr>
<th>VZV quantitative IgG</th>
<th>Interpretative comment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &lt;100 mIU/ml</td>
<td>Susceptible to chickenpox. Consider prophylaxis: VZIG or antiviral. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td>No serological evidence of previous infection Prophylaxis is recommended in line with PHE guidance (UK specific)</td>
</tr>
<tr>
<td>2 &gt;100 mIU/ml</td>
<td>Evidence of immunity from past infection or immunisation. Regard as immune. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td></td>
</tr>
</tbody>
</table>
Table 5: If using VZV qualitative IgG test (no flowchart) consider the following interpretation and reporting table:

<table>
<thead>
<tr>
<th>VZV qualitative IgG</th>
<th>Interpretative comment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Not reactive</td>
<td>Susceptible to chickenpox. Consider prophylaxis: VZIG or antiviral</td>
<td>No serological evidence of previous infection. Retest with a confirmatory quantitative assay (Table 4). If the result from quantitative testing will not be available within 10 days of exposure then VZIG should be given.</td>
</tr>
<tr>
<td>2 Equivocal</td>
<td>Uncertain immunity status. VZIG is not recommended.</td>
<td>Prophylaxis (VZIG) is not offered in this case in accordance with PHE guidelines. Retest with a confirmatory quantitative assay (Table 4). If the result from quantitative testing will not be available within 10 days of exposure then VZIG is not recommended.</td>
</tr>
<tr>
<td>3 Reactive</td>
<td>Evidence of immunity from past infection or immunisation. Regard as immune. Advise patient to contact healthcare services if rash and/or symptoms develop</td>
<td>Do not issue VZIG.</td>
</tr>
</tbody>
</table>
Investigation of exposure to vesicular and non-vesicular rash in pregnancy

References


