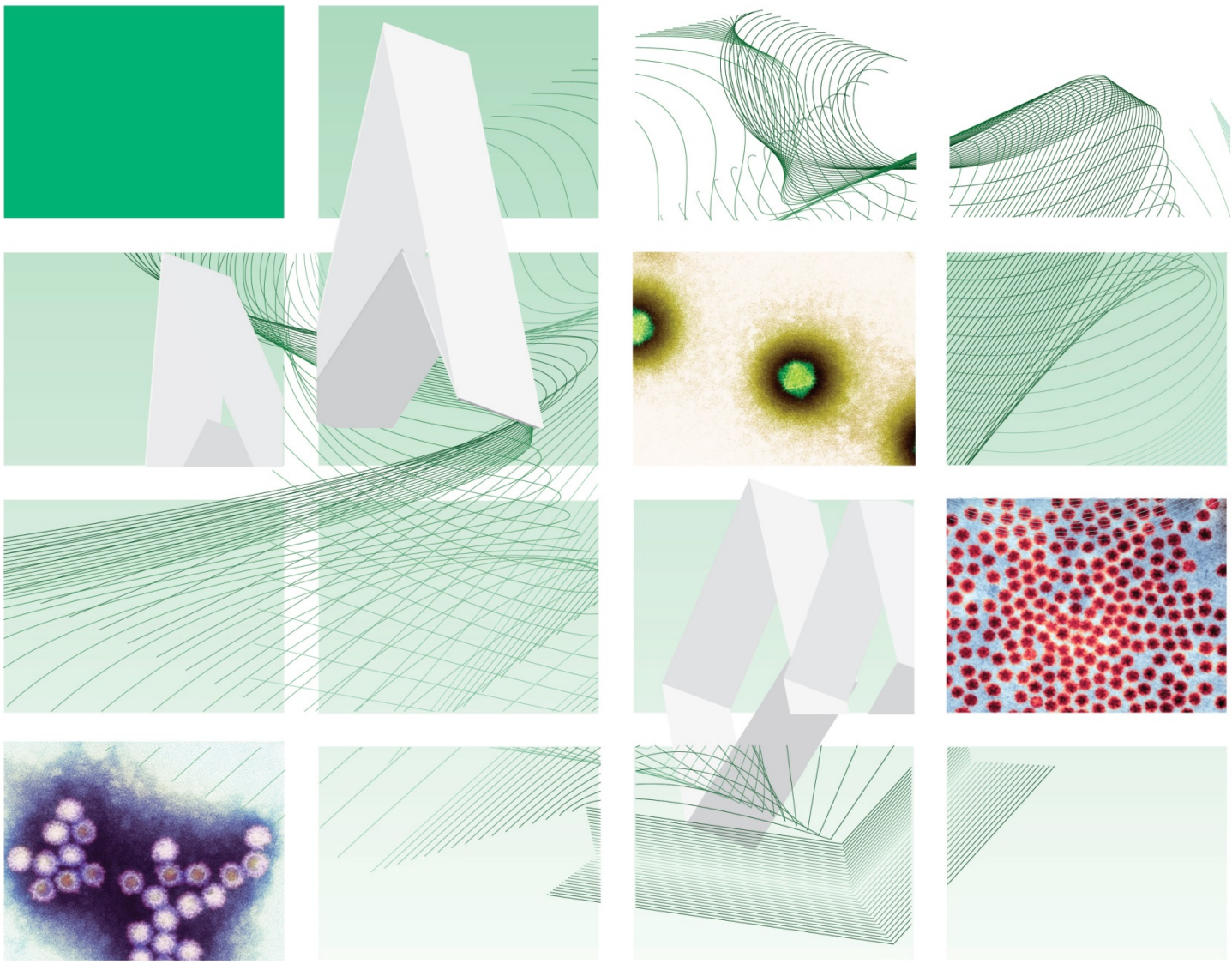
Public Health England

NHS

UK Standards for Microbiology Investigations

Chlamydial zoonotic infections



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"NICE has renewed accreditation of the process used by **Public Health England (PHE)** to produce **UK Standards for Microbiology Investigations**. The renewed accreditation is valid until **30 June 2021** and applies to guidance produced using the processes described in **UK standards for microbiology investigations (UKSMIs) Development process, S9365', 2016**. The original accreditation term began in **July 2011.**"

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Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of Public Health England (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.

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UK Standards for Microbiology Investigations are produced in association with:

Logos correct at time of publishing.

Contents

Amendment table

Each UK SMI method has an individual record of amendments. The current amendments are listed on this page. The amendment history is available from standards@phe.gov.uk.

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

Amendment number/date	5/27.10.16
Issue number discarded	2
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Anticipated next review date*	14.11.17
Section(s) involved	**Amendment**
Whole document.	V 57 formerly G 3. Document presented in a new format.

Amendment number/date	4/14.11.14
Issue number discarded	1.2
Insert issue number	2
Section(s) involved	**Amendment**
Whole document.	Hyperlinks updated to gov.uk.
Page 2.	Updated logos added.
Scope of document.	The type of specimens in this section of the text has been updated.
Introduction.	Taxonomy updated. More information has been added to the section. Some sentences were moved to other sections where it fits while some were reworded.
Avian chlamydiosis.	Updated to include information regarding molecular methods that could be used in diagnosis of chlamydial infections.
Diagnosis of psittacosis/ornithosis.	This section has been updated to include the molecular, culture and serology methods that could be used in diagnosis of psittacosis/ornithosis.

Zoonotic infection with chlamydiae of ruminant origin.	Updates have been done in section 3 and two more web links have also been updated. There is a mention of families Parachlamydiceae and Waddliaceae being recognised as agents of adverse pregnancy outcomes.
Diagnosis of chlamydial abortion.	This section has been updated to include the molecular and serology methods that could be used in diagnosis of chlamydial abortion.
Reporting.	This section is a new addition to the document.
Appendix 1: Taxonomy of Chlamydiales.	This section has been developed for guidance.
Appendix 2: Diseases caused by chlamydiae in man and in animals.	This section has been developed for guidance.
References.	Some references updated.

UK SMI[#]: scope and purpose

Users of UK SMIs

Primarily, UK SMIs are intended as a general resource for practising professionals operating in the field of laboratory medicine and infection specialties in the UK. UK SMIs also provide clinicians with information about the available test repertoire and the standard of laboratory services they should expect for the investigation of infection in their patients, as well as providing information that aids the electronic ordering of appropriate tests. The documents also provide commissioners of healthcare services with the appropriateness and standard of microbiology investigations they should be seeking as part of the clinical and public health care package for their population.

Background to UK SMIs

UK SMIs comprise a collection of recommended algorithms and procedures covering all stages of the investigative process in microbiology from the pre-analytical (clinical syndrome) stage to the analytical (laboratory testing) and post analytical (result interpretation and reporting) stages. Syndromic algorithms are supported by more detailed documents containing advice on the investigation of specific diseases and infections. Guidance notes cover the clinical background, differential diagnosis, and appropriate investigation of particular clinical conditions. Quality guidance notes describe laboratory processes which underpin quality, for example assay validation.

Standardisation of the diagnostic process through the application of UK SMIs helps to assure the equivalence of investigation strategies in different laboratories across the UK and is essential for public health surveillance, research and development activities.

Equal partnership working

UK SMIs are developed in equal partnership with PHE, NHS, Royal College of Pathologists and professional societies. The list of participating societies may be found at https://www.gov.uk/uk-standards-for-microbiology-investigations-smi-quality-and-consistency-in-clinical-laboratories. Inclusion of a logo in an UK SMI indicates participation of the society in equal partnership and support for the objectives and process of preparing UK SMIs. Nominees of professional societies are members of the Steering Committee and working groups which develop UK SMIs. The views of nominees cannot be rigorously representative of the members of their nominating organisations nor the corporate views of their organisations. Nominees act as a conduit for two way reporting and dialogue. Representative views are sought through the consultation process. UK SMIs are developed, reviewed and updated through a wide consultation process.

Quality assurance

NICE has accredited the process used by the UK SMI working groups to produce UK SMIs. The accreditation is applicable to all guidance produced since October 2009. The process for the development of UK SMIs is certified to ISO 9001:2008. UK SMIs represent a good standard of practice to which all clinical and public health

[#] Microbiology is used as a generic term to include the two GMC-recognised specialties of Medical Microbiology (which includes Bacteriology, Mycology and Parasitology) and Medical Virology.

microbiology laboratories in the UK are expected to work. UK SMIs are NICE accredited and represent neither minimum standards of practice nor the highest level of complex laboratory investigation possible. In using UK SMIs, laboratories should take account of local requirements and undertake additional investigations where appropriate. UK SMIs help laboratories to meet accreditation requirements by promoting high quality practices which are auditable. UK SMIs also provide a reference point for method development. The performance of UK SMIs depends on competent staff and appropriate quality reagents and equipment. Laboratories should ensure that all commercial and in-house tests have been validated and shown to be fit for purpose. Laboratories should participate in external quality assessment schemes and undertake relevant internal quality control procedures.

Patient and public involvement

The UK SMI working groups are committed to patient and public involvement in the development of UK SMIs. By involving the public, health professionals, scientists and voluntary organisations the resulting UK SMI will be robust and meet the needs of the user. An opportunity is given to members of the public to contribute to consultations through our open access website.

Information governance and equality

PHE is a Caldicott compliant organisation. It seeks to take every possible precaution to prevent unauthorised disclosure of patient details and to ensure that patient-related records are kept under secure conditions. The development of UK SMIs is subject to PHE Equality objectives https://www.gov.uk/government/organisations/public-health-england/about/equality-and-diversity.

The UK SMI working groups are committed to achieving the equality objectives by effective consultation with members of the public, partners, stakeholders and specialist interest groups.

Legal statement

While every care has been taken in the preparation of UK SMIs, PHE and the partner organisations, shall, to the greatest extent possible under any applicable law, exclude liability for all losses, costs, claims, damages or expenses arising out of or connected with the use of an UK SMI or any information contained therein. If alterations are made by an end user to an UK SMI for local use, it must be made clear where in the document the alterations have been made and by whom such alterations have been made and also acknowledged that PHE and the partner organisations shall bear no liability for such alterations. For the further avoidance of doubt, as UK SMIs have been developed for application within the UK, any application outside the UK shall be at the user's risk.

The evidence base and microbial taxonomy for the UK SMI is as complete as possible at the date of issue. Any omissions and new material will be considered at the next review. These standards can only be superseded by revisions of the standard, legislative action, or by NICE accredited guidance.

Suggested citation for this document

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Scope of document

Type of specimen

Serum, plasma, whole blood, sputum, tracheal aspirate, pleural fluid, bronchoalveolar fluid, throat swabs, eye swabs, placental tissue from abortions, amniotic fluid, nasopharyngeal aspirates

This UK SMI describes zoonotic Chlamydial infections in humans only.

This UK SMI should be used in conjunction with other UK SMIs.

Introduction

Classification of the Gram negative bacteria within the order Chlamydiales has always been controversial. The order's taxonomy has now been revised and expanded[1,2], based on molecular biology and phylogenetic analysis of the 16S and 23S ribosomal RNA (rRNA) genes, and is supported by analyses of several other genes, including the major outer membrane protein gene (MOMP)[2,3]. This revised taxonomy has been adopted by most researchers working on animal chlamydiosis but is still disputed by some involved in human infections[1].

The order Chlamydiales currently contains four families, namely Chlamydiaceae, Parachlamydiaceae, Simkaniaceae and Waddliaceae.

The family Chlamydiaceae contains two genera, *Chlamydia* and *Chlamydophila,* which are abbreviated as *C* and *Cp*[1]*.* There are nine species within these genera: three for the genus *Chlamydia* (*Chlamydia trachomatis, Chlamydia muridarum*, and *Chlamydia suis)*; and six for the genus *Chlamydophila* (*Chlamydophila pneumoniae, Chlamydophila pecorum, Chlamydophila psittaci*, *Chlamydophila abortus*, *Chlamydophila caviae* and *Chlamydophila felis*[4,5]. The latter four species were known, collectively, as *Chlamydia psittaci* prior to taxonomic revision.

It is notable that, for all four of the new species that used to make up *Cp. psittaci*, the distinct tissue tropisms seen in the natural hosts are also observed in zoonotic infections. Understanding the cellular and molecular bases of these tropisms still constitutes a major challenge for future research.

Parachlamydiaceae has two genera, *Neochlamydia* and *Parachlamydia,* each with one species only (*Neochlamydia hartmanellae* and *Parachlamydia acanthamoebae* respectively)*.*

The remaining families, Simkaniaceae and Waddliaceae, contain one species each (*Simkania nevegensis* and *Waddlia chondrophila* respectively).

Simkania nevegensis has been associated with human respiratory disease[6]. *Simkania* and the Parachlamydiaceae have been detected by polymerase chain reaction (PCR) in a wide range of clinical specimens from both human and animal sources. They are considered to be emerging pathogens but, as animal to human transmission has not been described, they are currently outside the scope of this document[7-9].

Diagnosis of chlamydial infections has benefited greatly from the introduction of molecular techniques, particularly PCR. These have allowed the detection, identification and quantification of chlamydial infections, such as *Cp. psittaci* with relative ease[10,11]. DNA microarrays or sequencing can also be used for diagnosis.

Further analysis can also be done using polymerase chain reaction restriction fragment length polymorphism (PCR-RFLP) or Multi-locus VNTR analysis (MLVA)[12].

Alternative tests for diagnosis of avian chlamydiosis include culture, immunohistochemical staining, serology assays such as enzyme-linked immunosorbent assay (ELISA), Indirect fluorescent antibody (IFA), microimmunofluorescene test (MIF) and Complement Fixation Test (CFT)[13,14]. However, some cross reactivity with other Chlamydiae including *Cp. pneumoniae, C. trachomatis, and Cp. felis* can occur in all serological tests[15].

Diagnostic testing for chlamydial zoonoses is unsatisfactory. There are no commercially available test procedures, in either human or veterinary medicine, which are both sensitive and species-specific. Species-specific testing is largely restricted to specialised laboratories[16].

This document will describe the two well established types of zoonotic chlamydial infection, including their diagnosis and briefly review the surveillance that may be needed in the future.

Avian chlamydiosis

Avian chlamydiosis is caused by the *Chlamydophila psittaci*. *Cp. psittaci* has at least eight serovars (six avian serovars and two mammalian isolates and nine genotypes (seven avian and two non-avian genotypes based on *omp*A sequence variations). Chlamydial infections from birds were among the earliest recognised zoonotic infections but, even so, several publications suggest that the spectrum of diseases caused by such chlamydial infections may be much wider than was realised before[9,17].

Avian chlamydiosis was previously named psittacosis, or parrot fever, as the disease was originally recognised to originate from psittacine birds. Although the condition was first described in the 19th century the fashion for avian pets, particularly parrots, in the 1930s led to many cases of psittacosis and greatly raised public awareness of the disease. In 1941 the term “ornithosis” was introduced to refer to chlamydial disease in, or contracted from, domestic poultry and other non-psittacine birds[18,19]. These diseases in birds are now all considered to be similar, and the term avian chlamydiosis is preferred. ‘Psittacosis’ still tends to be used to describe the disease in humans.

Cp. psittaci is found in the faeces, respiratory secretions and feather dust of infected birds and therefore direct contact with an infected bird is not necessary for infection. Transmission of disease occurs mainly through inhalation of aerosols, respiratory secretions, or dried faecal or feather dust, but oral infection (mouth-to-beak contact) and handling of plumage and tissues are alternative routes. The incubation period is 5-15 days. In serious cases the disease progresses from flu-like symptoms, through pneumonia to acute respiratory failure and septic shock. Many other symptoms and signs have been reported[20]. In the pre-antibiotic era, mortality was estimated at 15-20% of reported infections[21].

Major outbreaks among poultry have occurred on turkey and duck farms and have often led to infection of humans. A few outbreaks have also been reported in farmed geese. Although chickens appear to be more resistant, natural infections have been reported in breeder flocks, broilers and layers. In humans, chlamydial infections usually result from exposure to infected pet psittacine birds such as cockatiels, parakeets, parrots, budgerigars and macaws; however, human infections have also often been linked to non-psittacine pet birds (finches, canaries, pigeons, doves and

mynah birds)[10]. Outbreaks have also occurred in humans following slaughter and processing of infected ducks and turkeys[12]. Transmission from human to human is rare but has been reported in an outbreak of psittacosis in Scotland in 2012[22]. Transmission from humans to birds has not been documented[22,23].

Diagnosis of psittacosis/ornithosis

All current laboratory tests for avian chlamydiosis have drawbacks and the need for better means of diagnosis has been recognised for many years[24]. For this reason early diagnosis and treatment based on history and clinical signs, is recommended rather than waiting for laboratory results.

Early diagnosis and treatment may well depend on obtaining a history of contact with birds, or an environment contaminated by birds, and giving anti-chlamydial antibiotics on grounds of suspicion. An early review of psittacosis cases in Cambridgeshire from 1975-83 (prior to the identification of *Cp. pneumoniae*) found bird contact in only 17% of cases[25]. However a later review of cases in the same county, in which *Cp. pneumoniae* and *Cp. psittaci* infections were differentiated by the micro-immunofluorescence test (MIF, see below), reported that bird contact could be established in 84% of confirmed cases[26].

Note: Extreme care must be exercised with respiratory samples as *Cp. psittaci* is a category three pathogen.

Molecular methods

PCR allows the detection, identification and quantification of chlamydial infections with relative ease. The stability of molecular reagents and control material also make this rapid method very suitable for sporadic or infrequent testing[7,10,27].

Other rapid molecular techniques that are available in specialised reference laboratories are DNA micro-arrays, PCR-RFLP and *omp*A gene sequencing (for differentiation of the two closely related species *Cp. psittaci* and *Cp. abortus*)[14,16,28-31].

Serology

Historically, serology has been the mainstay of a diagnosis. Serum should be tested in parallel and a definitive diagnosis depends on observing a fourfold (or greater) rise in antibody titre, which may take 2-4 weeks to develop. This may be helpful when used retrospectively or for epidemiological purposes in outbreak situations. However for individual patients, serology gives only a delayed answer at best and obtaining paired sera can be difficult.

Frequently used serological tests for *Cp. psittaci* diagnosis in humans are CFT, ELISA and MIF.

The CFT is the traditional test, though it is now unavailable in many laboratories. The test detects antibodies to epitopes of chlamydial lipopolysaccharides (LPS) which are present in all members of the Chlamydiaceae, thus a positive result may be due to infection with *Cp. pneumoniae* or *C. trachomatis*.

The current reference standard is the MIF test, which was originally developed by Wang and Grayston for serotyping of *C. trachomatis*[32]. This test is more sensitive and specific than the CFT[33]. MIF uses elementary bodies (EBs) of the three human chlamydial pathogens, fixed microscope slides as antigen for detecting both total immunoglobulin and specific IgM or IgA. As EBs are at the limits of light microscope

resolution, endpoint detection can be difficult and the test suffers from considerable inter-operator variability[34]. The main antigen presented in the MIF test is MOMP and this is known to be highly variable in avian isolates, with 8 serovars currently described[14]. Thus the infecting strain may well be different from that used to produce the elementary bodies for the test, resulting in a false negative result.

As some of the outer chlamydial antigens, such as LPS, can cross-react with antibodies to other bacteria, positive results from either MIF or CFT must be interpreted cautiously[15,21,35]. MIF tests and ELISAs using chlamydial antigens with reduced LPS have now been developed. However, due to serological cross-reaction between different species of the Chlamydiaceae family, it remains difficult to distinguish *Cp. psittaci, C. trachomatis* and *Cp. pneumoniae* antibodies in any of the current serological tests.

An alternative to the MIF test is the whole inclusion immunofluorescence test (WIF) that tests sera against slides bearing *C.trachomatis*, *Cp. pneumoniae* and *Cp. abortus* infected cells[36]. *Cp. Abortus* (see section 3, below) is used in preference to *Cp. psittaci* since it is known to be very closely antigenically related to *Cp. psittaci* and this avoids the biohazard of growing *Cp. psittaci* which is a Category 3 pathogen. WIF is much easier to read than MIF and is the only test that presents all the chlamydial antigens including the 'non-structural' antigens present in the inclusion membranes. This is both an advantage and a disadvantage. It increases sensitivity but decreases specificity due to cross-reactions, especially those due to anti-LPS antibodies that react with all three species[37]. As a result, sera that show equivalent titres to *Cp. pneumoniae* and *Cp. psittaci* in the WIF test are considered to be infections with the latter, largely on grounds of clinical prudence.

Serological diagnosis of *Cp. psittaci* and *Cp. abortus* infections would be greatly simplified and accelerated if a specific immunodominant antigen or antigens for these species could be found. Two novel forms of LPS oligosaccharide found only in *Cp. psittaci /abortus / felis / caviae,* have been described and may well provide such antigens[38]. A monoclonal antibody against this novel LPS was found to be specific, but does not yet form the basis of any commercially available test.

Antigen detection

A more timely diagnosis would be achieved by direct pathogen detection in sputum, throat swabs or respiratory aspirates.

Antigen ELISA tests for *Cp. psittaci* or *Cp. abortus* in human medicine are not commercially available at present. However, if antigen ELISAs are to be used for detecting all the species of *Chlamydophila*, users should bear in mind that these tests are inferior to both detection in culture and the PCR with respect to sensitivity and specificity and that this can often at times, lead to misinterpretation of results[16,23].

Culture

Isolation of the organism by culture is the most reliable method to prove the presence of viable bacteria in a human (or avian) case of psittacosis. Diagnosis by culture can only be performed in a limited number of laboratories because of the need for a Containment Level 3 facility.

The isolation of *Cp. psittaci* is normally performed in cell cultures, often in the presence of cycloheximide. The use of numerous cell types has been described, including Buffalo Green Monkey (BGM), McCoy, HeLa, African Green Monkey (Vero)

and L-929 cells, with BGM cells shown to offer the best yield. The presence of *Cp. psittaci* is usually confirmed by immunofluorescence, immunoperoxidase staining or other similar techniques. Isolates can be serotyped with monoclonal antibodies, or genotyped with real-time PCR, DNA microarrays or DNA sequencing.

Cp. pneumoniae is more difficult to grow than other species but isolation rates are better in HeLa cells than in McCoy cells.

Zoonotic infection with chlamydiae of ruminant origin

Cp. abortus is the main cause of infectious abortion in sheep and goats in the UK and also cause occasional abortions in cattle. Recent evidence from the USA has suggested that low grade infection in cattle is widespread and may be responsible for fertility problems[39]. In sheep, the main pathology is found in the placenta but the fetus is also infected[17]. When sheep abort, there is usually massive excretion of chlamydiae in the infected placenta and on the aborted lamb which is a source of infection for other sheep and humans.

The infection in men and non-pregnant women is not well documented but an outbreak among workers preparing vaccine in 1981 suggested that it causes a relatively mild upper respiratory tract infection with influenza-like symptoms such as headache, chills, fever, joint pains and non-productive cough. Photophobia, vomiting, sore throat and myocarditis may also occur[40].

If pregnant women become infected, the infection can spread to the placenta following the respiratory symptoms and may result in abortion or stillbirth. Severe symptoms including renal failure, hepatic dysfunction and disseminated intravascular coagulation can occur around the time of fetal loss and may lead to the death of the mother in extreme cases[17,41]. If the pregnancy survives the acute infection, there is no evidence that *Cp. abortus* causes congenital malformation or any risk to subsequent pregnancies.

The risk is limited mainly to those actively working with sheep, including veterinary surgeons, and their immediate families[42]. The route of transmission to humans is not known for certain, however inhalation of aerosols and dusts heavily contaminated with *Cp. abortus* appears to be the likely route of infection. Contact with aborting sheep or sheep at risk of abortion, dead lambs and placentae are thus considered to represent a risk for humans. When lambing and handling of pregnant and post-partum ewes takes place indoors, the risk of human exposure to the organism may be greater than in open pastures. Infection has also been associated with handling of contaminated clothing and boots and contact with birds may be a risk[42].

Clearly for this infection, prevention is the best policy. Following recognition of the problem during the 1980s and 1990s, the dangers received considerable publicity in the farming and general press and, most effectively, in the agricultural soap operas. Currently, detailed advice for women who might be at risk is available from PHE (https://www.gov.uk/poultry-health), DEFRA http://webarchive.nationalarchives.gov.uk/20130402151656/http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/zoonoses/lambing.htm and the HSE (www.hse.gov.uk).

That *Cp. abortus* is indeed the chlamydial species involved was established by whole genome restriction enzyme profiling (WGREP)[43].

There is now growing evidence that Parachlamydiaceae and are also associated with adverse pregnancy outcomes. *Parachlamydia* may represent an agent of miscarriage in humans[44,45]. *Waddlia*, a *Chlamydia*-like organism first isolated from an aborted bovine, has emerged as an agent of abortion in cattle and more recently was implicated in human fetal death[45]. Achieving a better definition of the role of *Chlamydia* species and confirming the roles of other *Chlamydia*-like organisms in human miscarriage, stillbirth and preterm labour are major research challenges for the future.

Diagnosis of chlamydial abortion

Diagnosis of *Cp. abortus* in a person with positive serology for chlamydial infection is dependent primarily on clinical and epidemiological suspicion. It is important to establish diagnosis quickly in order to start aggressive anti-chlamydial therapy as soon as possible. Direct detection of the pathogen in aborted placenta and/or fetus is the quickest method of making a diagnosis.

The WIF test uses *Cp. abortus* antigen and so is particularly suitable for specific serological diagnosis of *Cp. abortus* infection although historically the CFT has been used in most cases. CFT however, does not distinguish between different species of *Chlamydophila*. Antigen ELISA tests for *Cp. abortus* are currently not commercially available.

Isolation in cell culture is extremely difficult for some species and so is restricted to very few laboratories with extensive practical experience[16]. However, the introduction of molecular methods, such as PCR, DNA microarrays, multi-locus sequence typing (MLST) and *omp*A gene sequencing, has allowed the detection, identification and quantification of chlamydial infections with relative ease without the need for culture[14,16,28-30].

Further research is still required to define the zoonotic potential of *Cp. abortus* of avian origin, as well as *Cp. psittaci* from non-avian sources.

Note: Additional diagnostic testing may be available from the Veterinary Laboratories Agency and the Moredun Research Institute, Edinburgh.

Reporting

Human psittacosis is a notifiable disease in some European countries (Germany, Denmark) but is not in the UK. However, the organism *Cp. psittaci* is listed as notifiable in the Public Health Scotland Act of 2008 and Health Protection Legislation (England) Guidance 2010[46,47].

A case may be suspected when the request bears relevant information, for example:

- abortion or stillbirth with maternal renal failure, hepatic dysfunction and disseminated intravascular coagulation
- clinically consistent illness after occupational or domestic exposure to birds or ruminants (see Appendix 2)
- investigation of possible outbreaks associated with bird and animal farms

Follow local protocols for reporting all presumptive and confirmed infections to the patients' clinicians.

Technical information/limitations

Limitations of UK SMIs

The recommendations made in UK SMIs are based on evidence (for example, sensitivity and specificity) where available, expert opinion and pragmatism, with consideration also being given to available resources. Laboratories should take account of local requirements and undertake additional investigations where appropriate. Prior to use, laboratories should ensure that all commercial and in-house tests have been validated and are fit for purpose.

Specimen containers[48,49]

UK SMIs use the term “CE marked leak proof container” to describe containers bearing the CE marking used for the collection and transport of clinical specimens. The requirements for specimen containers are given in the EU in vitro Diagnostic Medical Devices Directive (98/79/EC Annex 1 B 2.1) which states: “The design must allow easy handling and, where necessary, reduce as far as possible contamination of and leakage from, the device during use and, in the case of specimen receptacles, the risk of contamination of the specimen. The manufacturing processes must be appropriate for these purposes”.

Safety considerations

N/A

1 Specimen transport, storage and retention[48,49]

1.1 Optimal transport and storage conditions

Specimens should be transported and processed as soon as possible[50].

Samples should be retained in accordance with The Royal College of Pathologists guidelines 'The retention and storage of pathological records and specimens'[51].

Public health management

For information regarding notification to PHE (or equivalent in the devolved administrations) refer to the section on 'Notification to PHE or equivalent in the devolved administrations' at the end of this document.

Appendix 1: Taxonomy of Chlamydiales

Domain	Bacteria					
Class	Chlamydiae					
Order	Chlamydiales					
Family	Chlamydiaceae		Parachlamydiaceae		Simkaniaceae	Waddliaceae
Genera	*Chlamydia*	*Chlamydophila*	*Neochlamydia*	*Parachlamydia*	*Simkania*	*Waddlia*
Species	*C. muridarum* *C. suis* *C. trachomatis*	*Cp. abortus* *Cp. caviae* *Cp. felis* *Cp. pecorum* *Cp. pneumoniae* *Cp. psittaci*	*Neochlamydia hartmanellae*	*Parachlamydia acanthamoebae*	*Simkania nevegensis*	*Waddlia chondrophila*

Adapted and compiled from current journals[1-5].

Appendix 2: Diseases caused by Chlamydiae in man and in animals

Genus	Host		Pathology in animals		Route for human transmission	Pathology in humans	
	Principal	Occasional	Common signs	Severe disease		Common signs	Uncommon / severe disease
***Chlamydophila* species**							
Cp. psittaci	Birds (parrots, domestic poultry)	Dogs, horses, pigs	Hyperthermia, anorexia, lethargy, diarrhoea	Conjunctivitis pneumonia, pericarditis, death	Inhalation	Influenza-like illness	Endocarditis, encephalitis, pneumonia, death
Cp. abortus	Ruminants (sheep, goats cattle)	Pigs, deer, horses, rabbits, koalas, guinea pigs, mice	Abortion, stillbirth, epididymitis	Endometritis	Inhalation	Influenza-like illness	Pneumonia, abortion, renal failure, respiratory distress, death
Cp. felis	Cats	–	Conjunctivitis	Pneumonia, chronic salpingitis	Direct contact	Conjunctivitis	Endocarditis, liver failure
Cp. caviae	Guinea-pigs	–	Conjunctivitis, genital tract infection	–	Direct contact	Conjunctivitis	–
Cp. pneumoniae	Humans, koalas, horses	Reptiles and amphibians	Respiratory diseases	–	Fomites Inhalation	Pneumonia, Bronchitis, Asthma	Atherosclerosis Reactive arthritis
Cp. pecorum	Ruminants (cattle, sheep and goats), pigs,	koalas	Intestinal infection, abortion, conjunctivitis, urinary tract disease	Encephalomyelitis, pneumonia, arthritis	Direct contact	Non-pathogenic in man	
***Chlamydia* species**							
C. muridarum	Mice	-	-	-	-	Non-pathogenic in man	
C. suis	Pigs	-	Pneumonia, enteritis, conjunctivitis (pig)	-	-	Non-pathogenic in man	

C. trachomatis	Humans	-	Unknown	Unknown	Direct contact Fomites Inhalation	Urogenital infection Adnexitis Conjunctivitis Trachoma Venereal lymphogranuloma	Reactive arthritis Neonatal pneumonia
Simkania negevensis	Unknown	humans	Unknown	Unknown	Inhalation	Respiratory infections	
Parachlamydia *acanthamoebae*	Acanthamoeba	Goats, sheep,	Pneumonia, abortion	-	? Inhalation	Emerging role as an agent of bronchiolitis, pneumonia, miscarriage in humans	
Waddlia chondrophila	Cattle	-	Abortion	Unknown	? Contact with pets, through uncooked meat and milk	May be associated with miscarriages in humans.	

Adapted from current journals[1,8,9,16,44,45,52-54].

Notification to PHE[47,55], or equivalent in the devolved administrations[46,56-58]

The Health Protection (Notification) regulations 2010 require diagnostic laboratories to notify Public Health England (PHE) when they identify the causative agents that are listed in Schedule 2 of the Regulations. Notifications must be provided in writing, on paper or electronically, within seven days. Urgent cases should be notified orally and as soon as possible, recommended within 24 hours. These should be followed up by written notification within seven days.

For the purposes of the Notification Regulations, the recipient of laboratory notifications is the local PHE Health Protection Team. If a case has already been notified by a registered medical practitioner, the diagnostic laboratory is still required to notify the case if they identify any evidence of an infection caused by a notifiable causative agent.

Notification under the Health Protection (Notification) Regulations 2010 does not replace voluntary reporting to PHE. The vast majority of NHS laboratories voluntarily report a wide range of laboratory diagnoses of causative agents to PHE and many PHE Health Protection Teams have agreements with local laboratories for urgent reporting of some infections. This should continue.

Note: The Health Protection Legislation Guidance (2010) includes reporting of Human Immunodeficiency Virus (HIV) & Sexually Transmitted Infections (STIs), Healthcare Associated Infections (HCAIs) and Creutzfeldt–Jakob disease (CJD) under 'Notification Duties of Registered Medical Practitioners': it is not noted under 'Notification Duties of Diagnostic Laboratories'.

https://www.gov.uk/government/organisations/public-health-england/about/our-governance#health-protection-regulations-2010

Other arrangements exist in Scotland[46,56], Wales[57] and Northern Ireland[58].

References

Modified GRADE table used by UK SMIs when assessing references

Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) is a systematic approach to assessing references. A modified GRADE method is used in UK SMIs for appraising references for inclusion. Each reference is assessed and allocated a grade for strength of recommendation (A-D) and quality of the underlying evidence (I-VI). A summary table which defines the grade is listed below and should be used in conjunction with the reference list.

Strength of recommendation	**Quality of evidence**
A Strongly recommended	I Evidence from randomised controlled trials, meta-analysis and systematic reviews
B Recommended but other alternatives may be acceptable	II Evidence from non-randomised studies
C Weakly recommended: seek alternatives	III Non-analytical studies, for example, case reports, reviews, case series
D Never recommended	IV Expert opinion and wide acceptance as good practice but with no study evidence
	V Required by legislation, code of practice or national standard
	VI Letter or other

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