Public Health England

Chartered Institute of Environmental Health

Interim Public Health Operational Guidelines for Shigellosis

A joint guideline from Public Health England and the Chartered Institute of Environmental Health

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Guideline development

The PHE Gastrointestinal Infections Leads Network was established in 2016 as a cross-system group covering a specific national priority area. It brings together appropriate specialists and experts to drive improvements and consistency in practice. One of its roles is to support and encourage the delivery of safe and effective practice by developing guidance based on evidence and a review of the effectiveness of interventions.

The shigellosis guidelines were finalised in 2017 by a working group as detailed below.

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We are also grateful to Tony Lewis, Head of Policy, CIEH, and all those whose comments and feedback helped shape the final guidance.

Abbreviations

CIEH	Chartered Institute of Environmental Health
CCDC	Consultant in Communicable Disease Control
EHO	Environmental Health Officer
FES	Field Epidemiology Service
GBRU	PHE Gastrointestinal Bacteria Reference Unit
HIV	Human immunodeficiency virus
HPA	Health Protection Agency
HPT	Health Protection Team
HUS	Haemolytic Uraemic Syndrome
ipaH	Invasion plasmid antigen H (gene found in shigellae and some enteroinvasive *Escherichia coli*)
MSM	Men who have sex with men
PCR	Polymerase Chain Reaction
PHE	Public Health England
RCGP	Royal College of General Practitioners
RCPCH	Royal College of Paediatrics and Child Health
Sd1	*Shigella dysenteriae* type 1
STEC	Shiga toxin-producing *Escherichia coli*
STI	Sexually transmitted infection
stx	Shiga toxin (gene found in STEC and *S. dysenteriae* type 1)
VTEC	Vero cytotoxin-producing *Escherichia coli*
WGS	Whole genome sequencing
WHO	World Health Organization

1.0 Introduction

Shigellae are enteric pathogens which cause diarrhoeal illness in humans and some primates. These guidelines address the public health management of infection with shigellae (shigellosis). They are based on a review of current UK epidemiology and international guidelines, and provide an update to the shigellosis section of guidelines published by the Public Health Laboratory Service (PHLS) in 2004 [1].

Historically, in the UK, most reported cases of shigellosis were found to be associated with travel, and the infection is readily transmitted from child to child at home or, less frequently, in nurseries. However, over the past ten years, non-travel associated cases in adults aged 16 to 60 years old have risen, to account for a majority of all cases reported to the National Reference Laboratory. There is also good evidence that a sustained shigellosis epidemic has occurred in men who have sex with men (MSM) and that this is associated with sexual transmission [2,3,4,5].

Advice on clinical management and treatment of individuals with shigellosis is outside the scope of this guidance. Clinicians should seek advice from their local laboratory microbiologist or infectious disease physician, if required. However, notifying clinicians are advised that any child under 16 years old, presenting with bloody diarrhoea, should be managed as per the 2011 Royal College of Paediatrics and Child Health (RCPCH), Royal College of General Practitioners (RCGP) and HPA (now PHE) guidelines *The management of acute bloody diarrhoea potentially caused by vero cytotoxin-producing Escherichia coli in children* [6]. Haemolytic Uraemic Syndrome (HUS) cases without known aetiology should also be managed as Shiga toxin / vero cytotoxin-producing *Escherichia coli* (STEC / VTEC).

Shigella spp. are notifiable by laboratories under the Health Protection (Notification) Regulations 2010 [7].

1.1 Main recommendations and changes

- Hygiene measures remain the mainstay for the prevention of onward transmission.
- Clarification of case definitions to account for the increased use of polymerase chain reaction (PCR) diagnostic methods.
- The definitions of risk groups for gastrointestinal pathogens are in line with the risk groups proposed for the new version of the 2004 PHLS guidelines.
- No change to the management of single cases of *S. sonnei* and their contacts.
- A single negative specimen for microbiological clearance for cases of *S. flexneri*, *S. boydii* and S. *dysenteriae* (other than type 1) in risk groups.
- No exclusion or screening of asymptomatic contacts of *S. flexneri*, *S. boydii* and *S. dysenteriae* (other than type 1) in risk groups.

- Management of confirmed *S. dysenteriae* type 1 (Sd1) to be in line with that for STEC.
- A pragmatic approach for cases with microbiological results lacking speciation i.e. positive culture for *Shigella* spp.
- Inclusion of sexual contact as a risk factor for transmission amongst men who have sex with men (MSM).
- Addition of a standardised national questionnaire for *Shigella* spp.

2.0 Public health case definitions (see also Appendix 8.1)

Table 1: Definitions of shigellosis cases for public health purposes

Possible case[1]
• A person with a clinical history compatible with bacterial dysentery and where the clinician suspects shigellosis is the most likely diagnosis. • A person with a *Shigella* PCR (*ipaH*) positive, culture negative/culture awaited, result from a local laboratory. • A person with an epidemiological link to a confirmed or probable case AND a clinical history compatible with bacterial dysentery, who is *Shigella* PCR (*ipaH*) negative[2].
Probable case
• A person with an epidemiological link to a confirmed or probable case AND a clinical history compatible with bacterial dysentery, who is awaiting laboratory testing. • A person with an epidemiological link to a confirmed or probable case, who is *Shigella* PCR (*ipaH*) positive. • A person with a culture positive *Shigella* spp. determined by a local laboratory in the UK or overseas. This may be notified as either 'presumptive'[3] non-sonnei or awaiting further speciation.
Confirmed case
• A person with speciated shigellosis as determined by a local laboratory or the PHE Gastrointestinal Bacteria Reference Unit (GBRU).

[1] Possible cases are unlikely to come to the attention of the Health Protection Team, unless identified as contacts of probable/confirmed cases
[2] And in the absence of other pathogens
[3] 'Presumptive' is a microbiological term for diagnostic and reporting purposes

Table 1 provides case definitions to enable categorisation of shigellosis cases for public health purposes. This will determine whether and what public health action is needed. Public health action is only required for probable and confirmed cases.

Table 2: Definition of contacts

Contact	Description
Household	• Someone who lives, or has stayed overnight, in the same household as the case and/or has shared a bathroom and/or eaten food prepared by the case whilst the case was symptomatic and up to 48 hours after symptoms ceased.
Other contacts*	• Sexual contacts of men who have sex with men, while the case was symptomatic and for a week after symptoms have ceased[4].

***** Wider contacts may need to be considered if the case was symptomatic while attending a nursery/childcare setting or whilst working at a healthcare/food establishment.

Table 3: Risk groups for transmission of gastrointestinal pathogens

Risk Group	Description	Additional Comments
Group A	Any person who is unable to perform adequate personal hygiene due to lack of capacity or ability to comply OR lack of access to hygiene facilities.	Risk assessment regarding access to hygiene facilities should consider the availability of toilets/handwashing/ hand drying facilities in a work/educational setting.
Group B	All children aged five years old or under (up to sixth birthday) who attend school, pre-school, nursery or other similar child care or minding groups.	For children aged 5 years and under who do not attend school, risk assessment for clearance purposes should explore potential for transmission within other settings e.g. household or attendance at parties.
Group C	People whose work involves preparing or serving unwrapped ready-to-eat food (including drink).	Consider informal food handlers e.g. someone who regularly helps to prepare food for a congregation.
Group D	Clinical, social care or nursery staff who work with young children, the elderly, or any other particularly vulnerable people, and whose activities increase the risk of transferring infection via the faecal-oral route.	Risk assessment should consider activities such as helping with feeding or handling objects that could be transferred to the mouth.

[4] See section 7.7 - Sexual transmission

2.1 PCR results[5]

UK laboratories are increasingly using enteric PCR tests prior to culture methods. Cases that are *Shigella* PCR positive and awaiting culture or culture negative are not routinely reported to the HPT. Table 4 details the PCR results for the different *Shigella* spp.

Table 4: *Shigella* species and associated PCR results

Species	Classification	*Shigella* PCR (*ipaH*)	Shiga toxin PCR (*stx*)
***S. dysenteriae* serotype 1 (Sd1)**	Non-*sonnei*	Positive	Positive
***S. dysenteriae* serotypes 2-15**	Non-*sonnei*	Positive	Negative
S. flexneri	Non-*sonnei*	Positive	Negative
S. boydii	Non-*sonnei*	Positive	Negative
S. sonnei	*Sonnei*	Positive	Negative

Sd1 is very rare and a positive Shiga toxin PCR almost always indicates STEC[6] and not Sd1. Note that STEC is *Shigella* PCR (*ipaH*) negative. But it is possible to have an *ipaH* and *stx* positive result due to a dual infection with a *Shigella* sp. (other than Sd1) and STEC. Given the rarity of Sd1 in England, a more likely interpretation of an *ipaH* and *stx* positive result is such a dual infection rather than Sd1 infection.

3.0 Risk assessment

The initial risk assessment of cases should be carried out according to local arrangements, which should stipulate who is responsible for conducting the initial risk assessment in any particular circumstance. The aim of the initial risk assessment is to prevent onward transmission of infection[7] and to identify potential sources within the UK that need urgent investigation. The risk assessment should be carried out to allow for:

- Appropriate exclusion of cases and symptomatic contacts
- Early identification of potential sources of infection, particularly where there has been no travel outside the UK during the incubation period (*S. boydii* and *S. dysenteriae*)
- Provision of advice regarding transmission of shigellae[8] and hygiene measures
- Outbreak detection.

[5] See also section 7.6 - Microbiology of *Shigella* spp.
[6] In this event, please refer to the STEC PH guidance: https://www.gov.uk/government/publications/vero-cytotoxin-producing-escherichia-coli-operational-guidelines-for-public-health-management
[7] See section 7.7 - Transmission
[8] Including sexual transmission

The initial risk assessment (Section 5.0, Q1-3) needs to be performed within 24 hours of notification, including out-of-hours as per local arrangements. Completion of the national shigellosis surveillance questionnaire can be delayed until the next working day and ideally completed within 3 days of notification.

3.1 Exclusion of cases in risk groups

Apart from *S. sonnei* (no clearance required) and Sd1 (exclusion until two consecutive negative results), all cases in risk groups will need a single negative clearance result prior to returning to risk activities. This may be through exclusion (where risk activities cannot be mitigated) or alternative duties (where mitigation measures can be put in place). Mitigation measures such as a change in work procedures or duties may be an alternative to exclusion for adult cases in risk groups.

When undertaking a risk assessment on a recovered case, consideration of alternative duties may be appropriate where the clearance sample result is pending AND the case has either been asymptomatic for 48 hours or treated with an appropriate course of antibiotics which is likely to lessen public health risk. For health and social care workers, factors such as feeding duties, administration of medicines, handling of items placed in the mouth, e.g. thermometers, dentures and oral care should be considered. The risk assessment may be undertaken jointly with infection control and occupational health, or the manager of a care home.

Cases in risk groups who do not clear the infection after two clearance specimens should be considered for an appropriate course of antibiotics to allow them to resume their usual occupational activities.

3.2 *S. dysenteriae* infection

In practice, it is unlikely that a diagnosis of Sd1 will be available at the time of notification. However, Sd1 is extremely rare in England hence, until proved otherwise, assume that all cases of *S. dysenteriae* identified by local laboratories are NOT type 1, apart from the exceptions below:

- Those who have an epidemiological link to a confirmed type 1 case.
- Severe illness with clinical features compatible with Sd1 infection*****.
- Initial PCR-positive result for both *ipaH* and *stx******.

***** Risk assessment in these cases should consider the possibility of a dual infection with STEC and non-type 1 *S. dysenteriae*. But, from a practical viewpoint, the management of confirmed Sd1 is in line with that of STEC[9].

Note that full serotyping takes 6-10 days from receipt of the sample at GBRU. However, where an urgent result is needed (e.g. local laboratory has identified *S. dysenteriae* in a case in a risk group), GBRU can undertake a PCR within 4 hours to rule out Sd1.

[9] See STEC PH guidance: https://www.gov.uk/government/publications/vero-cytotoxin-producing-escherichia-coli-operational-guidelines-for-public-health-management

3.3 Unspeciated shigellosis

Where the species has not yet been identified, manage as non-sonnei shigellosis until the species is confirmed. In the unlikely event that unspeciated shigellosis in a risk group is subsequently identified as due to Sd1 and the case has resumed their risk activity, undertake a risk assessment as in section 3.4 below and consider whether a second clearance sample is required.

Between 2014 and 2016, an average of 1538 *Shigella* spp. isolates were received per year by the GBRU for confirmation and typing, of which 50% (average of 777 per year) were species other than *S. sonnei* (source: PHE GastroDataWarehouse database, extracted 5 September 2017). Unpublished audit data suggest that up to 80% of cases in a risk group with an initial diagnosis of *Shigella* spp. were later confirmed as non-sonnei shigellae [8,9]. The evidence supports the view that isolates initially notified by diagnosing laboratories as *Shigella* spp. should be presumed to be non-sonnei.

3.4 Late notification of cases

Consider the need for public health action (note section 3.1 above), particularly in the following cases:

- Notification occurs after at least 2 incubation periods (i.e. 2 weeks).
- The case has recovered and has already returned to nursery/work, and
- There is no evidence of transmission in the intervening period.

Professional judgement is an essential element of risk assessment; it is not possible to provide specific guidance applicable to all circumstances. Risk assessment and the public health rationale for decisions should be documented and supported, as appropriate, by completion of the national surveillance questionnaire within 3 days of notification of the case.

4.0 Public health management of probable/confirmed shigellosis cases and contacts

For all cases and for contacts (excluding *S. sonnei*) in risk groups: give link to NHS Choices information www.nhs.uk/conditions/dysentery/Pages/Introduction.aspx. Appendices 8.2 and 8.3 provide templates for case and risk group contact letters.

Table 6: PH management of *S. sonnei* - cases + contacts, regardless of risk group

Cases	Contacts
• Hygiene advice • Advise exclusion until at least 48 hours symptom free/no loose stools • Questionnaire as per local arrangements to enable identification of common exposures/contexts requiring public health action.	• No action

Table 7: PH management of *S. boydii, S. flexneri, S. dysenteriae* (type1 and non-type 1) and unspeciated shigellae – cases or contacts NOT in a risk group

Cases not in a risk group	Contacts not in a risk group
• Hygiene advice • Complete questionnaire • Advise exclusion until at least 48 hours symptom free/no loose stools.	• **Asymptomatic contacts**: no action • **Symptomatic contacts only**: ▪ Seek medical advice and testing for diagnostic purposes. ▪ Advise exclusion until at least 48 hours symptom free/no loose stools.

Table 8: PH management of *S. boydii, S. flexneri, S. dysenteriae* (non-type 1) and unspeciated shigellae – cases or contacts in a risk group

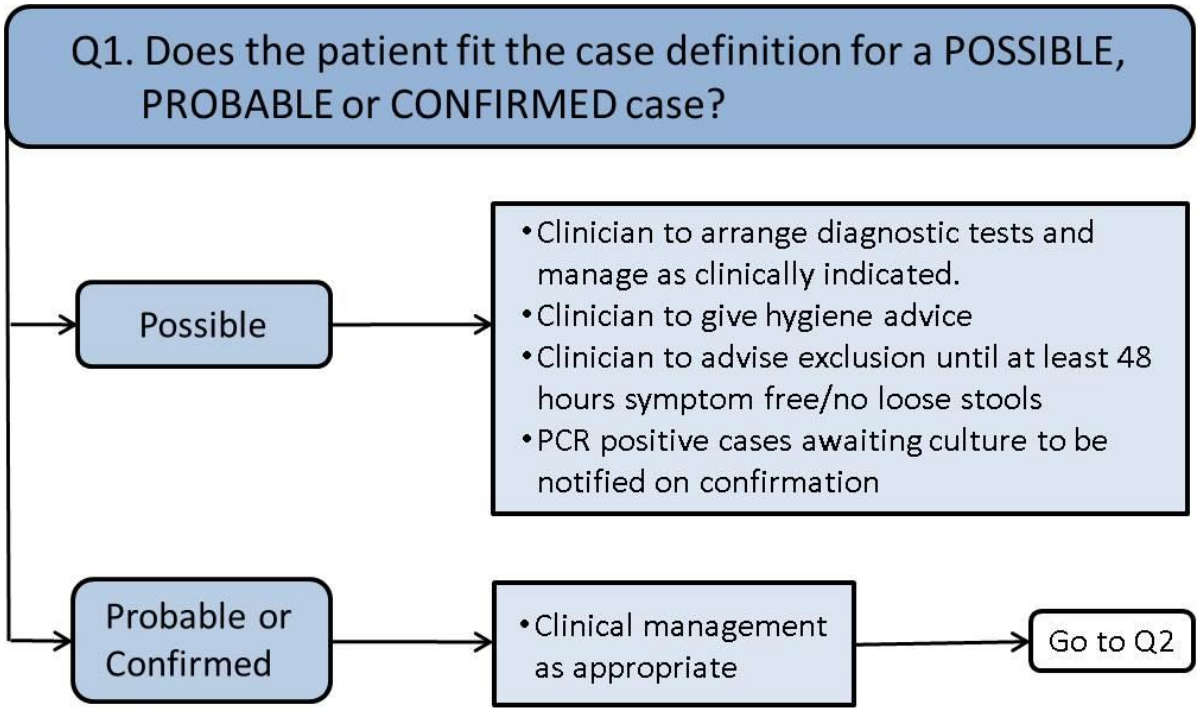
Cases in a risk group	Contacts in a risk group
• Hygiene advice • Complete questionnaire • Exclude until single negative culture[10] result from stool specimen taken at least 48 hours after symptom free/no loose stools, or 48 hours after completion of antibiotics (if recommended), whichever is later.	• Inform and advise contacts in risk groups • **Symptomatic contacts only**: ▪ Seek medical advice and testing for diagnostic purposes. ▪ Exclude while awaiting microbiological result. ▪ Further management in accordance with microbiological results.

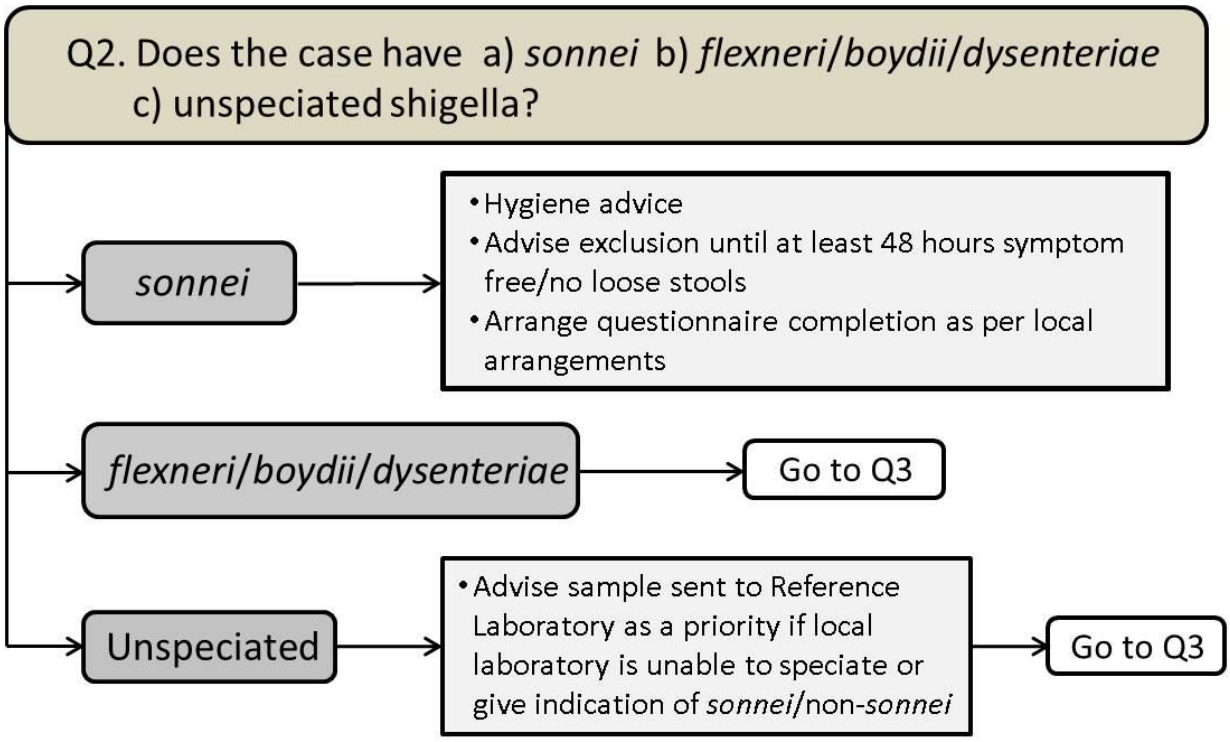
Table 9: PH management of *S. dysenteriae* type 1 – cases or contacts in a risk group

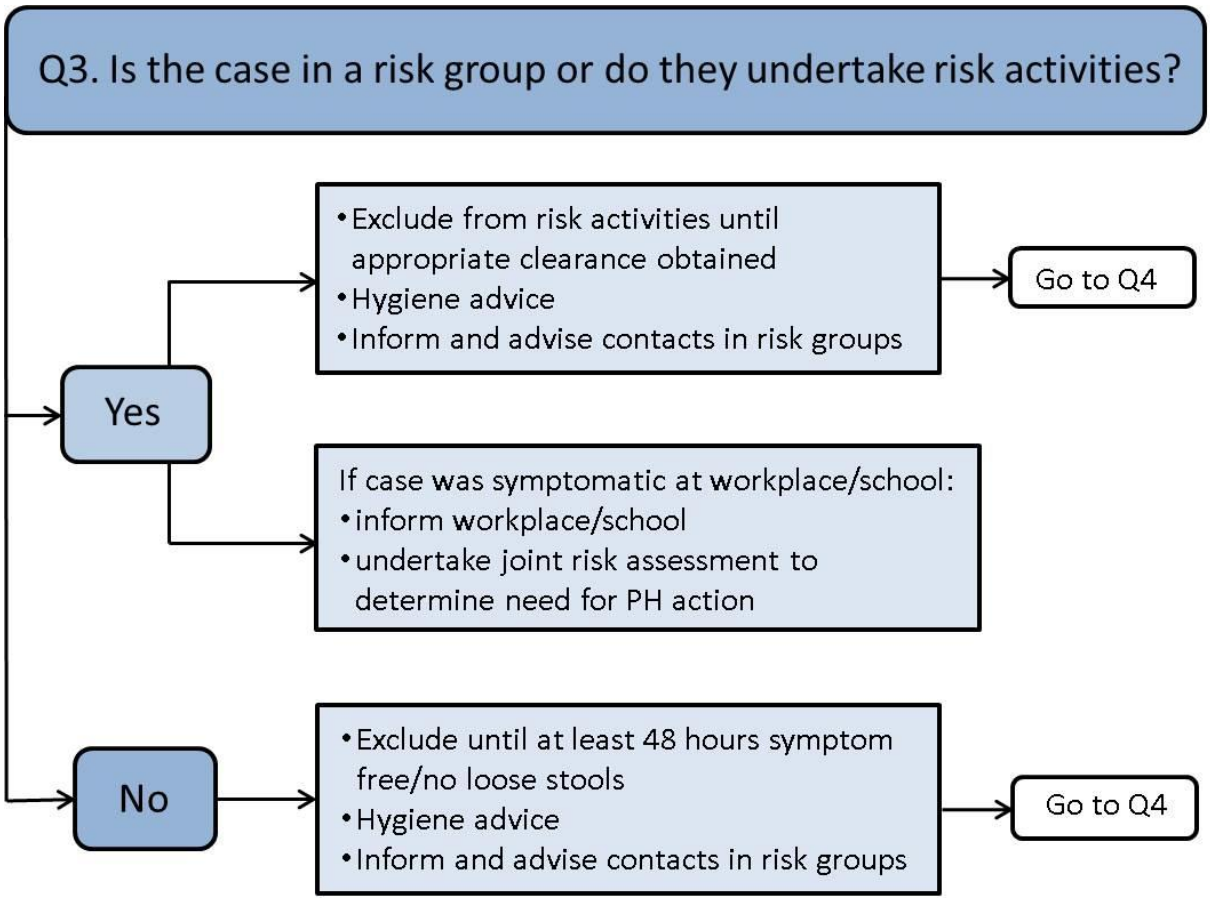
Cases in a risk group	Contacts in a risk group
• Hygiene advice • Complete questionnaire • Exclude until 2 consecutive negative stool culture results[10] from samples taken at least 48 hours after symptom free/no loose stools, or 48 hours after completion of antibiotics (if recommended), whichever is later. Samples to be taken at least 24 hours apart.	• Inform and advise contacts in risk groups **Symptomatic contacts:** ▪ Seek medical advice and testing for diagnostic purposes ▪ Exclude while awaiting microbiological result. ▪ Further management in accordance with microbiological results. **Recovered or asymptomatic contacts:** ▪ Exclude until 2 consecutive negative stool culture results[11] from samples taken at least 24 hrs apart.

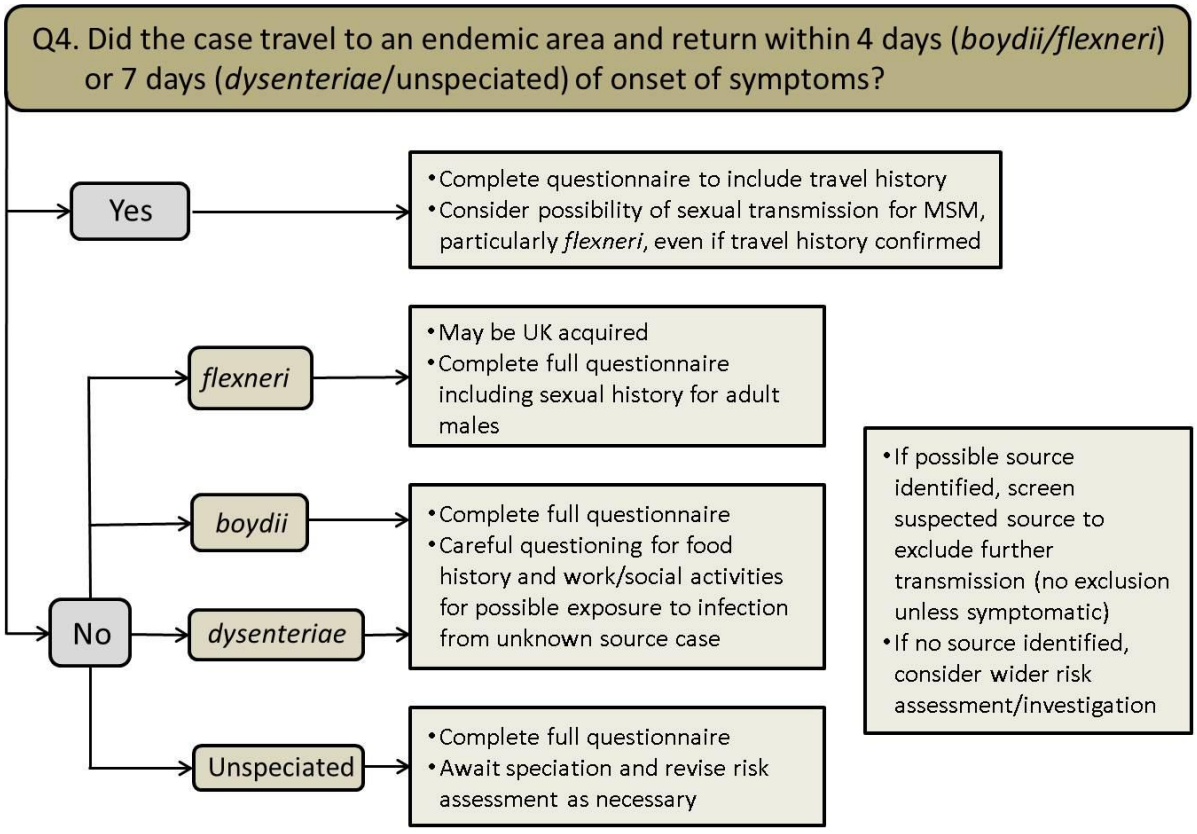
[10] Where obtained, a negative PCR is also suitable for clearance
[11] Where obtained, a negative PCR can be used to confirm absence of infection in asymptomatic contacts

5.0 Algorithms for public health management






Q3. Is the case in a risk group or do they undertake risk activities?
Yes
• Exclude from risk activities until appropriate clearance obtained
• Hygiene advice
• Inform and advise contacts in risk groups
Go to Q4
If case was symptomatic at workplace/school:
• inform workplace/school
• undertake joint risk assessment to determine need for PH action
No
• Exclude until at least 48 hours symptom free/no loose stools
• Hygiene advice
• Inform and advise contacts in risk groups
Go to Q4


Q4. Did the case travel to an endemic area and return within 4 days (boydii/flexneri) or 7 days (dysenteriae/unspeciated) of onset of symptoms?
Yes
• Complete questionnaire to include travel history
• Consider possibility of sexual transmission for MSM, particularly flexneri, even if travel history confirmed
No
flexneri
• May be UK acquired
• Complete full questionnaire including sexual history for adult males
boydii
dysenteriae
• Complete full questionnaire
• Careful questioning for food history and work/social activities for possible exposure to infection from unknown source case
Unspeciated
• Complete full questionnaire
• Await speciation and revise risk assessment as necessary
• If possible source identified, screen suspected source to exclude further transmission (no exclusion unless symptomatic)
• If no source identified, consider wider risk assessment/investigation

6.0 Outbreaks

Outbreaks should be managed in accordance with current agreed Outbreak Plans.

7.0 Disease-related information

7.1 Public health significance

Humans and a few primates are the only reservoirs of shigellae [10]. The organism is spread by faeco-oral contact via contaminated food or water. It has a low infective dose, which means that person-to-person spread can occur quite readily. Ingestion of 10-100 organisms may be enough to cause disease in healthy adults [11]. The incubation period is between 12 and 96 hours (up to a week for Sd1) [12].

Shigellae can cause serious illness and continue to be a major public health problem. They remain endemic in many developing countries and are the most important cause of bloody diarrhoea globally [10]. S. *boydii* and *S. dysenteriae* are not indigenous to the UK and occur as travel associated cases. *S. sonnei* and *S. flexneri* are endemic in the UK, although they can also be travel associated. Primarily a disease of children, over the past ten years in England and Wales, non-travel associated cases in adults aged 16 to 60 years old has risen, to account for a majority of all cases reported. In 2015, in England, the section of the population with the highest number of laboratory reports was males aged 30-39 [13]. Outbreaks of *S. sonnei* and *S. flexneri* have been linked to person-to-person spread among men who have sex with men.

7.2 The organism

Shigellae are gram-negative bacteria that can colonise and invade the intestinal cells, causing disease ranging from mild gastroenteritis to severe acute watery diarrhoea which may have blood or mucus (sometimes called bacillary dysentery). The genus *Shigella* belongs to the family Enterobacteriacae and consists of four species; *S. dysenteriae, S. flexneri, S. boydii* and *S. sonnei* [14]. All except *S. sonnei* can be subdivided into serotypes, on the basis of their O (somatic) antigens: *S. dysenteriae* (Group A) has 15 serotypes, *S. flexneri* (Group B) has 6 serotypes and *S. boydii* (Group C) has 20 serotypes. *S. sonnei* (Group D) contains only 1 serotype that may occur in two forms, form I (smooth) and form II (rough).

The only *Shigella* species which is capable of producing Shiga toxin is Sd1 (Shiga bacillus) which is extremely rare in England.

7.3 Clinical features and sequelae

The typical presentation of dysentery is abdominal cramps and diarrhoea characterized by the frequent passage of small liquid stools that contain visible blood, with or without mucus [10]. This may be accompanied by fever, anorexia, nausea and/or vomiting,

headache or malaise. Patients may, however, present only with acute watery diarrhoea without visible blood or mucus, and without the other symptoms described above, especially at the beginning of their illness. Asymptomatic infection can occur with all *Shigella* spp.

The most common symptoms of *S. sonnei* infection are diarrhoea, abdominal pain/cramps and fever [12]. A proportion also develop bloody diarrhoea: in outbreaks this has ranged from under 10% to about 50%. Nausea and/or vomiting, anorexia, headache or malaise may also occur. Illness lasts from 1 day to 2 weeks, with an average of 4-5 days.

S. flexneri also causes diarrhoea, abdominal pain/cramps and fever [15,16], but it tends to cause more severe illness than *S. sonnei*. Dysentery is common, illness can be prolonged and hospitalisation rates may be much higher. Abdominal cramps and fever may precede the onset of diarrhoea [16]. Reactive arthritis and Reiter's syndrome may be a late complication of *S. flexneri* [12].

S. boydii causes diarrhoeal diseases of varying severity, broadly in line with that produced by *S. flexneri* [12].

S. dysenteriae infection is more severe than that from other shigellae [17], with Sd1 associated with serious disease and complications, including toxic megacolon, HUS, disseminated intravascular coagulation and sepsis [12]. Dysentery occurs in most cases [17] and there is an appreciable death rate.

7.4 Role of antibiotics

Mild forms of shigellosis are self-limiting and most healthy people will recover without the need for antibiotics. The World Health Organisation (WHO) recommends treating all cases of bloody diarrhoea with an antimicrobial known to be effective against shigellae [10]. This lessens the risk of serious complications and death, shortens the duration of symptoms, and hastens the elimination of shigellae from the stool.

A Cochrane review in 2010 [18] found that there was evidence of clinical benefit from treating moderate to severe shigellosis with antibiotics. In 2013, a systematic review of antibiotics used for shigellosis concluded that antibiotics significantly reduce clinical and bacteriological failure rates, with antibiotics successfully clearing shigella pathogens in 96% of cases [19]. Before antibiotics are given, STEC infection should be excluded as a cause of the symptoms, and treatment should be guided by antibiotic sensitivities.

Increasing resistance to common first line agents such as quinolones and azithromycin is being seen, particularly in imported infections and in the MSM population. Inappropriate prescribing of antibiotics internationally has contributed to the occurrence of multidrug resistant shigellae [20].

7.5 Excretion and carriage

The mean duration of carriage with shigellae varies from 7-26 days [16,17,21]. Rarely does an asymptomatic carrier state persist for months [22] but carriage of 17 months has been reported [23]. Carriage may be prolonged in people who are co-infected with human immunodeficiency virus (HIV) [24].

7.6 Microbiology of *Shigella* spp

Microbiological diagnosis

Definitive diagnosis of shigellosis is by culture of the organism from faeces (to include colostomy specimens and rectal swab samples). If the isolate is from a non-gastrointestinal sample, e.g. blood culture or urine, a stool specimen should be collected to confirm if the case poses an infection risk through the gastrointestinal route. Culture on selective media is followed by confirmation of likely *Shigella* spp. colonies using biochemical profile tests, e.g. API organisation system, and positive agglutination tests with specific antisera for the strain concerned.

As control measures vary between species, speciation of isolates is important. The UK Standard Methods for Microbiology Investigations on identification of *Shigella* spp. [14] states that diagnostic laboratories should undertake species identification. Not all laboratories hold all 4 strain-specific antisera, so some laboratories may only be able to discriminate strains as *S.sonnei* (agglutinates with *S.sonnei* antiserum) or non-*sonne*i (fails to agglutinate with *sonnei* antiserum). However, biochemical testing alone may also indicate the likely strain, e.g. if the API test shows a high probability of a particular *Shigella* sp. If the laboratory report does not include speciation, the laboratory should be contacted for further information. HPTs should confirm the extent to which local services can provide prompt speciation.

The MALDI-TOF method [25] of identifying bacteria is less suitable for *Shigella* spp. due to its current inability to reliably discriminate pathogenic *E. coli* from *Shigella* spp because of the close genetic relatedness of the organisms.

In addition to traditional culture, a variety of PCR tests are available. These fall into 2 separate categories:

- PCR tests which target the ***ipaH* (invasion plasmid antigen H)** gene that is found in all four *Shigella* spp., but also in some strains of enteroinvasive *E*. *coli*.
- PCR tests which target the ***stx* (Shiga toxin)** gene. Shiga toxin is the same toxin as vero cytotoxin which is found in STEC/VTEC bacteria and which can cause HUS.

In laboratories using the above PCR tests, confirmation by conventional culture is recommended. However, PCR-positive, culture-negative stool results occur and may be due to factors such as the presence of non-viable or non-culturable organisms and numbers of organisms below the detection limit for culture methods.

PCR tests are used for the rapid diagnosis of gastrointestinal infection. A negative PCR test can be assumed to be culture negative.

In this document, *Shigella* PCR refers to the PCR test for the *ipaH* gene and Shiga toxin PCR refers to the PCR test for the *stx* gene.

Reference Laboratory services
Confirmatory serological testing and strain typing are available from GBRU. Whole genome sequencing (WGS) is routinely used for speciation, typing and investigation of outbreaks. Antimicrobial susceptibility testing can be performed on request.

7.7 Transmission

Direct and indirect transmission
Shigellae are spread by ingestion of the bacteria (faeco-oral route), either directly via close contact with an infected person (including asymptomatic carriers), or indirectly via food or water contaminated with faeces from infected people. The period of infectiousness is probably as long as the organism is excreted in faeces, although cases are most infectious when diarrhoea is present [12]. Poor hand hygiene and sanitation are likely to be the main cause of transmission [11]. Food that is eaten raw (including salads and some shellfish) may be harvested from sites contaminated by sewage; salads may also be contaminated by an infected food handler. Routine cooking kills shigellae [12].

Shigellae are sensitive to environmental conditions and, once excreted, die rapidly if dried or exposed to direct sunlight [10]. However, they may survive for weeks in cool and humid locations [26]. This could lead to transmission via toilet seats or other vehicles that become contaminated by faeces, either directly or via unclean hands. Environmental contamination can also occur during episodes of acute diarrhoea, where bacilli may be aerosolised during toilet flushing and settle on surrounding surfaces and survive for several days [27].

Household transmission
A study looking at risk factors for household transmission concluded that despite delays in reporting and the associated time interval between symptom onset and final speciation, evidence for secondary transmission was low [28]. Factors that increase the risk of household transmission include:

- Index case with acute diarrhoea
- Index case is a child aged 5 or under [29]
- Symptomatic index case or symptomatic contact prepares food for the household
- Symptomatic cases not treated with antibiotics
- People in the household needing assistance with toileting, e.g. nappies, potties, incontinence
- Presence of 3 or more children in the household [30]
- Presence of 6 or more people in a household [28]
- Older child supervising hygiene of younger children [28]
- Difficulties in communication and implementation of hygiene advice.

Sexual transmission

The epidemiology of shigellosis in England has changed markedly over the past decade, with non-travel associated cases accounting for a large and increasing proportion of diagnoses, rising from 26% in 2004 to 63% in 2015 [31]. Most cases of shigellosis not known to be associated with travel were in adult males; this includes 87% of *S. flexneri* 3a, 80% of *S. flexneri* 2a and 59% of *S. sonnei* cases. Diagnoses of shigellosis in women during 2004-2016 remained low (*S. flexneri*) or stable (*S. sonnei*). These data strongly suggest intense shigella transmission between MSM during these periods and are consistent with a previously reported epidemic of shigellosis in England associated with sexual transmission between men [3,32,33].

A significant proportion of MSM with shigellosis have also been co-infected with HIV and other STIs [3,34]. The emergence of shigellosis epidemics in MSM has coincided with increases in diagnoses of gonorrhoea, lymphogranuloma venereum and syphilis among MSM [35,36,37], as well as clusters of other sexually transmissible enteric pathogens. The increase in shigellosis and other infections has been linked to condomless sex, dense sexual networks among MSM diagnosed with HIV, reporting of large numbers of sexual partners, chemsex (engaging in sexual activities while under the influence of drugs) and meeting sex partners at sex parties through social media networking applications [3,32].

Identification of infection in MSM has potential benefits:

- Further spread may be reduced by control measures to reduce sexual transmission.
- MSM with shigellosis may be at risk of other sexually transmitted infections (STI), including HIV. Routine risk assessment of shigellosis can be used as an opportunity to advise MSM to seek sexual health advice and testing for other STIs/HIV.
- MSM with shigellosis may be co-infected with HIV, which might affect the clinical management.

In the event of a diagnosis of shigellosis in an adult male, particularly where this is not associated with travel to an endemic area, a sexual history should be sensitively obtained. Patients reporting same sex partners are likely to be at risk of other STIs and HIV co-infection, and referral to sexual health services for appropriate HIV/STI screening, partner notification and prevention advice should be advised. A leaflet prepared by PHE and the Terence Higgins Trust is available[12] [38] and gives advice to MSM on both prevention and measures to reduce spread.

While *S. sonnei* and *S. flexneri* have been identified in MSM outbreaks in England, any *Shigella* spp. may be sexually transmitted, and anybody may be infected with *Shigella* spp. through sexual contact. Routine information given to all cases in leaflets or

[12] https://www.gov.uk/government/publications/shigella-leaflet-and-poster

verbally, regardless of their sexual identity, should state that transmission is via the faecal-oral route, which can include sexual transmission[13].

7.8 Exclusion of cases and contacts in risk groups

A review of international guidelines showed considerable differences in suggested management of asymptomatic contacts, varying from no action, discretionary exclusion and/or screening, to exclusion and a single screen for young children attending a care facility [39,40,41,42,43,44]. Most advise actively identifying whether there are any symptomatic contacts and treating these as probable cases, particularly if they are in high risk groups.

The local authority has statutory powers within the Public Health (Control of Disease) Act 1984 (as amended) and the accompanying Health Protection (Local Authority Powers) Regulations 2010 [45]. Guidance on the use of these provisions has been issued jointly by the HPA (now PHE) and Chartered Institute of Environmental Health (CIEH) and Lewes District Council [46]. Exclusion may be arranged, either by the local authority where the case is resident, or by the local authority where they are in employment.

Microbiological clearance

Most guidelines specify two specimens for clearance purposes for cases in high risk groups. Clearance as assessed by conventional culture does not guarantee the absence of organisms as small levels may still be present below the detection level for culture. Clearance is therefore a proxy measure for an acceptable public health risk.

There is evidence that a single negative specimen is adequate for clearance purposes in a study [47] which showed that a single negative result was a 100% predictor of a second negative stool result. If microbiological clearance is a proxy indicator for acceptable public health risk, then a single negative result will suffice.

Cases with faecal specimens that are PCR +ve/culture –ve do not require further exclusion on public health grounds (as long as the diarrhoea is resolved and the patient has been asymptomatic for at least 48 hrs). The risk of transmission in these cases is negligible, for any of the following likely reasons:

- There are very low numbers of organisms in the sample
- The organisms which are testing positive are not viable (dead).
- There is free phage in the gut (the gene is encoded on a bacteriophage which can detach from the bacteria)

This is also the reason why PCR tests on their own have not been recommended for clearance purposes [48] as they may unnecessarily prolong the exclusion period. However, where a *Shigella* PCR-negative result is obtained, this can be taken as evidence that the individual no longer poses a public health risk.

[13] NHS Choices information at www.nhs.uk/conditions/dysentery/Pages/Introduction.aspx

8.0 Appendices

8.1 Case definitions and public health action

SHIGELLOSIS CASE	Clinical features consistent with bacterial dysentery*	Epidemiological link to confirmed or probable shigellosis case	Laboratory findings† (see table 4 and section 7.6)	Action required
POSSIBLE	Present	Absent	• Awaiting local laboratory testing	Initiate or complete testing at local lab.
	Present or absent	Absent	• *Shigella* PCR (*ipaH*) positive; culture negative or awaited	Standard hygiene and exclusion advice. No PH action.
	Present	Present	• *Shigella* PCR (*ipaH*) negative; culture negative	Standard hygiene and exclusion advice. No PH action.
PROBABLE	Present	Present	• Awaiting local laboratory testing	Initiate or complete testing at local lab. Initiate public health action.
	Present or absent	Present	• *Shigella* PCR (*ipaH*) positive • Culture negative or awaited	
	Present or absent	Present or absent	• Laboratory (UK or overseas) culture positive *Shigella* spp, presumptive non-*sonnei* or awaiting further speciation	
CONFIRMED	Present or absent	Present or absent	• PHE Reference laboratory or local laboratory speciated *Shigella*	Initiate or continue public health action.

***** Advise notifying clinicians that any child <16 years, presenting with bloody diarrhoea, should be managed as per the 2011 RCPCH/RCGP/HPA (now PHE) guidelines *The management of acute bloody diarrhoea potentially caused by vero cytotoxin-producing Escherichia coli in children (*6).

HUS cases without known aetiology should also be managed as STEC.

† Positive Shiga toxin PCR (*stx*) almost always indicates STEC and not *S.dysenteriae* type 1

8.2 Text of letter for shigellosis cases

The Public Health England Health Protection Team (HPT) has been informed that you are suffering from bacterial dysentery (shigellosis). We are writing to provide you with some information about the illness and advice on how you can prevent the spread of the infection.

Shigellosis is caused by shigella bacteria that infect the gut, causing diarrhoea (often watery or slimy and sometimes bloody), fever, stomach cramps and sometimes vomiting. The illness may last for only a day or continue for one to two weeks. The incubation period (the time taken from coming into contact with the bug until the illness starts) is usually 1 to 3 days, but can be up to a week.

You are infectious to other people while you are ill and have symptoms. Handwashing is the most important way to stop the spread of infection. You can reduce your risk of passing on the infection by taking the following steps:

- Stay away from nursery, school or work until you've been symptom free for at least 48 hours.
- Where possible, stay away from other people until your symptoms have stopped.
- Also wash your hands carefully with soap and warm water after using the toilet.
- Wash your hands carefully before handling, eating or cooking food.
- Don't prepare food for others until you've been symptom free for at least 48 hours.
- Avoid sharing towels.
- Avoid sexual contact until you have been symptom free for at least 48 hours.

As shigella is easily passed on to others, you may need to have a stool (poo) sample tested and be given the all clear before returning to work, school, nursery or a childminder. The type of shigella you have and whether or not you are in a risk group will influence how long you need to stay away. Risk groups are people in certain occupations, including healthcare workers and people who handle food, as well as people who need help with personal hygiene and very young children. The HPT or local Environmental Health Department will be able to advise you regarding this.

Further information can be found via the NHS Choices link:
www.nhs.uk/conditions/dysentery/Pages/Introduction.aspx

If you have any questions, please contact the HPT or local Environmental Health Department.

Yours sincerely

8.3 Text of letter for (risk group) contacts of shigellosis cases

The Public Health England Health Protection Team (HPT) has been informed that you are a close contact of a person with bacterial dysentery (shigellosis). We are writing to provide you with some information about the illness and advice on how you can avoid picking up the infection.

Shigellosis is caused by shigella bacteria that infect the gut, causing diarrhoea (often watery or slimy and sometimes bloody), fever, stomach cramps and sometimes vomiting. The illness may last for only a day or continue for one to two weeks. The incubation period (the time taken from coming into contact with the bug until the illness starts) is usually 1 to 3 days, but can be up to a week.

If you are well, then you do not need to do anything.

If you currently have or develop symptoms, please get medical attention and show this letter to your doctor. You may need to have a stool (poo) sample tested for the illness and be given the all clear to return to work, school, nursery or a childminder. The type of shigella you have and whether or not you are in a risk group will influence how long you need to stay away. Risk groups are people in certain occupations, including healthcare workers and people who handle food, as well as people who need help with personal hygiene and very young children. The HPT or local Environmental Health Department will be able to advise you regarding this.

You are infectious to other people while you are ill and have symptoms. Handwashing is the most important way to stop the spread of infection. You can reduce your risk of getting dysentery or passing on the infection by taking the following steps:

- Wash your hands carefully with soap and warm water after using the toilet.
- Also wash your hands carefully before handling, eating or cooking food.
- Be very careful with hand hygiene if you are taking care of others who are ill (such as helping with toileting or changing nappies).
- Avoid sharing towels.

If you currently have or develop symptoms:

- Stay away from nursery, school or work until you've been symptom free for at least 48 hours.
- Where possible, stay away from other people until your symptoms have stopped.
- Don't prepare food for others until you've been symptom free for at least 48 hours.
- Avoid sexual contact until you have been symptom free for at least 48 hours.

Further information can be found via the NHS Choices link:
www.nhs.uk/conditions/dysentery/Pages/Introduction.aspx

If you have any questions, please contact the HPT or local Environmental Health Department.

Yours sincerely

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