



Public Health  
England

Protecting and improving the nation's health

# **The investigation of household water systems in cases of Legionnaires' disease**

## **Guidance for health protection teams**

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Investigation of household settings in cases of Legionnaires' disease – guidance  
for health protection teams  
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# 1.0 Introduction

Legionnaires' disease is an uncommon, potentially fatal form of pneumonia caused by the bacterium *Legionella pneumophila* and other species of the genus *Legionella*. *Legionella* can grow in poorly designed and/or poorly maintained water systems, and can be transmitted to humans via aerosols, resulting in Legionnaires' disease. Most cases of Legionnaires' disease are single sporadic cases but legionella can cause clusters and large outbreaks with high morbidity. All cases of Legionnaires' disease should be investigated, even apparently sporadic single cases as they may be part of a developing outbreak.

Legionnaires' disease in England and Wales is a notifiable disease and has an enhanced national surveillance scheme<sup>1</sup>. Despite national surveillance of cases of Legionnaires' disease, there is a lack of definitive data on the proportion of Legionnaires' disease cases that are linked to a household water system as homes are not always sampled and, where they are, environmental sampling data are not routinely submitted to the surveillance system.

It is recognised that undertaking household sampling as part of the investigation for every sporadic case of Legionnaires' disease would have a significant impact on resources and would not always be necessary or appropriate. It is important to consider sampling of relevant high-risk locations/exposures (eg cooling towers, hospitals) before sampling the household of sporadic cases. However, there are situations in which household sampling might be beneficial as part of an investigation to identify the source of infection.

This document aims to provide guidance on when and why to sample a household for legionella, and discusses some of the important aspects to consider. It is designed as a tool for local health protection teams to assist decision making with environmental health departments. Although some of the practicalities are discussed, a technical description of sampling methods is not included here, as that is covered in additional guidance elsewhere.<sup>2</sup>

This guidance relates to households, where one or more individuals have benefit of the accommodation as their only or main residence. The guidance is therefore applicable to flats, maisonettes and other single dwellings, including caravans, mobile homes and house boats, if the place of the occupant's main residence.

Following the publication of this guidance, PHE will aim to evaluate its recommendations, in order to inform future updates of this document.

## 2.0 Investigating cases of Legionnaires' disease

The investigation of Legionnaires' disease involves the collection of a case history for the 10 days prior to onset of illness, using the National Legionnaires' disease surveillance form.<sup>1</sup> The incubation period is usually considered to be between two and ten days (median five to six days)<sup>3</sup>.

As part of the investigation into cases of Legionnaires' disease the potential sources of infection and risk factors are recorded and reviewed. Confirmed cases are generally classified into the following categories in terms of the potential or presumed source of infection: travel associated, hospital or healthcare associated, or community acquired (Figure 1). Classification to a single potential source of exposure is not always possible as cases may have multiple exposures.

### 2.1 Defining household settings

For the purposes of this guidance, households and household settings include fixed and non-fixed premises (including caravans, mobile homes and houseboats) if they are the main place of residence linked to a case. Multiple occupancy residential settings, such as flats, maisonettes and sheltered housing schemes that are under the management or control of one or more persons or organisations, would require special consideration (as per the public health risk assessment (2.3.2)).

Household settings which are the subject of other statutory duties to ensure the health, safety and welfare of persons, are not specifically addressed by this guidance. These settings would include: managed accommodation (through a contractor/s or otherwise) such as university halls of residence, care homes, staff accommodation and other such residential institutions such as prisons. Such settings may still pose a risk for legionella contamination and will need to be managed according to the relevant statutory regulations.<sup>4</sup>

### 2.2 Purpose of investigating households for legionella

The investigation of a household may be indicated in the following circumstances:

- to eliminate the home as a potential source during the investigation of a nosocomial or travel-associated case (where there is also exposure to the home during the incubation period)

- to rule out the home as a source in the investigation of cases associated with suspected clusters or outbreaks of community-associated cases
- to protect other vulnerable residents (eg due to older age or immunosuppression) within the home
- if there is a high index of suspicion that the home is the potential source, when few other potential sources are identified for the case

It is difficult to justify household sampling for apparent single, sporadic cases, where there is little evidence of a risk to public health. The guidance below outlines the information that is important to consider when making this decision and the decision to sample the water system.

### 2.2.1 Organisational roles in household investigations

A decision as to whether a domestic premise should be sampled will need to be made jointly between the local health protection team (HPT) and local authority environmental health department, according to existing local arrangements for investigation of Legionnaires' disease cases.

The local PHE food, water and environmental (FW&E) microbiology laboratory may be contacted as they can provide additional advice and guidance to HPTs when making a decision as to whether samples are required; they should always be informed before specimens are sent to the FW&E laboratory for testing.

### 2.3 Considerations regarding sample from a household setting for single cases

PHE recommends that any decision on when and why to sample a household satisfies the following five points:

- a clinical respiratory specimen from the case should have been submitted to the national reference unit for typing as an absolute minimum prior to proceeding with domestic sampling (in order to provide a comparison for any positive environmental isolates). If a cluster or outbreak is suspected and domestic sampling is required to exclude a source, please refer to [PHE guidance on investigation of cases, clusters and outbreaks of Legionnaires' disease](#).
- the cases's exposure to the household occurred within 2-10 days prior to onset of Legionnaires' disease symptoms
- an assessment of the public health risk within the household setting has been undertaken eg vulnerable individuals (2.3.2)
- a risk assessment of the domestic water system indicates a risk of legionella colonisation
- one of the conditions related to the potential source (in Box 1) has been satisfied

### **Box 1. Consideration of other potential sources**

Travel-associated cases: if the case has returned from travel to a household which has been empty for longer than one week AND has had exposure to that household in the 2-10 days before symptom onset

Healthcare associated cases: if the case's household has been empty for longer than one week AND the case has had exposure to that household in the 2-10 days before symptom onset

Community-associated cases: if the case has been housebound or has had little contact with other potential community sources, in the 2-10 days before symptom onset

Suspected community clusters/outbreaks: if a case is part of a community-associated cluster or outbreak.

More explanation on these investigations is given in Appendix 1.

### **2.3.1 Assessment of the public health risk within the household (summarised in Table 1)**

It is important to establish the level of risk to public health, should the household be the likely source of legionella. This is considered important as it can be more difficult to justify the commitment of resources where the wider public health risk is low eg a single case, in a home of sole occupancy. The public health risk is dependent on several aspects:

- the number of people potentially exposed: premises with multiple occupancy, changing occupancy or where water systems are shared between units within a building, represent a higher potential for exposure, and so should be given special consideration
- the vulnerability of those exposed: are there any people (other than the case) who are resident or regularly using the property and, if so, are they considered to be particularly vulnerable to legionella?

Potentially vulnerable people include the following:

- people over the age of 50 years
- persons with underlying clinical conditions including: respiratory or cardiovascular disease, diabetes, liver or renal disease
- people who have undergone splenectomy
- people who are immunocompromised by illness or immunosuppressive medication
- transplant recipients
- smokers or people with excessive alcohol consumption

### 2.3.2 Risk assessment of the water system (summarised in Table 1)

The household water system and use of the system should be considered carefully in terms of risk of colonisation with legionella.

Risk is higher where:

- the water system has not been used for a period of time (eg over one week),
- there are infrequently used outlets
- there have been issues with the water system, including maintenance of water temperature, the fitting of new sanitary appliances or work on the combined heating/hot water system
- other potential legionella sources are identified, for example any domestic spa pools within or in close proximity to the property, domestic swimming pools, garden hose pipes, pressure washing devices, and glass house watering systems and humidifiers

Risk based assessment of the water system does not necessarily require a visit to the home, it may be possible to obtain adequate information on the condition of the water system by interviewing the case over the phone. Details of any recent plumbing or repair work are requested as standard via the national surveillance form.

## 2.4 Advising the householder

The maintenance of the hot and cold water system in a household is the responsibility of the homeowner / landlord. If samples of household water systems are positive for legionella, the financial burden of any remedial work falls on the homeowner / landlord. If the current householders are also the homeowners, it is important that this is discussed with them prior to sampling, so that the potentially significant financial costs of remediation following positive results are fully understood before any sampling is undertaken. PHE has produced a [leaflet for householders](#) to explain the sampling process. Where the homeowner is unable to communicate, possibly due to ill health, then the next of kin and / or person in control of the property at the time should be contacted and the matter discussed with them. If no such person can be identified, it is advised that permission is sought from the householder when they have recovered.

It is not the role of PHE or Environmental Health to provide input beyond that of general advice around water system management. Minimum expected standards on managing hot and cold water systems can be found in the HSE Technical Guidance.<sup>4</sup> Expert advice and guidance on the specific system can be provided by a plumber experienced in legionella and water management, or a water management company. The Legionella

Control Association have a list of trained service providers, which homeowners can be directed to consult.<sup>5</sup>

Microbiological analysis of the water specimens takes 10-14 days; if the initial risk based assessment of the domestic premises has flagged concerns, then it is particularly important that general advice on water system management and precautions are provided prior to final laboratory results.

In order to assess the success of any intervention, the issue of post-intervention sampling is often raised by the householder. They must be informed that re-sampling is not required as part of the public health investigation. Post-intervention samples are not considered to be environmental investigation samples as these are not representative of the bacterial population present in the water system during the infection period. Therefore, testing of post-intervention samples would fall outside of the public health investigation and would be chargeable. This should be explained to the householder before any sampling is agreed.

Technical information on the control of legionella in water systems is available via the Health and Safety Executive Technical Guidance.<sup>4</sup> Although the HSE guidance does not directly apply to householders, it does provide useful technical advice for plumbers/contractors on legionella control in household hot and cold water systems.

## 3.0 Undertaking household sampling

### 3.1 Sampling and submitting samples for testing

It is outside the scope of this document to provide guidance on the technical aspects of sampling as this is covered elsewhere.<sup>2</sup> However, it is important that, prior to sampling, a health and safety risk assessment of the sampling activity is carried out.<sup>4</sup> This will include how to take the samples with due consideration of the health, safety and welfare of sampling officers and other persons when sampling is carried out. Sampling should be carried out in accordance with British Standard BS7592.<sup>6</sup>

Samples taken as part of the investigation of a case of Legionnaires' disease should be submitted to a PHE FW&E microbiology laboratory. They should be submitted in line with current procedures and protocols for the submission and transport of samples taken for legionella as part of a case, cluster or outbreak investigation.

Laboratories should be contacted as soon as possible prior to the taking of samples from a household to organise sampling bottles and/or equipment, discuss sampling and

the submission of the samples to the laboratory. It is important that the FW&E microbiology laboratory is advised that the samples are related to a case of Legionnaires' disease that is under investigation.

The sampling for legionella in water systems and interpretation of microbiology can be complex, and advice on the microbiology is available from the testing laboratory.

### 3.2 Roles and statutory powers during Investigation

It is not the responsibility of PHE to routinely undertake sampling of premises such as domestic water supplies; however, PHE has a limited capacity to advise on sampling methods based on operational capacity.

Local authority environmental health services authorise staff under various statutory provisions to carry out investigatory actions including the sampling of premises where there is a work activity and/or a statutory duty of care owed to the occupiers of a property. There is no prescriptive power of entry and statutory requirement to sample for legionella in all households for cases of Legionnaires' disease.

Local authority environmental health staff may carry out sampling of households for legionella as part of their wider public health investigatory powers under the Environmental Protection Act, 1990.<sup>7</sup> The final decision as to whether local authority staff undertake sampling would be made by the local authority themselves. Other powers are available where a property is owned by a landlord and statutory interventions are required.

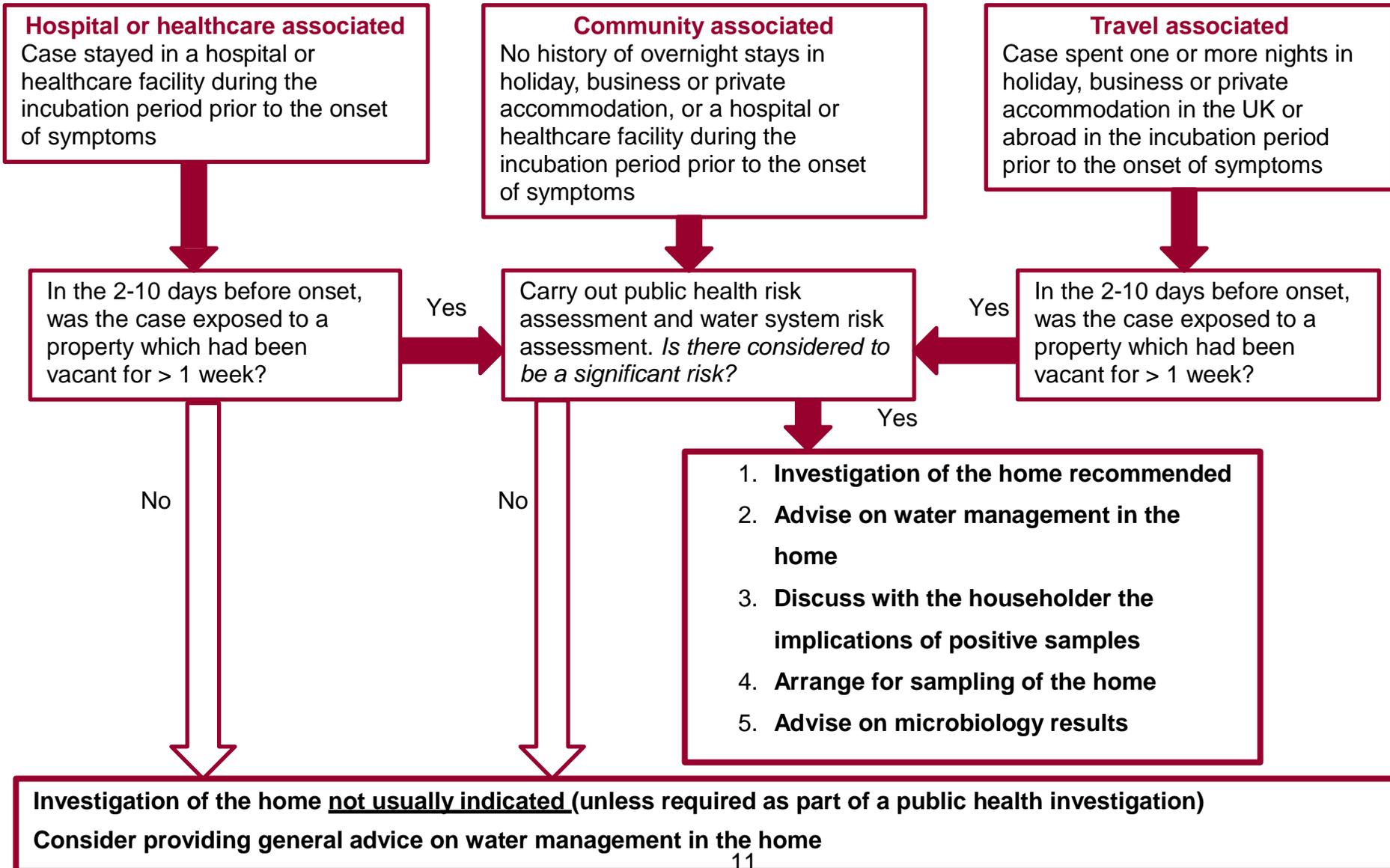
It should be noted that **national guidance** for the Housing Health and Safety Rating System (HHSRS) already includes legionella as a risk which may need to be considered by local authorities, during assessments of housing safety.

## 4.1 Algorithm & template

The algorithms in Figure 1 and Table 1 aim to simplify the text in Section 2.0, and act as a reminder, however they should not be considered in isolation.

**Figure 1: Deciding when to sample**

**Confirmed case of Legionnaires' disease with a clinical respiratory specimen submitted to the national reference unit**



**Table 1: Summary template of risk assessment**

Public health risk assessment	Risk based assessment of water system
<p>Aspects to consider:</p> <p>Is there multiple occupancy in the household and/or building?</p> <p>Is anyone in the household particularly vulnerable to legionella infection? eg:</p> <ul style="list-style-type: none"> <li>• people over the age of 50 years</li> <li>• persons with underlying clinical illness including: respiratory or cardiovascular disease, diabetes, liver or renal disease</li> <li>• people who have undergone splenectomy</li> <li>• people who are immunocompromised by illness or immunosuppressive medication</li> <li>• transplant recipients</li> <li>• smokers, or people with excessive alcohol consumption</li> </ul>	<p>Aspects to consider:</p> <ul style="list-style-type: none"> <li>• property vacant for &gt; 1 week</li> <li>• outlets in the home not used or flushed weekly</li> <li>• recent plumbing or building work</li> <li>• general condition of the water system</li> <li>• high risk systems? eg domestic spa pools</li> </ul> <p style="text-align: center;"><i>See 2.3.2 Risk assessment of the water system</i></p>

# Appendix 1 Consideration of other potential sources

## Travel-associated cases

As travel is a risk factor for Legionnaires' disease, a single case with a history of travel, prior to onset of illness, will not usually be a priority for household sampling. However, sampling may be appropriate, for cases returning home within 2-10 days before symptom onset where the property has been empty for longer than one week prior to returning.

## Hospital or healthcare-associated cases

This includes cases admitted as an inpatient for at least one night. In these instances, the home may remain a possible source, if the case has been at home in the 2-10 days prior to onset of symptoms, and the home was vacant for more than one week prior to this exposure. In these circumstances, sampling may be indicated, following the public health and household water system risk assessment.

In addition to providing useful information on the home, positive sampling of the home could eliminate the hospital as a potential source. However, sampling of the home must not delay any investigations related to a healthcare setting.

## Community cases

In the absence of other potential sources, community cases should be considered for household sampling (pending the public health and household water system risk assessment). Cases who are housebound or who have little contact with other potential community sources in the 2-10 days before onset, should be given special consideration, and water management advice may be indicated before the public health and water system risk assessments.

## 5.0 References and further information

1. National Legionnaires' disease surveillance Scheme for England and Wales:  
<https://www.gov.uk/government/collections/legionnaires-disease-guidance-data-and-analysis>
2. Guidance on Sampling from Households:  
<https://www.gov.uk/government/publications/legionella-species-sampling-of-households>
3. World Health Organization, 2007. Legionella and the prevention of legionellosis.  
[http://www.who.int/water\\_sanitation\\_health/emerging/legionella.pdf](http://www.who.int/water_sanitation_health/emerging/legionella.pdf)
4. HSE Technical Document: <http://www.hse.gov.uk/pubns/books/hsg274.htm>
5. Legionella Control Association: <http://www.legionellacontrol.org.uk/>
6. British Standard BS7592 (2008): Sampling for legionella bacteria in water systems.  
Code of practice: [Available online](#).
7. Environmental Protection Act, 1990:  
<http://www.legislation.gov.uk/ukpga/1990/43/contents>