



Guideline on the management of *Legionella* cases, incidents, outbreaks and clusters in the community

Health Protection Network
Scottish Guidance

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The Health Protection Network (HPN) is a network of existing professional organisations and networks in the health protection community across Scotland. It aims to promote, sustain, and coordinate good practice. The HPN supports a systematic approach to development, appraisal and adaptation of guidelines, seeking excellence in health protection practice.

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Acronyms

A&E	Accident and Emergency Department
ACoP L8	Approved Code of Practice L8
BS	British Standard
BTS	British Thoracic Society
CD/EH	Communicable Disease / Environmental Health
CFU	Colony Forming Units
CHP	Community Health Partnership
CMO	Chief Medical Officer
COPFS	Crown Office and Procurator Fiscal Service
COSHH	Control of Substances Hazardous to Health
CPHM	Consultant in Public Health Medicine
DNA	Deoxyribonucleic Acid
ECDC	European Centre for Disease Prevention and Control
EDTA	Ethylenediaminetetraacetic Acid
EHO	Environmental Health Officer
EIA	Enzyme Immuno Assay
ELDSNet	European Legionnaires Disease Surveillance Network
FAQ	Frequently Asked Question
GIS	Geographic Information System
GP	General Practitioner
HIIAT	Hospital Infection Incident Assessment Tool
HPS	Health Protection Scotland
HPT	Health Protection Team
HSE	Health & Safety Executive
HSWA	Health and Safety at Work Act etc 1974
IMT	Incident Management Team
LA	Local Authority
LMC	Local Medical Council
NHS	National Health Service
PAG	Problem Assessment Group
PCR	Polymerase Chain Reaction
PHE	Public Health England
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment

SBAR	Situation Background Assessment Recommendation
SBT	Sequence-based typing
SG	Scottish Government
SGoRR	Scottish Government Resilience Room
SHLMPRL	Scottish Haemophilus <i>Legionella</i> Meningococcal and Pneumococcal Reference Laboratory
TSO	The Stationary Office (formerly HMSO Her Majesty's Stationary Office)
TVC	Total Viable Count
UK	United Kingdom
WGS	Whole Genome Sequencing

1. Introduction

The purpose of this document is to provide interagency guidelines to aid investigation and management in the event of an incident, cluster and/or outbreak of legionellosis in the community.

1.1 This revised guideline

This document is a revised version of the guideline first published in April 2008. It has been revised following *Legionella* incidents in Scotland in the period 2008-2013, which identified deviations in current practice from those detailed in the original guideline. The revisions have been made by a group of experts who have been involved in recent *Legionella* incidents and who represent the principal membership in any Incident Management Team (IMT) who investigate *Legionella* incidents. Membership of the group is given in [Appendix A on page 49](#).

This guideline does not offer clinical guidance. It is for use in the investigation of a public health incident and is principally aimed at those staff and organisations who are involved in any public health response.

This document aims to provide a user-friendly, evidence-informed guideline for Scotland that offers best practice advice/guidance for investigation and management of incidents, clusters and outbreaks of *Legionella* in the community.

This document is based on current legislation, best published evidence and expert consensus.

Details on guidelines development process in line with the methodology established by the Health Protection Network, audience, out of scope, and disclaimer are considered in [Appendix A on page 49](#).

1.2 Background Information

Sources of background information about the causative microorganism, transmission and infection of the disease, as well as public health interest, are outlined in [Section 9 on page 46](#). Links to most recent Scottish information about Legionnaires' disease are also available in [Section 9](#). If specific local details are sought please get in touch with Health Protection Scotland.

1.3 Comments on the published guidance

Comments on this guidance should be sent to the HPN Steering Group via its national coordinator or administration, submitting the form available at <http://www.hps.scot.nhs.uk/about/guidancedevelopment.aspx>, to the following email address NSS.HPN@nhs.net. A copy of this form is also available in **Appendix G on page 67**.

Sometimes a comment after publication may highlight a potential error in clinical guidance. This might be in either the interpretation or the presentation of the evidence considered by the GDG/TEG. In these cases the Chair of the Health Protection Network and the advisors they approach will consider whether the potential error:

- may result in harm to patients / the population;
- undermines the conclusions on which the recommendations were based;
- indicates serious problems with our quality-assurance procedures.

If one of these criteria is met, the comment will be referred to the HPN Guidance Executive, which decides what action to take. If the Guidance Executive does not accept that an error has been made, the individual or organisation that made the comment will be notified. If the Guidance Executive accepts that an error has been made, a note will be put on our website, and the versions of the document on the website will be amended. Depending on the nature and significance of the error and the time since publication, registered stakeholders may also be notified in writing.

Comments or new evidence that are not an error but should be considered at the time when review of the document is due will be collated and taken into consideration in due course.

This guidance should be reviewed in 3 years or sooner if new evidence becomes available. It is envisaged that the HPN will oversee this process.

1.4 Definitions

1.4.1 Clinical and microbiological case definitions

The following definitions are based on the EU surveillance definitions (Commission Implementing Decision 2012/506/EU, 2012) and are used throughout this document.

Confirmed case

Any person meeting the clinical criterion AND at least one laboratory criterion for a confirmed case

Clinical criteria: any person with pneumonia

Laboratory criteria: at least one of the following three:

- isolation of *Legionella* from respiratory secretions or any normally sterile site;
- detection of *Legionella pneumophila* antigen in urine;
- significant (at least four-fold) rise in specific antibody level to *Legionella pneumophila* serogroup 1 in paired serum samples.

Probable case

Any person meeting the clinical criterion AND at least one laboratory criterion for a probable case

Clinical criteria: any person with pneumonia

Laboratory criteria: at least one of the following four:

- detection of *Legionella pneumophila* antigen in respiratory secretions or lung tissue e.g. by DFA staining using monoclonal-antibody derived reagents;
- detection of *Legionella* species nucleic acid in respiratory secretions, lung tissue or any normally sterile site;
- significant (at least four-fold) rise in specific antibody level to *Legionella pneumophila* other than serogroup 1 or other *Legionella* species in paired serum samples;
- single high level of specific antibody to *Legionella pneumophila* serogroup 1 in serum.

Possible case

There is no case definition for a possible case as cases of legionellosis must be identified by microbiological testing. However, in an incident situation a 'possible' case definition may be developed to include suspected cases who meet epidemiological criteria and who are awaiting testing or test results.

1.4.2 Category of exposure

One of the main objectives of any investigation is to determine the exposure in order to implement control measures and prevent further cases. The exposure is classified into three broad categories - community, nosocomial and travel-related, which are defined below.

Community exposure

Cases with no history of overnight stays away from home (in holiday or business accommodation or travel abroad or hospital admission) or association with a healthcare facility during the 2-14 days incubation periodⁱ prior to the onset of illness.

Nosocomial exposure

- Definite nosocomial - Legionnaires' disease in a person who was in hospital for at least ten days before the onset of symptoms.
- Probable nosocomial - Legionnaires' disease in a person who stayed or spent time (e.g. as an outpatient or a healthcare worker) in a hospital or other healthcare facility for part of the incubation period and where the facility has been associated with one or more previous cases of Legionnaires' disease, or the case has yielded an isolate that was indistinguishable (by monoclonal antibody subgrouping or by molecular typing methods) from isolates obtained from the hospital water system at about the same time.
- Possible nosocomial - Legionnaires' disease in a person who stayed or spent time (e.g. as an outpatient) or who worked in a hospital or other healthcare facility for part of the incubation period but where there have been no previous cases of Legionnaires' disease or isolates from the hospital water system at about the same time.

Travel associated exposure

ELDSNet operational procedures define travel associated cases and clusters (ELDSNet, 2012).

- Travel associated exposure is a case of Legionnaires' disease who spent one or more nights in holiday or business accommodation in the UK or abroad in the 2-14 days prior to the onset of symptoms. Holiday or business accommodation includes hotels, bed and breakfast, camp sites, ships, rented holiday apartments or other tourist facilities.

i Note ECDC guidance - the median incubation period for Legionnaires' disease is 6 days, with the majority of cases showing a 2-10 day incubation period. About 10% of cases might be expected to have an incubation period up to 20 days, and therefore limiting the case definition to only 10 days might limit the effectiveness of identifying the source. Collecting case information on activities for 14 days (incubation period for 90% of cases) prior to onset of symptoms offers a reasonable and pragmatic compromise. <http://legionnaires.ecdc.europa.eu/?pid=107>

- Travel associated single case - cases who in the 2-14 days before onset of illness stayed at or visited an accommodation site that has not been associated with any other cases of Legionnaires' disease, or cases who stayed at an accommodation site linked to other cases of Legionnaires' disease but more than two years previously.
- Travel associated cluster - two or more cases who stayed at or visited the same accommodation site in the 2-14 days before onset of illness and whose onset is within the same two year period.

1.4.3 Incident definitions

Sporadic case

A sporadic case not associated with any other case. No other case may be linked to the probable source of exposure in the last two years. Such cases may be confirmed or probable (see [Section 1.4.1 on page 5](#)).

Incident

A (first) single case – confirmed or probable – where, based on the evidence available, there are concerns about actual or suspected threats to the safety or quality of water systems that could require intervention to protect public's interests.

Community

Though not formally defined (yet) by ELDSNet, a community outbreak would refer to more cases than expected. A common source community outbreak would be when there is evidence for a common source. Definitions include:

- a) community sporadic case;
- b) community cluster;
- c) community outbreak.

Outbreak

Two or more confirmed or probable cases in the same locality for which there is strong evidence of a common source of infection and closely linked in time (weeks rather than months).

2. Initial response and risk assessment

2.1 Initial notification and investigation

A suspected or confirmed case of legionellosis is usually reported to the NHS board HPT by:

- microbiology diagnostic services (local laboratory or reference laboratory);
- hospital clinicians through hospital-based assessment of community acquired pneumonia;¹
- by general practice;
- or as a post-mortem finding.

Notification to the NHS board HPT must be supported by microbiological evidence of recent *Legionella* infection meeting confirmed or probable case definitions (see [Section 1.4.1 on page 5](#)), unless notified as a suspected case(s) associated with an identified outbreak. Discuss the case and the initial test results with the diagnostic microbiologist (see [Section 5 on page 30](#)). Consider a PAG if there is more than one case or there are unusual circumstances.

Every single case of Legionnaires' disease should be fully investigated in a timely fashion (same day where possible). This might be the first case in an outbreak and prevention of further cases is the priority. It should be noted that there might well be an appreciable delay before cases start to be reported.

A **single case definition** (potentially a preliminary outbreak case) may read as follows:

“Any person with:

a confirmed or presumptive diagnosis of Legionnaires' disease;

AND a history of association with (place) in the 2-14 days before onset of illness;

AND whose illness started between dd/mm/yyyy and dd/mm/yyyy.’

2.1.1 Action following initial notification

The following [Sections 2.1.2-2.1.5](#) apply to Legionnaires' disease caused by *L. pneumophila* only. For public health action for other species see [Section 2.1.6 on page 11](#).

2.1.2 Initial enquiries

- Initial enquiries should identify if the case is community, nosocomial or travel acquired.
- These enquiries are usually carried out as soon as possible (same day) after notification to the NHS board HPT, by members of the HPT.

- Definitions are provided in **Section 1.4 on page 5**.
- The questionnaire in **Appendix D on page 64** is suitable to gather information about all these types of cases.
- Additional useful information is recent (weeks to months) previous cases associated with a geographical location. For overseas travel contact HPS for this information.
- Advise CPHM (CD/EH) and on-call CPHM.
- Follow up and complete investigation.

2.1.3 For cases acquired in the community

- Obtain details of patient's movements for the two weeks prior to onset of illness and map these (paper or electronic). Collect information on the same day using epidemiological questionnaire in **Appendix D on page 64**.
- Obtain details of any cooling towers and high-risk (see **Section 4.2 on page 21**) aerosol producers in vicinity (initially within 2km - see note at the end of this section) of the patients' home, work place or places visited, from the local authority.
- Unless there is a high index of suspicion for a local source there is no requirement to check maintenance records, risk assessment documents and sampling regime of identified cooling towers for single cases given the difficulty in identifying a source. However where there is more than one case, consideration should be given to investigating community sources linking the cases.
- If cooling tower(s) are identified at a work place, enquire about recent levels of sick leave and respiratory illness in employees.
- If patient has had contact with a spa pool, request EHOs check that control measures comply with Health and Safety requirements² and PHE guidance.
- If maintenance and risk assessment indicates a deficiency, further investigation should be carried out after discussion with the CPHM and EHOs (and HSE where appropriate).
- If patient lives in a care home, enquire about recent levels of respiratory illness in other residents and care home staff.
- Consider sampling of the household and garden water sources and systems where there has been problems relating to maintenance of the water system, or if the house water-source/system has not been used for long periods of time.
- Submit surveillance form to HPS.

The evidence should be reviewed by a CPHM in the investigating NHS board where there appears to be an incident, cluster or (one or more) nosocomial cases. The CPHM will consider this preliminary investigation (including epidemiological and environmental assessment) and decide whether a more extensive investigation is required. If this is required then the CPHM may call a PAG or IMT to ensure all relevant parties are informed and engaged.

A note about aerosol spread in the outbreak zone

A review of the literature for outbreaks of legionellosis and distance of aerosol spread, identified the greatest risk of infection is within the nearest 2km of the aerosol source. However, a small number of studies identified cases of legionellosis up to 6km from wet cooling towers or other high energy or high volume aerosol sources. More distant aerosol spread is determined by the type of source (see [Section 4.2 on page 21](#)), wind direction, temperature and humidity.

The characteristics of the outbreak zone, including the radius, will vary from outbreak to outbreak and plans may need to be flexible and dynamic to incorporate initial and subsequent investigation findings.

It is recommended that in an outbreak, initial investigations should focus on wet cooling towers and other aerosol sources within 2km of case's residence, or a place where a number of cases have spent time. If appropriate, the search may then be extended beyond this distance where professional judgement on wet cooling towers or aerosol type, wind direction, temperature and humidity indicate.

Investigations outwith the domestic setting are not necessarily warranted for single cases unless it is a nosocomial or work-related case.³

2.1.4 For cases acquired in hospital

- Obtain details of the patient's movements for the two weeks prior to onset of illness, collect information on the questionnaire in [Appendix D on page 64](#).
- Call an IMT (see [Section 2.2 on page 12](#)).
- Review hospital water sources and delivery systems. Search for other cases associated with the hospital.
- Conduct environmental sampling.
- Institute remedial control measures.
- Record all actions.
- Advise patient of possible press interest and the role of the NHS in a response.
- Submit surveillance form to HPS.
- Undertake HIIAT assessment and report as necessary.

2.1.5 For cases identified as travel associated

- Obtain details of the patient's movements for the two weeks prior to onset of illness, collect information on the questionnaire in [Appendix D on page 64](#).
- Obtain address(s) of destination(s) including name of hotel / apartment / caravan site etc.
- Obtain travel details including dates of stay, mode of travel - including flight details and tour operator.
- Submit surveillance form to HPS.
- HPS reports travel-associated cases to ELDSNet. HPS has access to up to date information about incidents in the EU and can relay such findings to the NHS board, if needed.

2.1.6 Non *L. pneumophila* cases

For *L. longbeachae* cases

- Refer case to LA for completion of case investigation form – use garden exposures section in form in [Appendix D on page 64](#).
- Consider sources, particularly compost and occupational exposure.
- Good hygiene in relation to gardening is recommended for relatives of cases. However, *legionellae* have been detected in multiple sources of compost so there are no specific control measures.
- Report to HPS.

For *Legionella* species other than *L. longbeachae*

- If sporadic, probable or confirmed case, be aware of emerging organisms and maintain enhanced surveillance; consider PAG.
- For cluster of two or more probable or confirmed cases within a one month period of a specific *Legionella* species, then re-interview cases with the epidemiological investigation form (see [Appendix D on page 64](#)) to try and identify a common source.
- Map the cases.
- Set up PAG/IMT to discuss significance and further action.

2.2 Activating an Incident Management Team

The CPHM (or Infection Control Doctor if a nosocomial incident) confirms that an incident, cluster, outbreak or nosocomial infection exists or a Legionnaire's disease death has been identified at post mortem (see definition in [Section 1.4 on page 5](#)). The CPHM (or ICD) then activates a PAG or IMT to manage and further investigate the incident, with the overall purpose of protecting public health and preventing further infection. The IMT should be cognoscente of the fact the information may be used for a variety of other purposes including public enquiries, prosecutions, Freedom of Information requests, audit or other by a variety of other agencies where appropriate.

For members of the IMT see [Appendix C on page 63](#).

For roles and responsibilities of members of the IMT see [Appendix B on page 51](#).

There is National Guidance for the Management of Public Health Incidents, published jointly between HPN and Scottish Government.⁴

2.3 Risk assessment

Risk is defined as the probability of a problem occurring and the severity of impact it would cause if such an event occurs.

In an incident/outbreak of legionellosis, the key questions are:

- what is the likelihood of a population continuing to be exposed to *Legionella* and,
- what is the potential impact on health?

Answering these questions requires an assessment of the risks to public health.

This assessment should be derived from interpreting the collated findings from the epidemiological, microbiological and water systems investigations and reflecting on how these compare to the findings from previous similar episodes.

The assessment will guide the definition and prioritisation of control measures and what to communicate to the public, especially those who may have been or could continue to be put at risk. It will provide a framework for evaluating the impact of control measures and identifying whether the risks to health could recur.

2.3.1 Process of risk assessment

The risk assessment process will consider the following three steps.

STEP 1 - Identifying the hazard

In general terms, *Legionella pneumophila* serogroup 1 causes the majority of human cases in the UK. It is not greatly infective (probability) but does have a significant case fatality ratio associated with infection (severity). Other types of *Legionella* (such as *L. longbeachae*) cause disease less frequently, but can also cause severe disease.

Specialist advice with regards to *Legionella* infectivity and pathogenicity should be sought from SHLMPRL.

To identify and characterise the likely or definitive source(s) of exposure to *Legionella* consider the following:

- the location and nature of any producer of an aerosol which the findings from investigation indicate may have been the source;
- the scale of aerosol production;
- the level of contamination of an actual or putative water system with *Legionella*;
- the likely cause of contamination;
- the periodicity and timing of production of a contaminated aerosol: is it or has it been continuous?; and is it possible to identify an event which may have led to the contamination? (e.g. disruption of control measures).

To identify the route and nature of any likely or definitive exposure to *Legionella*, consider:

- the nature of any plume of aerosols produced by a likely source;
- the factors likely to have influenced its dispersion e.g. prevailing wind, climatic conditions, 'urban canyons' (where the street is flanked by buildings on both sides creating a canyon-like environment);
- the probable extent of its dispersion and the relationship this has to the spatial distribution of cases during the incubation period of their illness.

STEP 2 - Identifying the population at risk

To identify those who may have been or are likely to continue to be exposed to *Legionella* consider:

- the number of persons involved;
- their location (place) e.g. whether this is a workplace, institution, place of residence;
- the time during which the population at risk has likely been exposed;
- their level of susceptibility e.g. age, underlying medical conditions, immunosuppressed, lifestyle or other risk factors;
- defining the likely perception of risk and any factors likely to allay or amplify anxiety.

STEP 3 – Evaluate, reduce risk and protect

The key conclusions from the previous steps should be collated and any interrelationships defined. This will enable the development, evaluation and refinement of a hypothesis of risk. In this process, a particular question will help: is there evidence that the exposure has ceased or is it likely to be ongoing?

Consider:

- the capability and commitment of those responsible for any putative source to put in place any risk reduction measures required (considering best practice and legal requirements);
- the likelihood of these being fully implemented and effective and the timescales involved.

Implementing control and prevention measures (See [Section 7 on page 41](#)).

Communicating risk (See [Section 6 on page 35](#)).

Reporting (See [Section 8 on page 45](#)).

3. Epidemiological Investigation

3.1 Epidemiological questionnaire

An epidemiological or hypothesis generating questionnaire should be administered to suspected and confirmed cases as soon as possible during an incident. Where the case is too unwell to be interviewed, a partner or close relative may be a suitable alternative source of relevant information. The questionnaire is usually administered by a local authority EHO who attends the case's home to investigate. If the patient is interviewed in hospital it may be useful if a member of the HPT and an EHO attend the case together to complete the questionnaire – in such instances the local knowledge of the EHO may provide additional information on possible sources.

Appendix D on page 64 offers a template of this questionnaire. This questionnaire has three parts:

- case specific details and general exposures;
- questions about garden exposure;
- diary section to indicate timeline of movements and places visited.

Sections should be filled in as appropriate - not all case investigations will use all sections of this questionnaire.

3.2 Analysis of data from epidemiological questionnaire

3.2.1 Descriptive epidemiology

Descriptive epidemiology will allow common characteristics of cases, movements, timelines and exposures to be identified. During an incident, this information should be revised following the addition of every new case.

For a **small incident**, the HPT will undertake manual comparison of clustered cases for key characteristics that may identify a common exposure. This is supported by early establishment of a line listing (see **Appendix E on page 65** and **Appendix F on page 66**). The HPT use of HPZone will facilitate data capture and analysis.

For **larger incidents**, an outbreak database should be developed, into which data from all the epidemiological questionnaires should be entered. The outbreak database will allow for systematic analysis of individual variables. It is recognised that the HPT dealing with the outbreak may not have capacity to create and populate an outbreak database. In this case HPS can create and maintain the outbreak database. The relevant HPT(s) will need to work closely with HPS to ensure that completed epidemiological questionnaires are received by HPS promptly.

3.2.2 Mapping

In incidents where a common exposure is not immediately identifiable, it will be useful to map case movements. This is usually done using the postcode of places visited by the cases. To support mapping, postcode or at least full address of place visited, should be collected on the epidemiological questionnaire. In the initial stages of an investigation (e.g. out of hours) it may be appropriate to map cases on a paper map. Most NHS boards and local authorities now carry capability for electronic mapping using GIS software. Alternatively, the IMT lead can ask HPS for support with this.

In previous incidents, boards have found that a large paper map on the wall in an incident room, which is updated with new cases, is the most useful way of collating this information. However, for the purposes of sharing this within the IMT, an electronic version should be generated. Potential sources of contaminated aerosol should also be mapped where appropriate.

3.2.3 Cluster analysis

Cluster analysis such as GIS employs mathematical techniques to analyse cases together by space and time. From this analysis, geographical area (usually postcode sector), relative risks and a suspected release window(s) can be estimated.⁵

In recent incidents in Scotland, this work has been undertaken by the Emergency Response Department in PHE Porton Down. This collaboration is co-ordinated by HPS and requires postcode and date of onset information, which is generated most easily from an outbreak database.

Whilst useful, cluster analysis is limited in accuracy by the number of cases for which information is available. This means that at the beginning of an incident when case numbers are small, there is a large uncertainty in cluster analysis. Towards the end of an incident, when there have been large numbers of cases, potential sources have been identified and control measures put in place, cluster analysis has a much higher degree of certainty and can be used to corroborate the findings of epidemiological, microbiological and environmental investigations.

3.3 Meteorological data

The best source of meteorological data is the Met Office. HPS will approach the Met Office for relevant data on behalf of the IMT.

The ability to assess weather records is extremely useful in elucidating the role of a contaminating source such as a cooling tower e.g. bacterial concentrations increase with wind speed and temperature. The Met Office holds data for a number of monitoring stations across Scotland informing the nation's weather and climate. The data is collected hourly at each monitoring station and can be available for a specified period to support the outbreak investigation.

Weather data requires further modelling to become useful for the outbreak investigation. In previous incidents in Scotland, this work has been undertaken by the Emergency Response Department in PHE Porton Down. This collaboration is coordinated by HPS.

Additional expertise from scientists at the Met Office may be needed to interpret unusual climactic conditions and how they affect aerosols. HPS will approach the Met Office if this is necessary.

3.3.1 Plume modelling

Plume modelling has been used in incidents to better understand aerosol dispersal over an area and how meteorological factors can affect the plume. Plume modelling is complex mathematical modelling using specialist software.

For cluster analysis, modelling of weather data and plume, HPS will collaborate with PHE Emergency Response Department Porton Down who have expertise in this type of modelling.

3.4 Analytical studies

The IMT will decide if an analytical study is indicated.

Analytical studies may be used to:

- test a hypothesis which is raised during an outbreak investigation;
- understand the importance of specific risk factors or certain activities on illness;
- understand factors affecting severity of illness;
- identify the extent of illness including mild illness such as Pontiac fever. Symptoms of Pontiac fever are similar to those of Legionnaires' disease and usually last for 2 to 5 days. Pontiac fever is different from Legionnaires' disease because the patient does not have pneumonia. Symptoms resolve without treatment.

Analytical studies include case-control and cohort studies. The cohort study is the gold standard of analytic epidemiology as it allows calculation of indicators that have a very clear meaning and the results are immediately understandable. However, it is more realistic in an outbreak situation to use the case-control study and the use of this type of study has been repeatedly demonstrated in the investigation of *Legionella* outbreaks. It should be noted that case-control studies tend to be more biased than cohort studies.

Timing of analytical studies is crucial because of participants' recall bias and the timeframe for reliable detection of antibody titre where serology is needed. It is very difficult to conduct a study at the optimal time – i.e. during an outbreak.

Analytical studies are resource intensive investigations and additional funding and personnel are likely to be required. HPS will support and collaborate extensively with any analytical study undertaken. Contact HPS for protocol templates, previous study protocols and reports of previous studies.

For analytical studies, it is likely that potential participants will be those most affected by the incident. In such cases, care should be taken to work closely with all relevant agencies to ensure that other investigations, for example evidence gathering for a criminal investigation, are not compromised. It is likely that the results from any analytical study will be reviewed as part of evidence gathering for criminal investigations, should these investigations be undertaken.

4. Investigation of water systems

4.1 Typical and atypical putative sources of *Legionella*

4.1.1 Foreign travel

Approximately two thirds of all cases of Legionnaires' disease recorded in Scotland each year are associated with travel.⁶ An IMT/PAG should consider the likelihood of travel being implicated in the outbreak at the earliest opportunity.

4.1.2 Potential sources

Any water system that has the right environmental conditions could potentially be a source for *Legionella* bacteria growth. There is a reasonably foreseeable *Legionella* risk in a water system if:

- water is stored or re-circulated as part of the system;
- the water temperature in all or some part of the system is between 20-45 °C;
- there are deposits that can support bacterial growth, such as rust, sludge, scale and organic matter;
- it is possible for aerosols to be produced and dispersed;
- it is likely that employees, contractors, visitor etc. could be exposed to any contaminated aerosols.

4.1.3 Risk associated with systems

There is sufficient evidence from previous outbreaks to identify the 'high-risk' sources likely to cause major outbreaks. The number of water systems that can become contaminated is substantial, but many will present a 'low-risk' of causing an outbreak due to limited ability to cause aerosol dispersion.

Table 1 is a list of potential sources based on peer-reviewed papers and other information. It is recognised however, that virtually any water source can become contaminated with *Legionella* and, if favourable conditions occur for growth and dissemination in the context of inadequate control, then exposure and infection may occur. The list in **Table 1** is therefore not exclusive.

TABLE 1: Potential sources of *Legionella* in installations.

High risk sources	Other risk sources
Cooling towers/evaporative condensers/air conditioning systems and hybrid systems – associated with major community outbreaks	High pressure hosing/cleaning
Hot and cold water systems (particularly in hospitals, hotels, leisure facilities and care homes to a lesser extent) – often related to shower-heads	Car/train wash
Whirlpools/spa baths (both ‘display’ and leisure)/birthing pools	Industrial water systems (for example concrete batching plants, aqueous tunnel washers)
	Plant and machinery cooling systems (which are open)
	Fountains
	Commercial irrigation system (e.g. used in sports venues)
	Sewage plants
	Ship water pump repair
	Growing media / composted green waste (specific species: <i>L. longbeachae</i>)
	Garden sprinkling water systems (both from indoor and outdoor taps)
	‘Respiratory therapy devices’ which generate aerosols; ‘Aerosolising’ devices
	Contaminated hospital equipment
	Hot spring bath water
	Public bath water
	Ice machines
	Dental equipment
	Food display humidifiers
	Air humidifiers

4.2 Compliance with legislation

4.2.1 General

Health and Safety Legislation and guidance are designed to control the risk of *Legionella* developing in water systems and to protect employees and the community at large.

There is further technical guidance on these systems in the following HSE guidance.⁷ These documents also contain details of risk assessment and control measures:

- Part 1: Evaporative cooling system;
- Part 2: Hot and cold water systems;
- Part 3: Other risk systems.

Specific guidance on managing spa pools is available at www.hse.gov.uk/legionnaires/spa-pools.htm.

Further general information² is available from the HSE website at: www.hse.gov.uk/legionnaires/what-you-must-do.htm.

4.2.2 Duties and responsibilities

The duty on employers and others in control of premises to control *Legionella* risks is required under specific health and safety legislation:

- The Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended):
 - <http://www.legislation.gov.uk/ukxi/2002/2677/regulation/1/made>
 - <http://www.legislation.gov.uk/ukxi/2004/3386/contents/made>

The legal duties and practical guidance on how to comply with the regulations are set out in a series of documents published by HSE:

- Legionnaires' disease: The control of *Legionella* bacteria in water systems, Approved Code of Practice and guidance (ACoP L8);⁸
- Legionnaire's disease: Technical Guidance (HSG 274).⁷

Duty-holders must notify cooling towers and evaporative condensers, as required under the Notification of Cooling Towers and Evaporative Condensers Regulations 1992, available at: <http://www.legislation.gov.uk/ukxi/1992/2225/contents/made>.

In addition to H&S legislation, LAs have other powers under the Public Health etc. (Scotland) Act 2008⁹ and Nuisance procedure under Section 79(1) of the Environmental Protection Act 1990 (see **Section 7.1.3 on page 41**).

The law requires duty holders to:

- identify and assess the risks from Legionnaires' disease associated with their work;
- appoint a person to have managerial oversight;
- prepare a written plan or scheme to ensure that the risks are controlled;
- implement the control regime;
- monitor the performance of the control regime and keep appropriate records.

Duty holders should have the following information about their system:

- risk assessment document and the "significant findings";
- details of the appointed person and deputy and other competent persons involved in the control regime;
- communications arrangements and training requirements;
- schematic plan of the water system(s);
- description of the correct and safe operation of the system;
- the precautions to be taken (the control regime);
- records of checks that have been carried out to ensure the efficacy of the control regime (i.e. monitoring and test results, inspection and checks data);
- details of the remedial action that should be taken in the event of failure of the control regime.

With regards to the control regime, the written precautions should include the following information:

- the chemical or physical (e.g. temperature) water treatment programme;
- water quality/system control data;
- remedial measures to be taken when control parameters are exceeded;
- cleaning and disinfection procedures.

Monitoring records should be kept for five years and risk assessments, written schemes and other records should be kept for two years.

4.2.3 Other supporting legislation and HSE guidance

Other HSE guidance is available from the HSE website <http://www.hse.gov.uk/legionnaires/index.htm>.

This includes:

- Legionnaires' disease: A brief guide for duty holders (INDG458) <http://www.hse.gov.uk/pubns/indg458.htm>.
- Control of *Legionella* bacteria in water systems: Audit checklists <http://www.hse.gov.uk/pubns/books/ck02.htm>.

4.3 Investigative approach

In the event of an incident or an outbreak, after excluding travel, all potential sources in the appropriate zone should to be identified (as far as possible) in collaboration with the IMT. The strategy for the investigation will depend on the circumstances (e.g. hospital, workplace, community etc.). Priority should be given to the most likely appropriate source(s), depending on their associated risk. The investigation should focus on the water systems management and control systems. Steps should be taken to eliminate risks, ensure that the water systems are cleaned and disinfected and that an adequate control regime is in place. Sampling of systems under investigation will support investigation, identify if control measures have been effective and may be used as evidence in any following investigation.

Additional guidance can be found in: Legionnaires' Disease Technical Guidance Parts 1, and 3.⁷

4.4 Sampling of water systems and other potential sources

4.4.1 Sampling strategy

The purpose of water sampling is to:

- help identify the potential source(s) of the outbreak in conjunction with other information obtained during investigation; and
- to verify that any remedial actions taken by the duty-holder, for example the shock dosing of a risk system with a disinfectant to control the risk of *Legionella*, is effective and that control is being maintained.

A sampling strategy should therefore be prepared during an outbreak investigation. Those involved in investigating potential sources at sites should be involved in preparing and agreeing the sampling strategy. This could involve local authority EHOs, sampling personnel, scientists and specialists such as occupational hygienists. The sampling strategy should:

- reflect the risks associated with the systems (see **Section 4.1.3 on page 19**) - sampling appropriate 'high-risk' sources should be given initial priority, unless there is evidence to the contrary;

- include safety of sampling personnel;
- equipment required;
- label and sample collection form information;
- means of keeping accurate records of samples taken;
- consideration of the different types of risk systems to be sampled;
- the types and numbers of samples to be taken;
- the method of collection, safe transport and handover to laboratory staff of the samples taken.

Further information that may assist in the preparation of a sampling strategy can be found in the following publications:

- BS 7592:2008 Sampling for *Legionella* bacteria in water systems: Code of Practice, Section 3: Sampling for outbreak and other investigations;¹⁰
- The determination of *Legionella* bacteria in waters and other environmental samples (2005) Part 1 - Rationale of surveying and sampling (Environment Agency, 2005). Section 3.4 Sampling for outbreak investigations;¹¹
- Legionnaires disease': Technical guidance Parts 1, 2 and 3.⁷

4.4.2 Sampling

- **The type and volume of water sampling** that is required during an investigation is directed by the epidemiological information that is available to the IMT at the outset of the investigation. It is essential to prioritise the sampling to target high risk systems or equipment first, followed by sampling of lower risk processes.
- **The numbers and focus of the sampling** should be continually assessed by the IMT and redirected as the investigation develops and results and information become available to locate the source of the infection and prevent further infection.
- The samples taken normally comprise of water taken from a water distribution system and swabs of the biofilm or other potentially suspect materials. Samples of water should be taken from systems for both chemical and microbiological analysis. Sampling should be conducted in accordance with the procedures described in BS 7592:2008. Further information can be found in 'The determination of *Legionella* bacteria in waters and other environmental samples (2005)- Part 1' and following consideration of the risk to investigators (see [Section 4.4.1 on page 23](#)).

- LAs should ensure that either their own staff or those of contractors they use have received appropriate training in sampling procedures specified in accordance with BS 7592:2008 (see above reference).
- Principally, LAs are exercising their powers available under the Public Health etc. (Scotland) Act 2008 when taking samples from any system in any premises they investigate.⁹
- Wherever possible, samples should be taken in such a manner that the chain of evidence from collection to analysis is preserved in order that any results may be suitable for consideration in any subsequent legal proceedings.
- The sample should be taken with reference to COPFS advice. When the sample has been collected it should be divided into three parts. One part should be given to the occupier or their representative, another sent for analysis and the third retained by the inspector. If prosecution is a possibility, the investigating inspector should contact any potential defendants before the sample is analysed to give them an opportunity to be present at such tests. This should not however, result in a delay to the analysis as this requires to be carried out in accordance with established laboratory testing methods.
- It is of paramount importance that an absolute priority is accorded to the protection of public health, accordingly if it is not possible for whatever reason to arrange for sampling activities to be undertaken without delay, then precautionary chemical shot dosing of suspect risk systems which cannot readily be taken out of use should proceed immediately.
- To aid the IMT in its decision making processes the results of environmental investigations including sampling should be recorded and reported in a standardised format ([Appendix F on page 66](#)).

4.4.3 Water samples

- **The volume of water sample** required is normally 1 litre bottle for microbiological analysis (both for total viable counts and *Legionella*) and 500ml bottle for chemical analysis. However it may be appropriate to take larger volumes of water if additional investigations are to be undertaken, for example, for DNA enumeration. Samples should be collected in appropriate container, for example sterile polyethylene bottles or similar containers for microbiological examination.
- **In the case of microbiological sampling** the sampling container must contain a suitable agent to neutralise any oxidising biocide that may be present in the water. The use of a 1 litre sterile sampling containers containing 180mg of sodium or potassium thiosulfate would be sufficient to neutralise biocides containing chlorine, bromine or chlorine dioxide. If the system to be sampled contains biocides based on the use of silver or copper ions then the sampling container should contain 10mg/l of ethylenediaminetetraacetic acid (EDTA).

- In some circumstances it may be appropriate to take pre-flush samples for a detailed DNA investigation to take place to help identify the source of the outbreak. A pre-flush sample is unlikely to be suitable for chemical analysis to determine the efficacy of the water treatment regime.
- Placement of sampling points may be key to identifying if *Legionella* is present. In the initial phase of the public health investigation, sampling officers will likely have to utilise the sampling points already placed by the company. These may not be in the position recommended in ACoP L8 (i.e. nearest the heat source and in the return line from the cooling tower), and experience suggests often they are close to the biocide injection point where maximum control of *Legionella* and other organisms can be predicted. Similarly, it may not be possible to collect biofilm due to access problems. The sampling therefore may not be representative of the state of the whole system.
- These issues should be recorded and reported back to IMT to enable specialist assessment of the implications to draw scientifically valid conclusions about the sampling results on which further IMT decisions will depend.
- HSE and the LA can follow up any sampling point issues or access problems identified.

4.4.4 Biofilm samples

Samples of biofilm can be collected from the surfaces in parts of the water distribution system, for example from water tanks, showerheads, sumps and pack within cooling towers. The biofilm is sampled using a sterile cotton swab which is wiped and rotated across the test surface. Samples should be taken in accordance with BS 7592:2008.

4.4.5 Transport of samples

All water samples should be delivered to the laboratory as soon as possible, preferably within 1 day but not more than 2 days.

In terms of sampling for *Legionella*, the water sample(s) should be transferred at ambient temperature and protected from sunlight. In practical terms the use of a coolbox with a tight fitting lid and no ice blocks would satisfy this requirement. If it is not possible for the analysis of the water sample(s) for *Legionella* to begin on the same day as the sampling, then the sample(s) should be stored in the dark at ambient temperature (approximately 20°C) overnight.

4.4.6 Temperature Measurement

In addition to collecting samples of water and biofilm it is also extremely useful to record the temperature of the water when sampling. The temperature will give an indication of the parts of the system that would support the optimum growth and survival of *Legionella*.

4.4.7 Growing media and compost

Where growing media and/or compost may be implicated as a source of *Legionella* the LA will arrange for samples to be taken from domestic premises, workplaces, distribution outlets or suppliers as necessary. Safety precautions must be taken to protect samplers, including the wearing of appropriate respiratory protection to prevent the inhalation of dust. Samples of growing media or compost should be placed in suitable containers and sealed prior to transport to the laboratory for analysis. No special arrangements are required in terms of temperature control.

In order to assist with product traceability, when procuring a sample of growing media or compost the following details should be obtained and recorded from the packaging:

- brand;
- volume;
- barcode.

Enquiries should be made as best as possible with the owner / user to find out where and when the product was purchased and if there is a receipt or invoice available to verify this, a copy of this should be obtained.

If it is more practical, consideration should be given to removing the whole sack of product and contents from the premises and transporting this to the laboratory for analysis and for further investigations to be made into the supply of the product.

4.5 Training and equipment to sample potential sources

4.5.1 Risk to investigators

There is potential risk for exposure to *Legionella* bacteria for personnel engaged in investigating work, including sampling.

To control this risk, no officers should undertake an investigation into an outbreak of legionellosis, including sampling, unless they have received training in accordance with their organisational instructions or are supervised by someone who has undergone such training. Prior to any sampling activities or inspection of cooling towers or other risk system, a suitable and sufficient risk assessment must be undertaken of the system and recorded. Officers should be instructed in safe working practice to be adopted.

Each LA Environmental Health Service should maintain a register of trained officers in order that they can be readily identified during an investigation. Organisational policies should take into account precautions and recommendations given in the Safe Systems of Work, agreed between the HSE and LAs.

- Selection of personnel for certain aspects of the investigation and sampling should take into consideration personal risk factors (e.g. higher risk for immunosuppressed individuals, individuals greater than 50 years of age and smokers or greater than 50 years of age and recent smokers).

- Officers must ensure that risk systems under investigation are made non-operational before a physical examination and any sampling takes place, to ensure there are no aerosols in the environment while work is being undertaken. If examination and sampling of a cooling tower or evaporative condenser system is required quickly and it is not possible to make the installation non-operational for process reasons, officers should consult an HSE specialist and ask for advice on how to proceed. In practice, this requires the duty holder to switch off the tower fan for a period of approximately 30 minutes prior to approaching the device in order that the system has time to equilibrate and for aerosols to disperse.
- All officers entering areas where exposure to *Legionella* may occur must be aware of the hazards they could face and be provided with the necessary personal protective equipment (PPE). The PPE will vary according to circumstances and may include:
 - Respiratory Protective Equipment (RPE) for the protection against fine water droplets and dust (growing media and compost);
 - hard hat and safety shoes;
 - high visibility clothing;
 - eye protection;
 - disposable overalls.
- On any occasion where investigators may be exposed to aerosol they must wear suitable RPE. In most situations, high efficiency disposable masks that meet FFP3 standards will be appropriate. Personnel should check that the RPE fits their face and are trained in the use of the equipment.¹²

4.5.2 Training

Officers carrying out investigative work on *Legionella* should have appropriate training that should cover the following areas:

- the organism and disease;
- strategy;
- hot and cold water systems;
- cooling towers;
- spa pools;
- other risk systems;
- growing media and compost;
- inspection;
- outbreak investigation;
- sampling;
- collection, handling and recording of evidence.

4.5.3 Sampling equipment

Equipment required for sampling will include:

- 1 litre sterile polyethylene bottles containing an appropriate neutralising agent for microbiological samples;
- 500ml polythene or glass bottles for chemical samples;
- cool boxes in which to store the samples;
- pens for labelling (should be in accordance with BS7592:2008; alcohol disinfectant for post-flush samples;
- sterile cotton swabs and containers;
- sterile diluent to moisten swabs i.e. Ringers solution;
- sterile tube to sample tanks, the tube should be 2-3 metres long;
- plastic bags food grade;
- scissors;
- calibrated thermometer;
- camera - photographs should be handled, stored and retrieved in such a manner that they remain suitable for evidential purposes;
- PPE and RPE;
- means for ensuring the integrity of the sample for evidential purposes.

The LAs and/or public analyst laboratories should maintain a supply of all equipment required for *Legionella* sampling. LAs should liaise with their local *Legionella* accredited laboratory to ensure that they also have the requisite equipment available to deal with an outbreak, to include biocide neutralising agents.

5. Microbiology Investigations

5.1 Human samples

The presentation of *Legionella* infection cannot be distinguished clinically from that of pneumonia due to other causes, and special diagnostic methods are required. However molecular testing of lower respiratory tract samples for *Legionella* species and *L. pneumophila* can be incorporated into a molecular screening test (polymerase chain reaction (PCR)) to detect a range of micro-organisms at the local diagnostic laboratory.

The algorithm in **Figure 1 on page 31** should be used to interpret laboratory test results. Ideally urine, serum, both acute (day 1) and convalescent (10-14 days post onset) and lower respiratory tract samples (or sputum) should be collected.

- Urinary antigen tests should be performed at the local diagnostic microbiology department. Assistance is available from SHLMPRL as required in the case of a large outbreak, or where additional confirmation is needed. This test only confirms *L. pneumophila* serogroup 1 infection.
- All serum samples should be forwarded to SHLMPRL for antibody detection, preferably in matched pairs of acute and convalescent sera.
- Respiratory samples (or sputum) should be investigated by PCR and culture. If a respiratory sample is positive by PCR and/or culture, then the original sample and the isolate should be forwarded to SHLMPRL for further typing.

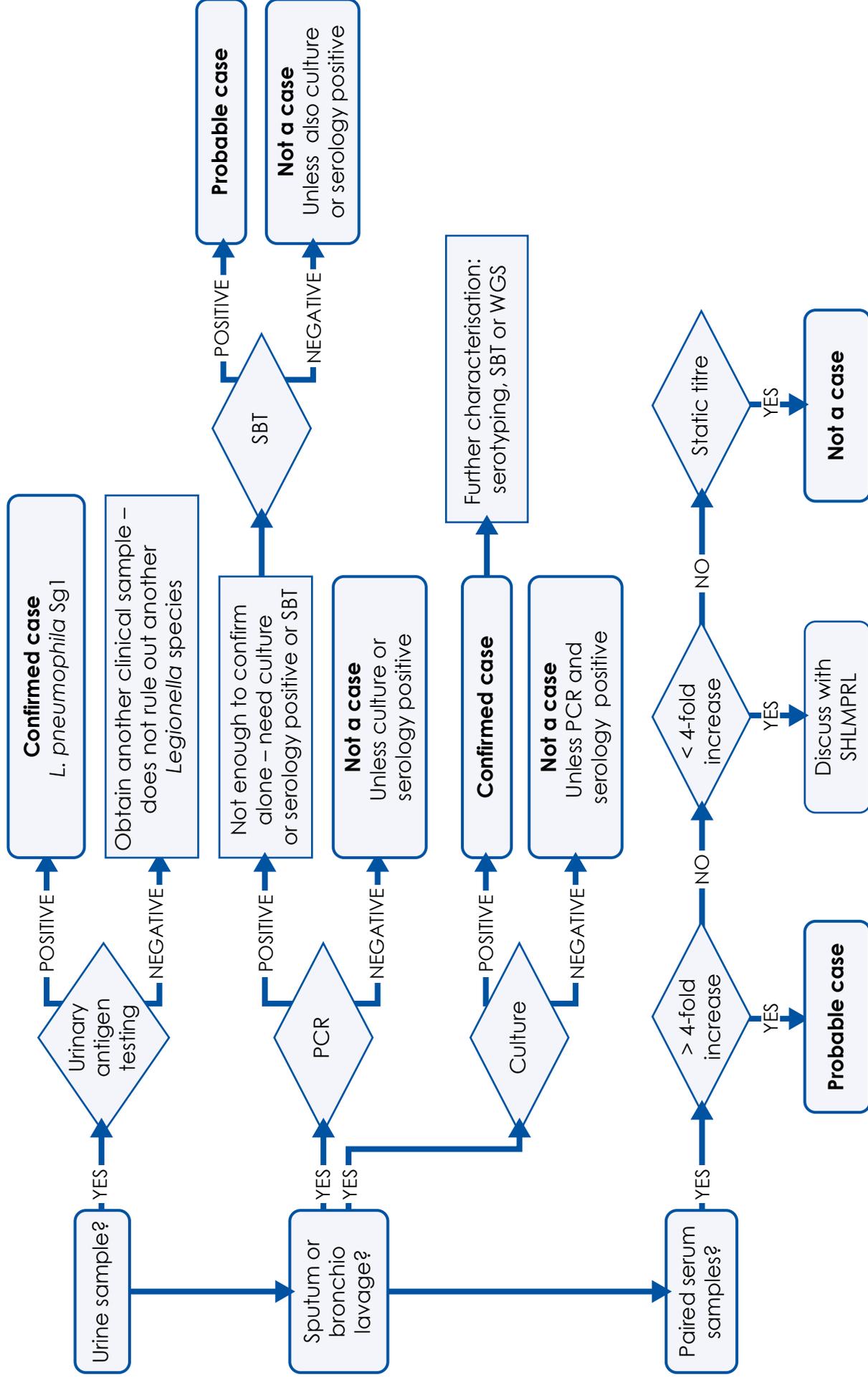
If molecular testing by PCR is not available at the local diagnostic laboratory, then consideration should be given to forwarding lower respiratory tract samples from patients meeting the criteria below, to SHLMPRL or other diagnostic laboratory offering this service. Clinical criteria for this referral are:

- severe community acquired pneumonia, negative on routine culture and on urinary antigen testing;
- severe community acquired pneumonia suspected of being associated with a cluster of cases of infection due to a *Legionella* species other than *L. pneumophila* serogroup 1.

For non *L. pneumophila* species, test results should be interpreted as follows:

- if a respiratory or sputum sample is positive for *Legionella* species by PCR and a greater than four-fold rise in serology titre, this represents a probable case (see **Section 1.4.1 on page 5**);
- if a respiratory or sputum sample is negative by PCR and there is a greater than four-fold rise in serology titre, discuss with SHLMPRL as this would be classed as a probable case but would be a confirmed case if identified as *L. pneumophila* Sg1. (see **Section 1.4.1 on page 5**); if the serology titres are high but unchanged across the testing interval, or show a four-fold decrease in titre or greater, this should be interpreted as not representing recent exposure. In this instance, discuss results with SHLMPRL.

FIGURE 1: Interpretation of clinical microbiological investigation results.



5.2 Environmental samples

During an investigation into an outbreak of Legionnaires disease the number of potential sources can be quite considerable. It is vitally important, especially in the early stages of an investigation that sampling focuses on systems which have been identified by the IMT as high risk.

It is essential that samples are handled and tested in such a way to preserve full chain of evidence to allow the results to be used in any subsequent legal proceedings, where this is practicable (physically possible) or reasonably practicable (does not compromise the pace required of the public health investigation).

5.2.1 Legionella testing

In order to identify the source of the *Legionella*, samples of water, biofilm or compost can be collected where accessible. The samples are normally examined for *Legionella* bacteria using conventional culture methods based on BS 6069-4.12:1998 and BS ISO 11731-2:2014. A summary of the procedures for examination of environmental samples is given in [Figure 2 on page 33](#).

The examination of the sample involves the concentration of bacteria from the sample matrix, followed by inoculation onto a culture medium that is selective for *Legionella* bacteria. The inoculated selective medium is then incubated at 36°C in a moist environment for a period of up to 10 days.

Suspect *Legionella* colonies that develop during the incubation period are then confirmed as *Legionella* bacteria and broadly grouped using serological based reagents into one of three groupings: *L. pneumophila* serogroup 1, *L. pneumophila* serogroup 2-15 or *Legionella* species.

The confirmed *Legionella* colonies are then sent to SHLMPRL for further characterisation and to enable the matching of the environmental isolates with isolates from human cases.

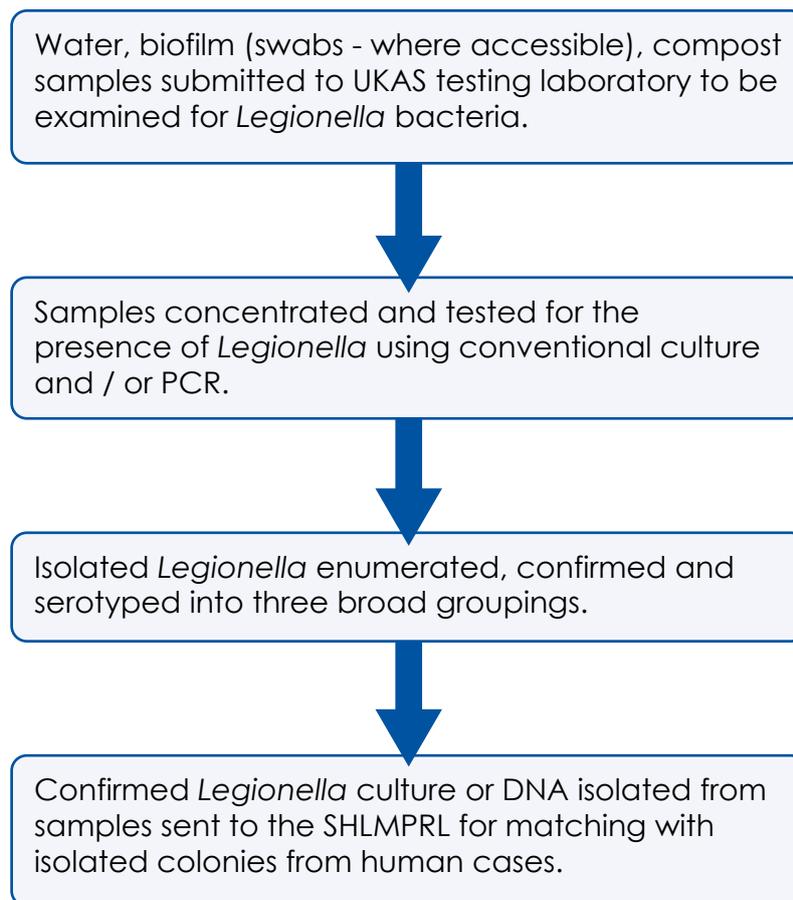
In addition to the above conventional culture techniques, molecular testing using real time - PCR may be used to provide results faster (within 36 hours) than those from the conventional culture technique. Depending on the assay used the technique will provide data on the amount of DNA in the sample from *Legionella* species, *L. pneumophila* or *L. pneumophila* serogroup 1. For evaluation it is important to know whether the samples have been filtered or centrifuged during the concentration stage. Filtered samples are most likely to show only live bacteria whilst centrifugation will collect all DNA even from dead cells. Dead bacteria are to be expected in a cooling tower system which is being controlled by biocide dosing, so the IMT needs to carefully consider what the presence of *Legionella* DNA means.

The samples must be examined by laboratories that are UKAS accredited for the examination of *Legionella* bacteria and take part in the Public Health England (PHE) Microbiology External Quality Assessment Scheme for the isolation of *Legionella* from water.¹³

The laboratories in Scotland currently UKAS accredited to carry out *Legionella* examination are:

- Aberdeen City Council - Aberdeen Scientific Services culture only
- Dundee City Council - Tayside Scientific Services culture only
- Edinburgh City Council - Edinburgh Scientific Services culture & PCR
- Glasgow City Council - Glasgow Scientific Services culture only

FIGURE 2: Examination of environmental samples for *Legionella*.



5.2.2 Other testing

Total viable colony (TVC) counts at 30°C are useful to determine the bacterial load in the environmental sample. High TVC levels may indicate that disinfection systems are not under control. TVC results, which are available within 24 hours, can be useful to determine if a system is back under control after shock dosing.

Chemical testing for disinfectant levels such as chlorine or bromine may be useful to determine if disinfection systems are under control. Results, which may be available same day, can be useful to determine if a system is back under control after shock dosing with disinfectant.

5.2.3 Sample results

The IMT should ensure that sample results are objectively assessed in terms of what can be scientifically stated or proved (on the balance of probabilities or beyond reasonable doubt), to take account of factors such as the effect of sampling point position and whether samples have been filtered or centrifuged and contain dead cell DNA. Where possible, if the company information is available at the initial stage, sampling results should be considered alongside other evidence such as photographic evidence of the state of cleanliness of the cooling tower, company sampling results, temperature and biocide levels to draw scientifically valid conclusions on which further actions will be based.

The IMT will critically assess if the sampling evidence does point to a system that is not under control, or if there is uncertainty in drawing such a conclusion arising from the limitations of the sampling and testing process.

All environmental sample results should be collated on the template found in [Appendix F on page 66](#), to allow easy interpretation by the IMT.

6. Communication

6.1 Summary of communication activities

Communication activities depend on the extent of the incident under investigation. The summary below indicates the range of communication activities required in different situations – it is not exhaustive.

Single case

- Communications about case and investigation within team or PAG;
- Notify case to HPS.

Cluster

- Communications about case and investigation within PAG or IMT;
- Communication with local NHS colleagues, HPS and Scottish Government;
- Public and media communications;
- Notify cases to HPS.

Outbreak

- Communications about cases and investigation within PAG or IMT;
- Communication with local and national NHS colleagues, HPS and Scottish Government;
- National (UK-wide) and international communications;
- Public communications;
- Media communications;
- Notify cases to HPS.

6.2 Communications about cases and investigation within team, PAG or IMT

- Where the investigation is small summarise in a SBAR (Situation, Background, Actions and Recommendations) report that can be circulated as required.
- Where the investigation is large, consider regular (no more than daily) situation reports ('sit-reps'). A sit rep template is available in the separate communications bundle.
- Agree procedures for disseminating information from the investigation in advance.
- All members of the IMT (and other relevant agencies that may not be full members, such as Scottish Government) should be informed promptly of any relevant progress of the investigations.

- Normally, the IMT chairperson will receive the results of all diagnostic tests and forward them to the relevant members of the IMT.
- When results are complex and/or numerous they should be collated onto a spreadsheet in order to facilitate effective communication and utilisation of results for decision making. Template spreadsheets or 'line-listings' are available for cases (see [Appendix E on page 65](#)) and for environmental investigation (see [Appendix F on page 66](#)).
- Territorial boards and HPS should ensure that they have up to date resources, facilities and plans required for communication in incidents and outbreaks. This includes adequate teleconferencing facilities, up to date contact lists, staff familiar with established communication channels such as email groups and group text messaging. There need to be clear channels for communicating within and across service areas such as secondary and primary care, public health and laboratories.

6.3 Communication with NHS colleagues

During an incident investigation, case ascertainment and prompt effective care may be increased if clinicians in the affected areas are sent specific information about the incident.

- Key colleagues include: general practice, primary care management CHPs, LMC, secondary care management, and specifically respiratory, infectious disease, critical and high dependency care and A&E specialist clinicians. Clinical algorithms for secondary and primary care may be required.
- Examples of GP letters are available in the separate communications bundle.
- It may be appropriate to provide frontline services (including primary care) with sitreps via established channels such as email lists.
- In an incident the local LMC should be involved so that they can support and take some responsibility for primary care organisation, response, internal communications and resilience.
- Frontline services may require additional support to manage the increased case load and this requires communication with the secondary and primary care management.
- At the end of an incident, notice should be given to stop any incident-related additional activities to front-line services – this may include requests for specific testing.

6.4 National and international communications

Incidents which have a national, UK-wide or international dimension include those which may affect any persons (including Scottish nationals) through travel to the affected area.

- For communications within Scotland and the UK, HPS will prepare an HPS Alert, together with the managing NHS board, and circulate to other NHS board HPTs and to administrations within the UK.
- For all incidents, HPS will report the nature of the incident to ECDC through the ELDSNet Team and if indicated share the information through the ELDSNet communication platform (EPIS).
- For incidents that can be described as significant, HPS will liaise with the UK Focal Point (PHE) about circulating an EWRS (Early Warning Response System) Alert. Updates will be sent as required.

6.5 Communications with members of the public

- Results released to the public (and other agencies without full membership of the IMT) should be simple in order to avoid potential patient identification and confusion. For example wherever possible, case numbers can be restricted to confirmed cases only, updated once per day at an agreed time, and case details such as sex, age and underlying conditions can be avoided. Such information is usefully gathered into a situation report ('sitrep'), an example is enclosed in the separate communications bundle.
- It may be necessary to provide information leaflets to large numbers of people in an affected area. NHS boards should ensure that they have up to date means of rapid design, printing and distribution of patient information leaflets. Example leaflets are available in the separate communications bundle.
- Example letters informing individuals of risk of exposure are available from the Legionnaire's disease outbreak investigation toolkit.¹⁴
- All written or email communications received from members of the public and others should have a timely response and be archived according to suitable criteria e.g. complaints, advice, request for information etc.

6.6 Media communications

- A media spokesperson or a single member of the team should be designated to speak to the media and ensure consistency.
- The IMT may decide to appoint a communications subgroup where the situation is rapidly changing and frequent agency and media updates are required.
- To avoid confusion, a common data set (e.g. on number of cases and their clinical status) and a timetable for its compilation and issue to the media should be agreed by the IMT and key partners such as Scottish Government. Decisions about media briefing, and the issuing of press statements, should be made at each IMT meeting.
- Key messages to be communicated by the IMT include:
 - The symptoms and signs of Legionnaires' disease
 - That anyone with symptoms or concerns about their health should seek medical advice and details of the NHS 24 helpline
 - That there is (may be) no need for people to change their usual behaviour as a result of the outbreak
 - Legionnaires' disease cannot be spread from person to person or through drinking water
 - The source is not always found in Legionnaires' outbreaks.
- Examples of text for press releases are in the separate communications bundle and in the Legionnaire's disease outbreak investigation toolkit.
- Where there may be future criminal proceedings arising from an outbreak any media release commenting on the source of the outbreak must take care to avoid prejudicing those proceedings. Any such releases should be cleared through the Media Relations Unit at COPFS.
- Occasionally, the media can be used to help find cases and protect public health by providing advice. Questions and answers could be available on the internet for the public and the media. See examples of information on *Legionella* for the public at:
 - <http://www.fitfortravel.nhs.uk/advice/disease-prevention-advice/respiratory-infections.aspx>;
 - <http://www.cdc.gov/legionella/about/index.html>;

6.7 Other sources of information and templates

Communicating with the Public About Health Risks, Health Protection Network Scottish Guidance. September 2008.¹⁵

Management of Public Health Incidents Guidance on the Roles and Responsibilities of NHS led Incident Management Teams revised in October 2011.⁴

Department of Health (1998), Communicating About Risks to Public Health - Pointers to Good Practice, London, UK, TSO. (This document offers insights from well-established material and provides pointers to good practice for communicating effectively about risks.)¹⁶

ECDC Legionnaires' disease outbreak investigation toolbox (<http://legionnaires.ecdc.europa.eu/>) which includes the following:

- [Message: Initial identification of an outbreak;](#)
- [Message: Continuing updates;](#)
- [Message: Identify cause of potential source;](#)
- [Message: Cruise ship identified as source;](#)
- [Message: Hotel identified as source;](#)
- [Message: Cessation of the outbreak control team investigation;](#)
- [Letter: Template letter to inform individuals of risk of exposure;](#)
- [FAQ: Typical questions and answers regarding Legionnaires' disease;](#)
- General *Legionella*.

See also HSE *Legionella* pages <http://www.hse.gov.uk/legionnaires/>

6.8 Communications bundle

Additional communication materials prepared and released during recent outbreaks in Scotland are detailed below:

- <http://www.nhsllothian.scot.nhs.uk/MediaCentre/PressReleases/2012/Pages/LegionellaSouthWestEdinburgh.aspx>;
- http://www.nhsggc.org.uk/content/default.asp?page=s1192_3&newsid=16491&back=home.

Patient information:

- *Legionella* example letter to public: <http://legionnaires.ecdc.europa.eu/?pid=608>;
- *Legionella* factsheet example: <http://www.nhsllothian.scot.nhs.uk/HealthInformation/Documents/LegionellaFactSheet.pdf>.

Legionella longbeachae and compost advice

- <http://www.hps.scot.nhs.uk/news/newsdetailtemp.aspx?id=638>.

Additional communication materials available to IMTs on request from HPS:

- SBAR;
- SitRep (Lothian);
- HPS briefing note;
- HPS Alert;
- Information for social media.

7. Control

The key step for control is eliminating the source of exposure to *Legionella*. This chapter covers stopping a process or system and the conditions required for the re-starting the process or systems.

Public health legislation enforced by the LA is the primary route to control, and requires proof of the source 'on the balance of probabilities'.

Health and Safety legislation enforced by HSE and LAs at premises allocated to each requires proof 'beyond reasonable doubt' or sufficient for an Inspector to form an opinion of a breach of law. Evidence of the source of *Legionella* and of any failures in the management system may not be available during the initial investigation phase.

The aim of the regulators is to ensure current control and compliance with ACoP L8. Once control is confirmed or achieved, the investigation will then focus on identifying past potential breaches of legislation.

7.1 Control of the putative source(s) of *Legionella*

7.1.1 General action

The following actions will form the basis of an outbreak investigation. Actual practices may vary depending on the circumstances, e.g. the approach may change where the outbreak is associated with single premises rather than with a group of premises. The same approach may be used where there is a single case.

7.1.2 Specific Local Authority action

LAs have a dual public health and health and safety enforcement role within an IMT. In addition to visiting/inspecting LA enforced premises within the 'outbreak' zone, EHOs may also visit HSE enforced premises on the instruction of the IMT, for public health purposes.

These public health visits will be part of the investigation to identify probable sources of *Legionella* as part of a risk assessment programme. If these visits are agreed within the IMT, early notification to the HSE must be undertaken and it is recommended that HSE is invited to the initial IMT meeting (see [Section 2.2 on page 12](#)). These visits should only occur on rare occasions.

7.1.3 Other legislation

In addition to health and safety legislation LAs have other powers under the Public Health etc. (Scotland) Act 2008 and Nuisance procedure under Section 79(1) of the Environmental Protection Act 1990. These powers can be applied to all premises whether enforced under the HSE or LA in terms of the Health and Safety at Work Act 1974. This enables the LA to enforce shock dosing and take water samples to test for *Legionella*.

It is recommended that every effort should be made by the LA to advise the HSE of their intention to use such powers in order to allow the HSE to participate in the process and where possible offer to utilise their powers if appropriate. Independent action should only be taken if directed by the IMT in the interest of controlling the outbreak.

7.1.4 Response during an outbreak

The LA will provide the IMT with a current list of registered cooling towers and evaporative condensers and other notifiable devices. HSE and/or the LA should seek to visit all relevant premises for which each is the enforcing authority within the 'outbreak' zone which are putative sources of *Legionella*. HSE specialist advice may be sought to assist risk assessment and identify 'relevant premises' based on the risk ranking in **Table 1 on page 20**. Local knowledge of premises and processes will be used to assist in prioritisation. Identification of any unregistered cooling towers will be a priority. Efforts will be made to identify any dry/wet cooling systems, which do not need to be notified to the LA but which can generate an aerosol.

There will be an initial phase where the purpose is to deal with immediate issues - eliminate the risk to people and minimise the potential for further infection. Inspections will follow normal procedures, although very rapid assessments and decisions will be made on actions. The nature of action taken will be in accordance with HSE or LA Enforcement Policy. LAs will enforce shock dosing and take water samples using public health powers. Enforcement action, such as prohibiting continued operation of cooling towers, can only be taken by HSE and LAs under health and safety legislation if there is sufficient evidence of a breach of law for failing to control *Legionella*. Often in the initial investigation phase such evidence is not available. However, site operators will usually voluntarily cease operations to enable further investigation.

In the second phase, HSE and/or LA activity will focus more on compliance with legislation (i.e. COSHH Regulations 2002 (as amended) and ACoP L8. Photographic evidence of the cleanliness of the towers, packing etc. will be sought and arrangements made for access to inspect tower and sump conditions. Where there are deaths, HSE or the LA will investigate in partnership with COPFS and Police Scotland following the Work Related Deaths protocol.¹⁷ Further action may be taken where there are clear failures to comply with relevant legislation or significant risks still exist. The type of action taken and the formal issuing on any enforcement notices would depend on the exact nature of the circumstances and conditions. Some situations may lead the serving of a Prohibition Notice or an Improvement Notice. Notices would be served in accordance with HSE or LA enforcement policy. Organisations may also decide to stop processes voluntarily or cease activities. Police Scotland, HSE or the LA may report to COPFS for a decision on legal proceedings and/or Fatal Accident Inquiry.

7.1.5 Specialist support

Where required, both HSE field officers and LA EHOs may call on specialised advice from HSE Specialist Inspectors to assist in risk assessment of operations and activities within suspected premises. This specialist support is particularly relevant both for identifying potential sources of *Legionella* bacteria and advising on the activity, process etc. requiring formal action to reduce the risk to the community.

7.1.6 Criteria for control

Each premise and process should be considered in accordance with its potential to be a possible source of *Legionella* bacteria (see **Table 1 on page 20**). This must be considered within each situation, as set out in ACoP L8 (<http://www.hse.gov.uk/pubns/books/l8.htm>). These are well established standards and set the bench marks. Where there are risks to health and/or there is non-compliance with these standards, action will be taken to eliminate the risks and secure compliance. The actions taken will be in line with HSE and/or LA enforcement policy.

In relation to nosocomial infections – consider healthcare settings, hospitals, nursing homes, etc. – reference should be made to hospital plans and the Scottish Health Technical Memorandum 04-01.¹⁸

7.2 Re-starting of a process or system considered a putative source of *Legionella* – cooling towers

7.2.1 General Action

The following actions apply to both HSE and LA controlled premises. The actions will apply following an outbreak of Legionnaires' disease but are also relevant for and may also apply where there is a single case. Public health legislation has primacy over Health and safety legislation.

7.2.2 Response during an incident or outbreak

HSE and/or LA activity will initially seek to eliminate the risk to people and focus on compliance with legislation (i.e. COSHH Regulations (<http://www.hse.gov.uk/coshh>) and ACoP L8). Where the risk has been significant or there have been clear failures to comply with relevant legislation, enforcement action will have been taken in order to control the risk of further cases of Legionnaires' disease, to allay public concern and to ensure future compliance. This action can include stopping process and systems, which may lead to closure or partial closure of premises.

Restarting a process will only be allowed once the system has been adequately cleaned and disinfected and suitable treatment and monitoring programmes are in place. The results of monitoring must be reviewed to establish the effectiveness of the cleaning and treatment regime, and/or the need for further cleaning and disinfection.

7.2.3 Main control methods for treating and managing water systems and remedial action

Biocides or physical treatment techniques can eradicate *Legionella* in the *in vitro* state (in laboratory suspension) either by continuous dosing or by a shock treatment. However, *Legionella* are usually found within biofilm adhered to a water contact surface, rather than free in the circulating water, but may slough off from the biofilm periodically. Biofilms provide protection from biocidal treatment and importantly, water systems should be kept clean to prevent biofilm build up.

Once a water system becomes colonised with *Legionella*, it may prove extremely difficult to reduce numbers to undetectable levels and periodic positive *Legionella* results may recur. It is not illegal to have *Legionella* in a water system and control measures should ensure that, although likely to be present at low levels, *Legionella* cannot multiply to dangerous levels. Monitoring is undertaken to assess the effectiveness of the control scheme. One of the desired outcomes of an effective water treatment programme is that microbial activity and *Legionella* do not exceed the action levels specified in HSG274 Parts 1 & 2.⁷ For *Legionella*, it is desirable to control concentrations to no greater than 100 cfu/litre. Specific actions will be triggered at levels above 100 cfu/litre.

Within biofilm or other harbouring material, such as sediment, sludge or scale, *Legionella* can survive (and indeed multiply) inside certain species of host amoebae, some of which are very resistant to high temperatures and/or harsh environmental conditions.

7.2.4 Re-starting a process or system considered a putative source of *Legionella*

Once the management of the water system has complied with the standards set out in ACoP L8, consideration can then be given to re-starting the process or system considered a putative source of *Legionella*. If there is sufficient confidence in the management controls being applied to the system, consideration could be given to opening the premises based on colony counts within the water with the proviso that regular monitoring must be carried out to confirm the standards set out in ACoP L8.

Therefore the eradication of *Legionella* from a system is not possible and control of contamination (as set out above) within the water contained in the system, is the only realistic option. HSE and the LA will seek evidence and assurance that the site operator is capable of sustained compliance with ACoP L8.

The LA will re-sample using public health powers to check CFU counts and biocide levels remain in line with ACoP L8 and demonstrate adequate control of *Legionella*.

8. Reporting

Incident and outbreak control management plans and procedures need to be reported and documented by the IMT.

If the Procurator Fiscal is involved in the investigation, before the report is finalised it must be reviewed by the Procurator Fiscal to ensure it will not prejudice any criminal investigation.

The IMT should also produce a final report for dissemination to:

- members of the team;
- the Chief Medical Officer (CMO);
- the Chief Executive of the NHS board(s) where the outbreak took place;
- any other relevant stakeholders and participating agencies;
- the public - where appropriate.

Report template and guidance on content are detailed in the 'Management of public health incidents – guidance on the roles and responsibilities of NHS-led incident management teams'.⁴

9. Background Information

Background information about *Legionella* and legionellosis can be found at:

1. The Health Protection Scotland website: <http://www.hps.scot.nhs.uk/resp/legionella.aspx?subjectid=18597>.
2. The Public Health England website: <http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/LegionnairesDisease/>.
3. The ECDC website: http://ecdc.europa.eu/en/healthtopics/legionnaires_disease/Pages/index.aspx.
4. The ELDSNet website: <http://ecdc.europa.eu/en/activities/surveillance/ELDSNet/Pages/index.aspx>.
5. The ECDC toolkit: <http://legionnaires.ecdc.europa.eu/>.
6. Commission Implementing Decision 2012/506/EU of 8 August 2012 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision No 2119/98/EC of the European Parliament and of the Council [Internet]. [cited 2011 Dec 6]. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:262:0001:0057:EN:PDF>.
7. ELDSnet operating procedures <http://www.ecdc.europa.eu/en/publications/Publications/1202-TED-ELDSNet-operating-procedures.pdf>.

Health Protection Scotland publishes biennial reviews of Legionnaires' disease surveillance in Scotland. These are available at: <http://www.hps.scot.nhs.uk/resp/legionella.aspx?subjectid=18597>.

For more recent data than those published in the latest report, or for local area data, please contact Health Protection Scotland directly.

10. References

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8. Health & Safety Executive (2013) Legionnaires' disease: the control of Legionella bacteria in water systems. <http://www.hse.gov.uk/pubns/books/l8.htm>
9. Public Health etc. (Scotland) Act 2008 (2008) <http://www.legislation.gov.uk/asp/2008/5/contents>
10. Health & Safety Executive (2008) Sampling for Legionella in water systems. Code of practice <http://shop.bsigroup.com/ProductDetail/?pid=000000000030161148>
11. Environment Agency (2005) The determination of Legionella bacteria in waters and other environmental samples https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/316814/book_200_1028650.pdf
12. Health & Safety Executive (2013) Respiratory protective equipment at work <http://www.hse.gov.uk/pubns/books/hsg53.htm>
13. public Health England (2013) Proficiency testing for food and water microbiology http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/hpawebfile/hpaweb_c/1265994078393
14. ECDC (2014) Legionnaires' Disease outbreak investigation toolbox <http://legionnaires.ecdc.europa.eu/?pid=608>
15. HPS (2008) Guidance on Communicating with the Public About Health Risks <http://www.documents.hps.scot.nhs.uk/about-hps/hpn/risk-communication.pdf>

16. Public Health England (1998) Communication about risks to public health http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4039670.pdf
17. Health & Safety Executive (2006) Work related deaths protocol <http://www.hse.gov.uk/enforce/wrdp/>
18. Health Facilities Scotland (2014) Water safety for healthcare premises <http://www.hfs.scot.nhs.uk/publications-1/engineering/shtm-04-01>

Appendix A: Guideline review group

Guideline review process

The development of this guidance was based upon the method outlined by the HPN. A team of health professionals and technical experts known as the Guidance Review Group (GRG) – membership (below) followed the systematic framework referred to above. Recommendations given in this guidance are as a result of careful review and consideration of the evidence available, existing guidance and principles of best practice. The evidence base for this guidance was synthesised from that collated using an explicit search strategy devised by the guidance technical and editorial group (TEG) and members of the GRG. The search covered MEDLINE, EMBASE, CINAHL and various meta-search engines from 2006 to Dec 2013. The scope of the search strategy did not include recommendations covering every detail of the recognition and initial management of *legionella* infections. Instead this review tried to focus on those areas of clinical and public health practice that were identified as relevant.

Membership of the Guideline Review Group (2013-14)

Name	Title	Organisation
Syed Ahmed	Review Sponsor, CPHM	Health Protection Scotland
Jackie Hyland	Chair of the GRG, CPHM	NHS Tayside
Alison Potts	Guideline Co-ordinator, Epidemiologist	Health Protection Scotland
Kevin Pollock	Guideline Co-ordinator, Epidemiologist	Health Protection Scotland
Alistair McNab	Head of Operations (Scotland)	Health & Safety Executive
Brian Lawrie	Team Leader Environmental Health	South Ayrshire Council
Mark Sutherland	Food & Health & Safety Team Leader	Edinburgh City Council
Diane Lindsay	Principal Clinical Scientist	SHLMPRL, NHS Greater Glasgow & Clyde
Duncan McCormick	Senior Medical Officer	Scottish Government
Garry Ahrens	Senior Analyst / Microbiologist	Dundee City Council
Giles Edwards	Consultant Microbiologist	SHLMPRL, NHS Greater Glasgow & Clyde
Gillian Penrice	CPHM	NHS Greater Glasgow & Clyde
Lindsay Matthew	Food Health & Safety Manager	Dundee City Council
Louise Wellington	Health Protection Nurse	NHS Lothian
Mary Hanson	Consultant Microbiologist	NHS Lothian
Michelle Marley	Environmental Health Adviser	Health Protection Scotland
Margaret Ramsay	Health Protection Nurse	NHS Tayside
Robbie Beattie	Scientific & Environmental Services Manager	Edinburgh City Council
Robert Marshall	Business Regulation Manager	Renfrewshire Council
Tom Stirling	Environmental Strategy Manager	Renfrewshire Council

Appendix B: Roles and responsibilities of organisations involved in the investigation of *Legionella* incidents

Appendix B.1. NHS board Public Health Teams

Objectives

- Preventing people being put at risk from further exposure.
- Reducing complications, disabilities and mortality in those affected.
- Ensure appropriate clinical management of cases.
- Communicate with the public and agencies.

Legislative framework

- [Public Health etc. \(Scotland\) Act 2008](#).

Section 2 of the Act places a duty on NHS boards to ensure provision is made within their area for the purposes of protecting public health.

Section 3 of the Act requires NHS boards to designate sufficient persons on behalf of the board for the purpose of protecting public health. This person is known by the term 'Health Board Competent Person'.

Section 4 of the Act requires LAs to ensure provision is made within their area for the purposes of protecting public health. EHOs are the prime LA resource in health protection. EHOs also have responsibility for securing the abatement of public health nuisances through advice and enforcement and thereby reducing the risks from many environmental hazards, including *Legionella*.

Section 5 of the Act requires LAs to designate persons for the purpose of protecting public health. This person is known by the term 'Local Authority Competent Person'. A LA Competent Person may also take or instruct any person to assist them with their investigations in whatever way they deem appropriate.

Section 6 of the Act places a duty on NHS boards and LAs to co-operate with each other in order to protect public health.

Under Part 3 of the Act, NHS boards are required to investigate public health incidents and carry out public health investigations.

Actions

Through management of the IMT, the NHS board HPT will ensure that all key agencies clearly understand their respective roles, and carry out their investigative and management tasks promptly and effectively in co-operation with each other as required.

Appendix B.2. Local Authorities Environmental Health (LAs)

Objectives

- Protection of public health by seeking to prevent people being put at risk from further exposure.
- Investigation of potential sources of *Legionella* during an outbreak.
- Specialist Reporting Agency to the Procurator Fiscal Service with reporting responsibilities for investigations of crimes, including the failure to control the risk from *Legionella* in water systems.

Legislative Framework

- Public Health etc. (Scotland) Act 2008 (see [Appendix B.1 on page 51](#))
- Health and Safety at Work etc. Act 1974 (HSWA 1974)

Both the HSE and LAs enforce the HSWA 1974 and the subordinate regulations and approved codes of practice in their respective areas of responsibility which are defined in the Health and Safety (Enforcing Authority) Regulations 1998.

Typically, LAs enforce health and safety at work legislation in hotels, care homes, leisure premises, warehouses, retail and office premises and catering premises.

On a day-to-day basis, officers in LAs carry out inspections and investigations under this legislation. Officers have statutory powers to ensure that where required, improvements are made in risk control, and where there is a risk of serious personal injury associated with a work activity that this activity is prohibited until appropriate controls are in place to safeguard those at risk of injury.

In terms of their proactive inspections, the HSE has published a list under the National Local Authority Enforcement Code of higher risk activities falling into specific LA enforced sectors. Under this code proactive inspection should only be used by LAs for activities which appear in the list of activities and within the sectors or types of organisations identified, or where there is intelligence showing that risks are not being effectively managed. LAs are permitted by the list to carry out proactive inspections of premises within their enforcement remit which have cooling towers / evaporative condensers to ensure that adequate control measures are in place to manage the risk of *Legionella*.

Actions

1. The LA pursues compliance with H&S legislation within those premises where they enforce the Health and Safety at Work etc. Act 1974 and related legislation. This compliance includes investigation of management systems and performance and potential sources of *Legionella*.
2. The LA will investigate potential sources of *Legionella* by examining site records and taking (or arranging to be taken) samples and specimens from risk systems within their area. Samples may include water samples (for both chemical and microbiological analysis), bio film swabbing and such other materials as may be considered necessary, for example composts and soils.

3. The LA provides advice to the duty holder on corrective action(s) to be taken to ensure that the risk system is brought under control where deficiencies are identified.
4. The LA has statutory powers to pursue enforcement action where necessary, in premises where they enforce the Health and Safety at Work etc. Act 1974.
5. The LA will work with the HSE where corrective action is considered necessary within premises where they enforce the Health and Safety at Work etc. Act 1974.
6. LA EHOs will, under the direction of the IMT, undertake interviews of cases in the community to clarify and gather further detailed information on movements and places visited (see [Section 3.1 on page 15](#)).
7. LAs should consider putting a list of cooling towers on their website.

Appendix B.3. Health Protection Scotland (HPS)

Objectives

- National surveillance of legionellosis to allow rapid identification of clusters and outbreaks.
- Preventing people being put at risk from further exposure by rapid investigation and control in any *Legionella* incident situation.
- Supporting outbreak investigation with specialist, timely and appropriate advice.
- Development of national guidance and best practice for use in *Legionella* incident situations.

Legislative framework

- Public Health (Scotland) Act 2008 (see [Appendix B.1 on page 51](#)).

Actions

HPS is responsible for the national surveillance of communicable diseases and environmental health hazards and the provision of expert operational support on infection and environmental health to NHS boards and LAs in Scotland.

HPS will contribute to the IMT by providing expertise on surveillance, analytical and epidemiological studies, infection and environmental control and will support communications. Other expert advice will be provided as required, and may include access to meteorological data, mathematical modelling and advice on identified and suspected cases across geographical and organisational boundaries within Scotland, the UK and where applicable Europe.

As well as its own function, HPS will be responsible for coordinating the tactical health protection response by the NHS boards (i.e. surveillance, investigation, risk assessment and management and risk communication). NHS boards will remain responsible for the operational health protection response.

HPS works with appropriate organisations including HPN to ensure appropriate specialist guidance for management of *Legionella* public health incidents.

HPS ensures there are appropriate reference laboratory facilities available for surveillance and that these can accommodate demand in emergency situations. This is done by commissioning reference laboratory services in collaboration with NSS National Services Division.

Where more than one NHS board is involved in an incident, HPS will discuss with NHS board leads who is best placed to lead the investigation and where indicated HPS will take this lead.

Appendix B.4. Health & Safety Executive (HSE)

Objectives

The HSE is the independent regulator which acts in the public interest to reduce work-related death, serious injury and ill-health across many workplaces in the UK. The mission is to ensure that risks in the workplace are properly controlled. HSE helps businesses understand how the laws to keep people safe at work affect them. Securing justice through investigation and enforcement where there are serious breaches of law and non-compliance is an important element of HSE's powers.

Companies have a legal requirement to control the risks from *Legionella*. HSE publishes extensive guidance on the control measures which are necessary to minimise the risks and to comply with the legislation (ACoP L8). HSE periodically carries out inspections of companies with registered cooling towers and evaporative condensers to ensure that controls for *Legionella* remain adequate and that workers and the public are protected. Where there is evidence of serious non-compliance, in line with their Enforcement Policy Statement, HSE will use formal enforcement powers (Improvement or Prohibition Notices or recommendation of legal proceedings to the Crown Office and Procurator Fiscal Service (COPFS)).

Legislative framework

- Health and Safety (Enforcing Authority) Regulations 1998.

These regulations allocate workplace activities to either HSE or LAs for enforcing health and safety legislation. HSE deals with health and safety in factories, farms, hospitals and schools, offshore gas and oil installations, the safety of the gas grid and the movement of dangerous goods and substances, nuclear installations and mines and many other aspects of the protection both of workers and the public throughout various industry sectors.

- Health and Safety at Work etc Act 1974 (HSWA 1974) (see [Appendix B.2 on page 52](#)).

Section 2 requires employers to ensure so far as is reasonably practicable the health, safety and welfare at work of all his employees.

Section 3 requires employers to conduct their undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in their employment who may be affected thereby are not thereby exposed to risks to their health or safety. This is the main duty relevant to outbreaks affecting the public offsite.

- Approved Code of Practice (ACoP L8)

The Approved Code of Practice (ACoP L8) is approved by virtue of Section 16(4) of the HSWA 1974. It has a special legal status and an employer has to follow the ACoP L8 or show that they have complied with the law in some other way. The ACoP L8 applies to the risk from *Legionella* bacteria (the causative agent of legionellosis including Legionnaires' disease) in circumstances where the Health and Safety at Work etc. Act 1974 applies.

ACoP L8 gives practical advice on the requirements of the Health and Safety at Work etc. Act 1974 (HSWA 1974) and, the Control of Substances Hazardous to Health Regulations 2002 (COSHH) (as amended), (2005) concerning the risk from exposure to *Legionella* bacteria. In particular, it gives guidance on sections 2, 3, 4 and 6 (as amended by the Consumer Protection Act 1987) of HSWA and regulations 6, 7, 8, 9 and 12 of COSHH 05. The Code also gives guidance on compliance with the relevant parts of the [Management of Health and Safety at Work Regulations 1999 \(MHSWR\)](#).

- Public Health etc. (Scotland) Act 2008 (see [Appendix B.1 on page 51](#)).

HSE does not enforce the Public Health Act. HSE does not sample water systems. During an outbreak LAs are empowered to take samples in HSE enforced premises under the Public Health Act.

Actions

1. Preventing people being put at risk from further exposure by taking appropriate action in HSE enforced workplaces to ensure that the risks from *Legionella* are prevented or controlled in the outbreak zone; and seeking to ensure sustained compliance with H&S legislation.
2. Stopping growth of the organism and reducing the risk from *Legionella* growth in water systems by providing advice on corrective action to control *Legionella* in affected premises, and pursuing enforcement action where necessary; ensuring compliance with ACoP L8.
3. In the event of an outbreak HSE will contribute to IMT decisions on the extent of the outbreak zone, the priority order of potential sources of *Legionella*, and provide specialist advice as required.
4. HSE along with the LA as co-partners will seek to investigate all relevant priority premises in the outbreak zone. HSE will make a decision as to which HSE enforced premises to visit, based on a number of factors including registered cooling towers, local knowledge and advice of the IMT.
5. HSE will seek to ensure that the water systems do not present a risk to workers or the public and that the potential for further cases of infection are minimised.
6. HSE will seek to ensure compliance with legislation and that adequate arrangements are put into place for the on-going and sustained control of *Legionella* risks. HSE will often specify the necessary corrective actions to decontaminate water systems and to achieve adequate control, using formal enforcement notices as necessary.

7. HSE will advise employers if the towers need to be shut down as a precautionary measure, voluntarily. HSE is unable to prohibit the use of cooling towers unless sufficient evidence of an out of control system is available to sustain a Prohibition Notice. In the early stages of outbreak investigations such evidence is often not available. Employers have a legal right to appeal any Notices to an Employment Tribunal, so HSE must be sure that there is sufficient evidence to substantiate their actions.
8. HSE will investigate to secure justice. HSE (where it is the enforcing authority for the workplace) will investigate the outbreak in partnership with COPFS and the Police in line with the Work Related Deaths Protocol for Scotland, where deaths have already occurred or are likely.

Appendix B.5. Clinical microbiology laboratories

Objectives

- Identifying the causative organism in human cases of legionellosis.

Legislative framework

Clinical microbiologists perform a diagnostic function as determined by their commissioning body. Additional work related to an incident will be as directed by the IMT.

Actions

NHS diagnostic laboratory microbiologists will:

- provide laboratory confirmation of clinically suspected cases;
- notify detection of *Legionella* species in diagnostic samples to clinicians and the local HPT;
- report cases and suspected cases to the local HPT;
- refer appropriate samples and all isolates to the reference laboratory and liaise with reference laboratory staff;
- provide advice on investigation and management of suspected and confirmed cases as required;
- communicate with clinical colleagues as required;
- attend IMT meetings.

Reference laboratory microbiologists will:

- ensure provision of appropriate reference laboratory tests;
- report results to the local diagnostic laboratory microbiologists;
- liaise with diagnostic laboratory microbiologists, HPS and local HPTs as appropriate;
- attend IMT meetings.

Appendix B.6. Public Analyst Laboratories

Objectives

- Identifying the causative organism in environmental samples taken in association with cases of legionellosis.

Legislative framework

Public Analyst microbiologists perform a diagnostic function as determined by their commissioning body. Additional work related to an incident will be as directed by the IMT.

Actions

- Provide sampling and examination advice to LA EHOs and participate in sampling as appropriate.
- Examine water, biofilm, sludge, soils and other environmental materials using suitable microbiology methods to identify the causative organism in human cases.
- Test water and other environmental samples to ensure that chemical and other parameters are compliant with regulatory requirements such as HSE document L8 to ensure putative *Legionella* sources are in control.
- Link with the SHLMPRL to assist in the characterisation and identification of the causative organism in human cases.
- Assist the police and prosecuting authorities in taking and testing water and other environmental samples from the homes of persons suspected to have been infected with *Legionella*, where appropriate.
- Attend IMT meetings to provide scientific advice and support.

Appendix B.7. Scottish Government

Objectives

- To support the response and recovery efforts.
- Where there is a significant incident, provide strategic direction for Scotland.

Actions

The CMO and Public Health Directorate, Health Protection Team is the main point of contact for public health incidents. Where this risk is considered low then the Health Protection Team will monitor the situation to ensure that all necessary measures are taken by statutory agencies and that information is effectively communicated to the public and between agencies. This may involve participation as an observer in IMT.

When the scale or complexity of an incident is such that it would benefit from central government coordination or support, the Scottish Government will activate its emergency response arrangements through the Scottish Government Resilience Room (SGoRR). The role of SGoRR will vary according to the nature, scale and impact of the incident.

Scottish Government has prepared guidance on resilience (Prepare Scotland, available at: <http://www.scotland.gov.uk/Resource/0038/00389881.pdf>) and management of public health incidents (together with HPN, available at: <http://www.scotland.gov.uk/Publications/2013/08/6455>).

Appendix B.8. Crown Office and Procurator Fiscal Service (COPFS)

Objectives

The Lord Advocate through COPFS, is responsible for investigating all sudden, suspicious or unexplained deaths and is the sole prosecuting body in Scotland.

Legislative framework

- [Corporate Manslaughter and Homicide Act 2007](#)

An organisation commits corporate homicide if the way in which its activities are managed or organised causes the death of a person and amounts to a gross breach of a relevant duty of care owed by that organisation to the victim. The way its activities are managed or organised by its senior managers is a substantial element.

The Work Related Deaths Protocol establishes the partnership working required to investigate where there is suspicion that a serious offence (other than a health and safety offence) may have caused the death. Police Scotland will assume primacy for the investigation, directed by COPFS and in partnership with HSE or other enforcing authority.

Actions

COPFS will direct the Police Scotland investigation into the deaths to establish if there is evidence of serious criminal offences, and will work in partnership with HSE or other enforcing authorities.

COPFS will work with the IMT to ensure clear links and demarcations between the police and IMT investigations.

COPFS will work with the IMT to balance risk of withholding IMT investigation findings and the effect on public health, with potential prejudice to the criminal investigation from releasing investigation findings.

It is a duty of the forensic pathologist, working under the direction of the Procurator Fiscal, to ensure that samples delivered from relevant laboratories are delivered in a manner which preserves the chain of evidence.

Appendix B.9. Employers and industry

Legislative framework

- Health & Safety at Work Act etc (1974) (see [Appendix B.2 on page 52](#)).
- Approved Code of Practice (ACoP L8) (see [Appendix B.4 on page 55](#)).

Role

Employers should ensure compliance with the relevant legislation in order to control growth of *Legionella* within their water systems. It is not illegal for employers to have *Legionella* in water systems as the organism cannot be fully eliminated, but the risk must be controlled.

The employer is innocent until proven guilty in a court and the IMT and regulators must avoid speculation about the source which could have significant adverse repercussions for any potential future legal proceedings as well as an employer's reputation. Identification of a source does not necessarily imply criminal act but is necessary to protect the public.

Note - employers are likely to take legal advice from the initial investigation stage onwards, and regulators and/or the IMT may face challenge about powers, sampling techniques, laboratory tests etc.

Employers will normally voluntarily shut down towers and water systems if requested to by HSE or LA, as a precautionary measure to enable further detailed analysis and investigation. Should HSE or the LA use formal enforcement powers, the employer is entitled to appeal to a Tribunal.

Employers should provide sufficient information about potential sources to identify cases and further protect health.

Appendix C: IMT membership

An IMT should include at least the following members:

- Consultant of Public Health Medicine (CPHM) or Infection Control Doctor if nosocomial (IMT Chair);
- Health Protection Scotland;
- Local diagnostic microbiologists;
- Reference laboratory microbiologist;
- Public analyst microbiologist;
- Clinician (ideally, involved with the confirmed cases of *Legionella*);
- Environmental Health Officer(s) from the relevant local authorities;
- Health and Safety Executive;
- Media spokesperson;
- Other members from partner agencies as decided by the IMT chairperson, for example the Procurator Fiscal, or observers;
- Administrative support.

Appendix D: Epidemiological questionnaire

This epidemiological questionnaire has three parts:

- case specific details and general exposures;
- diary section to indicate timeline of movements and places visited;
- epidemiological questions about environmental exposures.

Available from: <http://www.hps.scot.nhs.uk/resp/publicationsdetail.aspx?id=61062>.

Appendix E: Case line listing

An example of a clinical case line listing can be found at: <http://www.hps.scot.nhs.uk/resp/publicationsdetail.aspx?id=61062>.

Appendix F: Environmental investigation line listing

An example of an environmental investigation line listing can be found at: <http://www.hps.scot.nhs.uk/resp/publicationsdetail.aspx?id=61062>.

Appendix G: HPN Guideline feedback form



HPN Guideline Feedback Form

Section A – About the Document (Guideline)

Guideline Title:

Author:

Publisher:

Date of Publication:

Section B – About the Evaluation

Reviewer's Name:

Reviewer's Occupation:

Reviewer's Organisation:

Reviewer's Contact Email Address: *(Optional)*

Date of Evaluation:

Section C – Comments

1. Does the Guideline meet your needs/inquiry at the time of evaluation?
(Please explain why this is the case.)

2. Is there anything lacking in the Guideline? (Please explain.)

3. Do you have any other comments?

An electronic version of this form can be downloaded here:
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Once completed please return this form to: NSS.HPN@nhs.net

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