The role of legislation and guidelines on the prevention of legionellosis: is compliance enough?

An overview

Dr Susanne Lee

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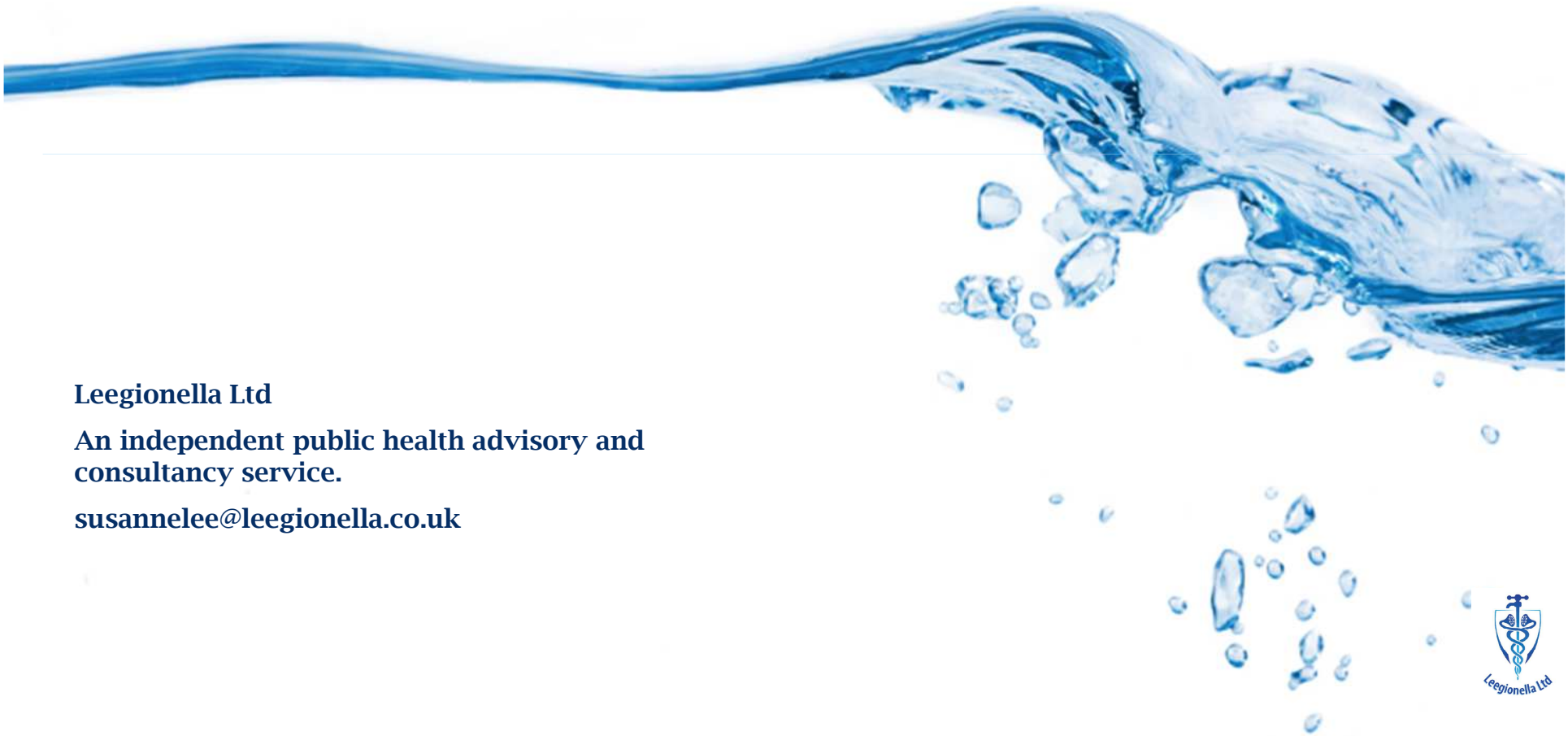

It is a shocking fact that poor water quality is not just a problem for developing countries:
the WHO (2011) Guidelines for drinking-water quality state:-

“ waterborne microbial hazards, continue to be the primary concern in both developing **&** **developed countries**”

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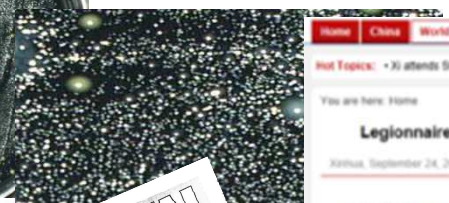
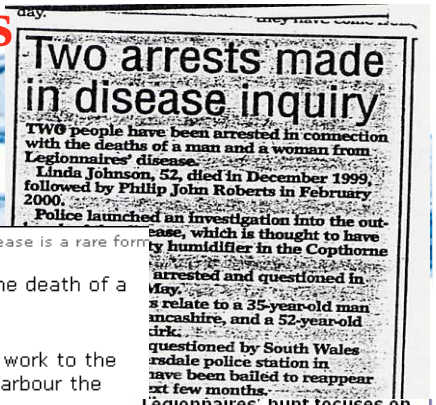
38 years on and stil outbreaks and deaths from Legionnaires' disease





Victim: Roger Russell

Man k
garde
spa ba

Daily Mail Reporter

A MAN died after catching Legionnaire's Disease during a spa bath demonstration.

Roger Russell, 61, was visiting a garden centre when a salesman invited him to dip his hand into the hot tub.

As it was switched on, the jets shot air through the water, blasting the father-of-four with a mist containing the deadly bug.

Mr Russell fell ill with flu-like symptoms two days later.

Bagshot, Surrey, last June. There he was shown a Spaform Lyon whirlpool bath, by an employee of Merlin Timber Products.

Samples taken from the tub showed the bacteria still present in the water more than three weeks later.

Mr Russell's son Marc, 38, told the inquest in Woking: "The salesman asked Dad to put his hand into the pool water and turned the spa on to

In the week hospital. Mr diarrhoea, tem tions and vomit.

A doctor initial tro-enteritis then bronchitis, his a inquest.

By the time he ent tal he was in "total l unable to communicate

THE M

No. 6720 SATURDAY AUGUST 3 26

HOSPITAL BUG KILLS DAD ON THE DAY HE BEAT CANCER

Legionnaires' in ward sh

Killer bug strikes fear into tho

Britain's worst outbreak of legionnaires' disease grips town

By Nigel Hawkes, Health Editor and Steve Bird

AN OUTBREAK of legionnaires' disease has killed an elderly man and infected 19 others in what could be the UK's worst ever case.

A further 11 people in Barrow-in-Furness, Cumbria, are suspected to have the disease and according to experts as many as 150 more cases could emerge in the next week or so, of which up to 20 could die.

Tens of thousands of people who have walked through the heart of the town in recent weeks could also be at risk of contracting the disease.

A public health team has been set up to search for the source. The only common feature is that all those with the disease had been in Barrow town centre recently. The man who died was 59 and lived locally. He has not been named.

One of the 19 confirmed as being infected with the disease was named last night as Myra Gawrton, 71, who contracted it when she left her house for the first time in two years. Her husband, Edwin, 75, died two months ago and she had asked the council offices to organise changes to his and benefits.

Suspicion is focusing on an air-conditioning unit housed on the roof of the council-owned civic centre in the heart of the town near the main shopping street. Last night health officials closed the building and cordoned off the area.

The unit was shut down on Thursday afternoon amid fears that it was pumping out contaminated water droplets

Myra Gawrton, one of 19 people infected

Hospitals Trust, said that health officials were preparing to treat as many as 100 more cases of the disease over the next ten days. All electric surgery at Furness General Hospital has been cancelled for Monday and Tuesday and other hospitals in Kendal and Lancaster are preparing to help.

"The disease has an incubation period of between five and ten days. We are looking at something in the region of another ten people a day for the next ten days," Mr Cumming said.

Dr Frank Atherton, director of public health for Morecambe Bay Primary Care Trust, said: "People could still be exposed to the infection. There's going to be a great deal of public concern. Anyone who has visited the area of Barrow since July 1 is potentially at risk from the disease."

Legionnaires' – normally strikes in the summer or early autumn, seasons when pneumonia is not common. Dr Atherton said that suspicion was aroused when more than the expected number of pneumonia cases were diagnosed at the hospital.

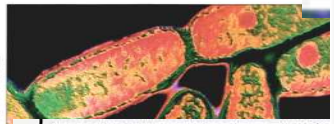
Figures from the Public Health Laboratory Service show that there are up to 350 cases of legionnaires' disease in Britain each year. Provisional figures from the Office for National Statistics show there were 34 deaths from legionnaires in 2000.

Mr Cumming said he believed the hospitals in the area could cope with the outbreak and urged residents not to be alarmed but to see a doctor if they became worried.

Dr Britton said that 19 confirmed cases represented an extremely large and significant outbreak.

Dr David Telford, medical director of Morecambe Bay's Hospitals NHS Trust, said the mortality rate for patients in hospital suffering from legionnaires' disease was in the region of 10 to 15 per cent.

INSIDE



Legionnaire

A CARDIFF man is among five from across Britain to have be tioned by police over the death South Wales people from Legio disease.

Grandmother Linda Johnson, in December 1999 and 59-year-ol John Roberts died in February 20 were diagnosed with the disease ing an outbreak of the legionella in the Culverhouse Cross area of between July 1999 and January 20

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Legionnaires' disease claims three more lives in Spain's Catalonia

Xinhua, September 24, 2014 | 0 Comment(s) | Print | E-mail

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The Catalan Regional Government in Spain has detected a second outbreak of Legionnaires disease in the locality of Ripollet, close to the city of Barcelona.

Legionnaires' disease claims three more lives in Spain's Catalonia

2014/9/24 20:58:19

MADRID, Sept. 24 (Xinhua) -- The Catalan Regional Government in Spain has detected a second outbreak of Legionnaires disease in the locality of Ripollet, close to the city of Barcelona.

The disease has affected at least five people, of whom three have subsequently died and overlaps with a further outbreak in the nearby down of Sabadell which has affected 34 people causing a further four deaths.

The majority of those affected in Sabadell are of advanced age and 17 remain in hospitals in the area, although authorities are optimistic that the outbreaks are under control.

"It appears that the focus has stopped emitting as there have not been any new cases in Ripollet for over a week or in Sabadell for several days," the newspaper la Vanguardia quoted Secretary for Public Health of the Catalan Regional Government Antoni Mateu as saying. The official said the number of cases had peaked, "between 10-11 of September."

However, Mateu was surprised at seeing two focal points for the disease between towns which are 11 km apart.

"Never has a single outbreak affected people separated by so much distance, so we don't think there is much chance of it being the same source, although it is also true that it is very rare for two outbreaks of such virulence to happen," he said.

The health secretary added it had been hard to coordinate data over the outbreak, given that two of the people affected by the disease had reported their cases at hospitals some distance away from Ripollet or Sabadell.

He added that in Sabadell they believed the cause had been the air conditioning system of a factory, while in Ripollet, although the local authority has closed down public fountains and stopped watering plants, the source of the outbreak had still to be confirmed.

Source: English.news.cn

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...he Trust was
control a bug
Legionnaire's disease, after the death of a

...Trust carried out £300,000 of work to the
...s in the building, which can harbour the

...diagnosis o

Legionnaire's disease is a rare form of pneumonia

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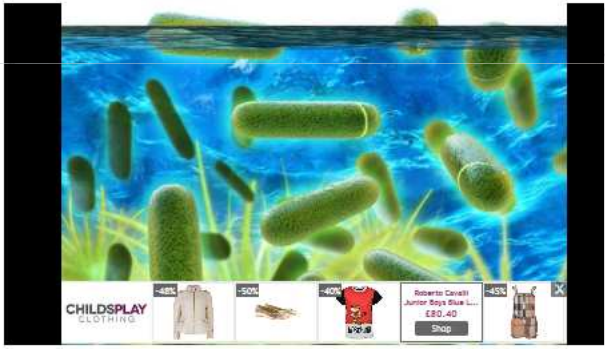
Sunday 13 July 2014

Life Newsletter

Health & Wellbe

Alert as baby dies after water birth

Eilish O'Regan PUBLISHED 07/07/2014 | 02:30



A 3D rendering of legionella bacteria.

IRELAND'S disease watchdog has repeated an alert issued in the UK about certain kinds of birthing pools following a single case o serious lung infection in a baby.

The baby who was born in the pool caught Legionnaires disease, a lung infection caus by legionella bacteria.

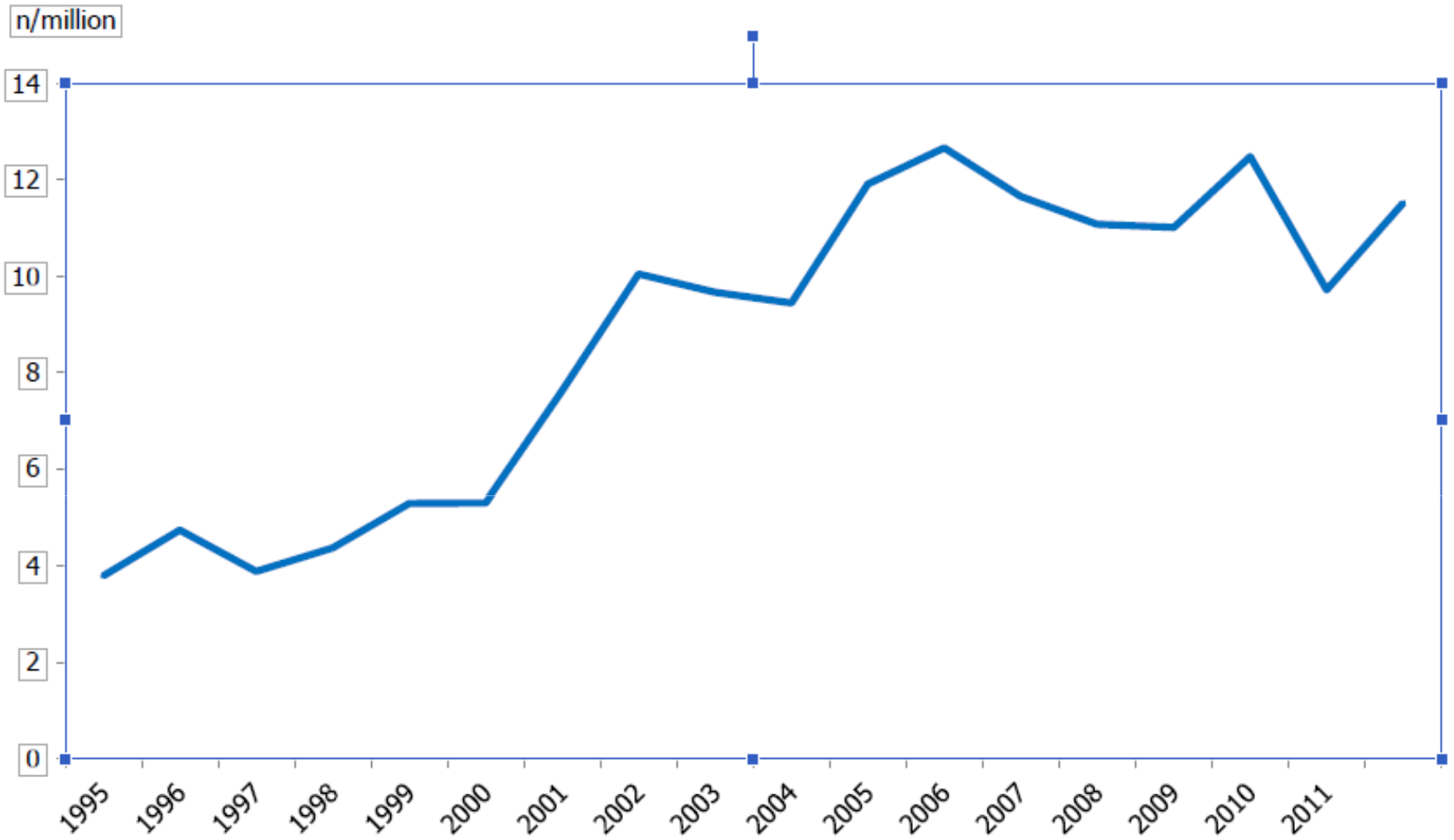
It is usually caught by breathing in small droplets of contaminated water. It is not contagious and cannot be spread directly from person to person.

The Health Protection Surveillance Centre of Ireland said its counterparts in the UK have temporarily advised against the home use of birthing pools with built-in heaters and recirculation pumps, potentially filled up to two weeks in advance of the birth.

Samples taken from the heated birthing pool used are reported to have confirmed the presence of legionella bacteria, which cause Legionnaires' disease.

Tests are ongoing to establish if it is the same strain which infected the baby. This is t first reported case of Legionnaires disease linked to a birthing pool in England,

Figure 1. Notification rates of Legionnaires' disease in the EU/EEA* by year of reporting, 1995–2012



* *EWGLINET member countries not belonging to the EU/EEA were excluded for 1995–2008.*

Slide courtesy of Birgitta deJong ECDC

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Table 2. Reported cases and notifications of Legionnaires' disease per million, by reporting country, EU/EEA, 2012

Country	Cases (n)	Population (n)	Notification rate (n/million)	Average difference between 2012 and 2008–11 rates (%)	Age-standardised notification rate (n/million)
Slovenia	82	2 055 496	39.9	53	37.7
Latvia	48	2 041 763	23.5	215	23.6
Denmark	127	5 580 516	22.8	-1	22.0
Italy	1 332	60 820 696	21.9	13	19.1
Spain	972	46 196 276	21.0	-11	20.2
France	1 298	65 327 724	19.9	-1	19.6
Netherlands	304	16 730 348	18.2	-12	17.6
Portugal	140	10 541 840	13.6	81	12.4
Austria	101	8 443 018	12.0	7	11.3
Sweden	102	9 482 855	10.8	-19	10.1
Malta	4	417 520	9.6	-28	9.3
Belgium	106	11 094 850	9.6	67	NA[a]
Luxembourg	5	524 853	9.5	-27	10.0
Cyprus	7	862 011	8.1	73	9.6
Germany	628	81 843 743	7.7	7	6.8
United Kingdom	401	62 989 551	6.4	12	6.3
Iceland	2	319 575	6.3	-43	6.6
Czech Republic	56	10 505 445	5.3	77	5.1
Norway	25	4 985 870	5.0	-37	5.1
Hungary	33	9 957 731	3.4	-29	3.2
Ireland	15	4 582 769	3.3	62	4.2
Lithuania	9	3 007 758	3.0	165	3.1
Greece	27	11 290 067	2.4	52	2.1
Estonia	3	1 339 571	2.2	-40	2.3
Finland	10	5 401 267	1.9	-44	1.8
Slovakia	4	5 404 322	0.7	-20	0.8
Poland	8	38 538 447	0.2	-58	0.2
Romania	3	21 355 849	0.1	34	0.1
Bulgaria	0	7 327 224	0.0	-100	0.0
EU/EEA total	**5 852**	**509 005 430**	**11.5**	**4**	**10.8**

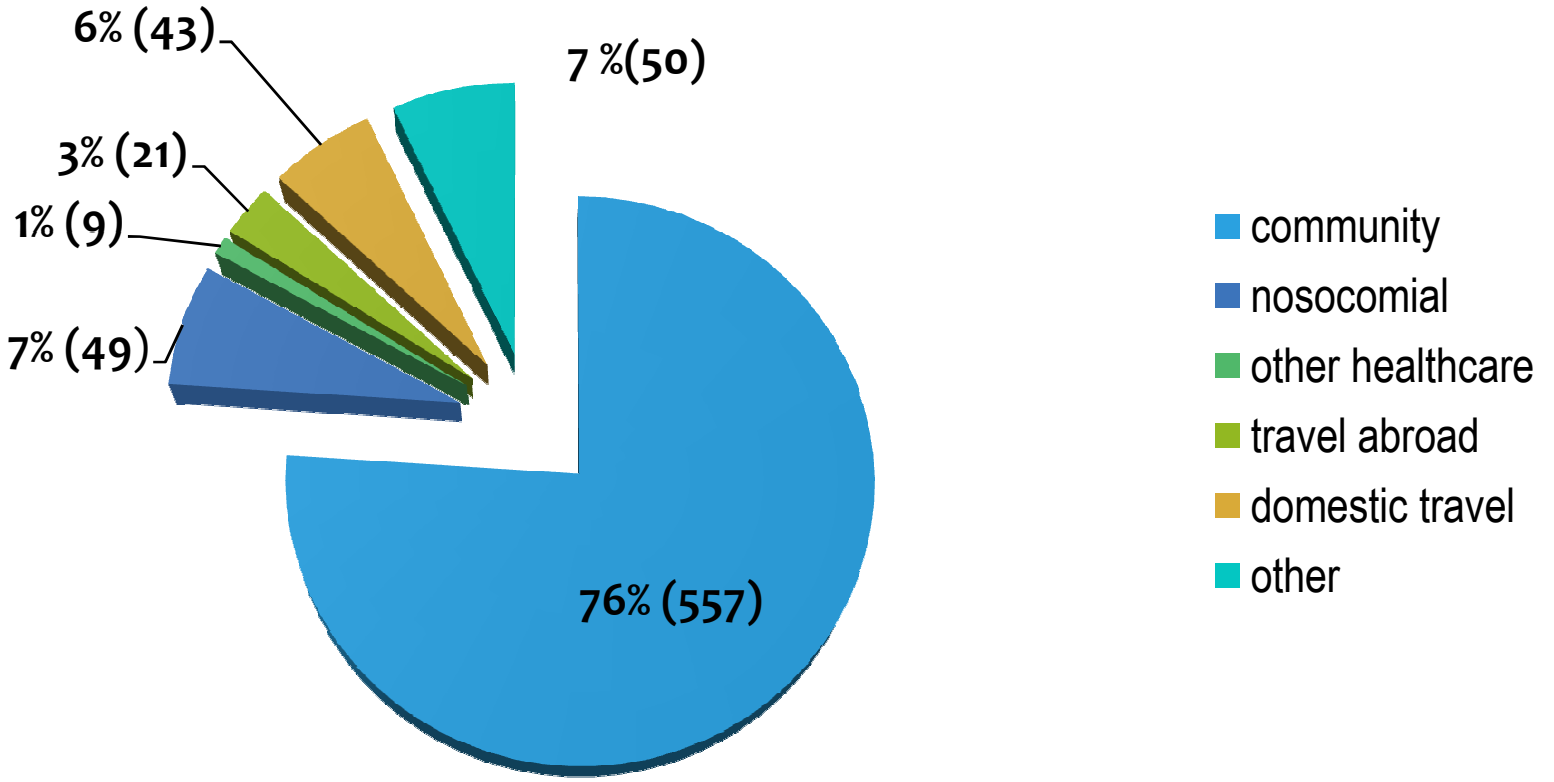
Reported cases of Legionnaires' disease by country and setting of infection, EU/EEA, 2012a

Country	Community n (%)	Nosocomial n (%)	Other healthcare n (%)	Travel abroad n (%)	Domestic travel n (%)	Other n (%)	Total n (%)
Austria	70 (69)	9 (9)	0	17 (17)	5 (5)	0	101 (100)
Belgium	19 (40)	6 (13)	4 (8)	18 (38)	1 (2)	0	48 (100)
Czech Republic	23 (70)	5 (15)	0	4 (12)	1 (3)	0	33 (100)
Germany	295 (69)	17 (4)	7 (2)	86 (20)	20 (5)	0	425 (100)
Denmark	59 (53)	7 (6)	2 (2)	43 (38)	1 (1)	0	112 (100)
Estonia	3 (100)	0	0	0	0	0	3 (100)
Spain	557 (76)	49 (7)	9 (1)	21 (3)	43 (6)	50 (7)	729 (100)
Finland	0	0	0	7 (100)	0	0	7 (100)
France	826 (64)	88 (7)	59 (5)	88 (7)	157 (12)	77 (6)	1 295 (100)
Greece	17 (63)	7 (26)	0	0	3 (11)	0	27 (100)
Hungary	1 (6)	7 (41)	0	5 (29)	2 (12)	2 (12)	17 (100)
Ireland	5 (33)	0	2 (13)	7 (47)	1 (7)	0	15 (100)
Iceland	0	1 (100)	0	0	0	0	1 (100)
Italy	1 062 (80)	72 (5)	41 (3)	11 (1)	124 (9)	22 (2)	1 332 (100)
Lithuania	5 (56)	0	0	2 (22)	0	2 (22)	9 (100)
Luxembourg	0	1 (100)	0	0	0	0	1 (100)
Latvia	48 (100)	0	0	0	0	0	48 (100)
Netherlands	151 (50)	1 (<1)	4 (1)	130 (43)	17 (6)	0	303 (100)
Norway	9 (36)	0	0	16 (64)	0	0	25 (100)
Poland	0	0	1 (50)	1 (50)	0	0	2 (100)
Portugal	106 (87)	2 (2)	0	7 (6)	6 (5)	1 (1)	122 (100)
Romania	3 (100)	0	0	0	0	0	3 (100)
Slovenia	74 (99)	0	0	1 (1)	0	0	75 (100)
Slovakia	3 (75)	0	0	1 (25)	0	0	4 (100)
United Kingdom	217 (54)	10 (3)	0	148 (37)	24 (6)	0	399 (100)
EU/EEA total	**3 553 (69)**	**282 (5)**	**129 (3)**	**613 (12)**	**405 (8)**	**154 (3)**	**5 136 (100)**

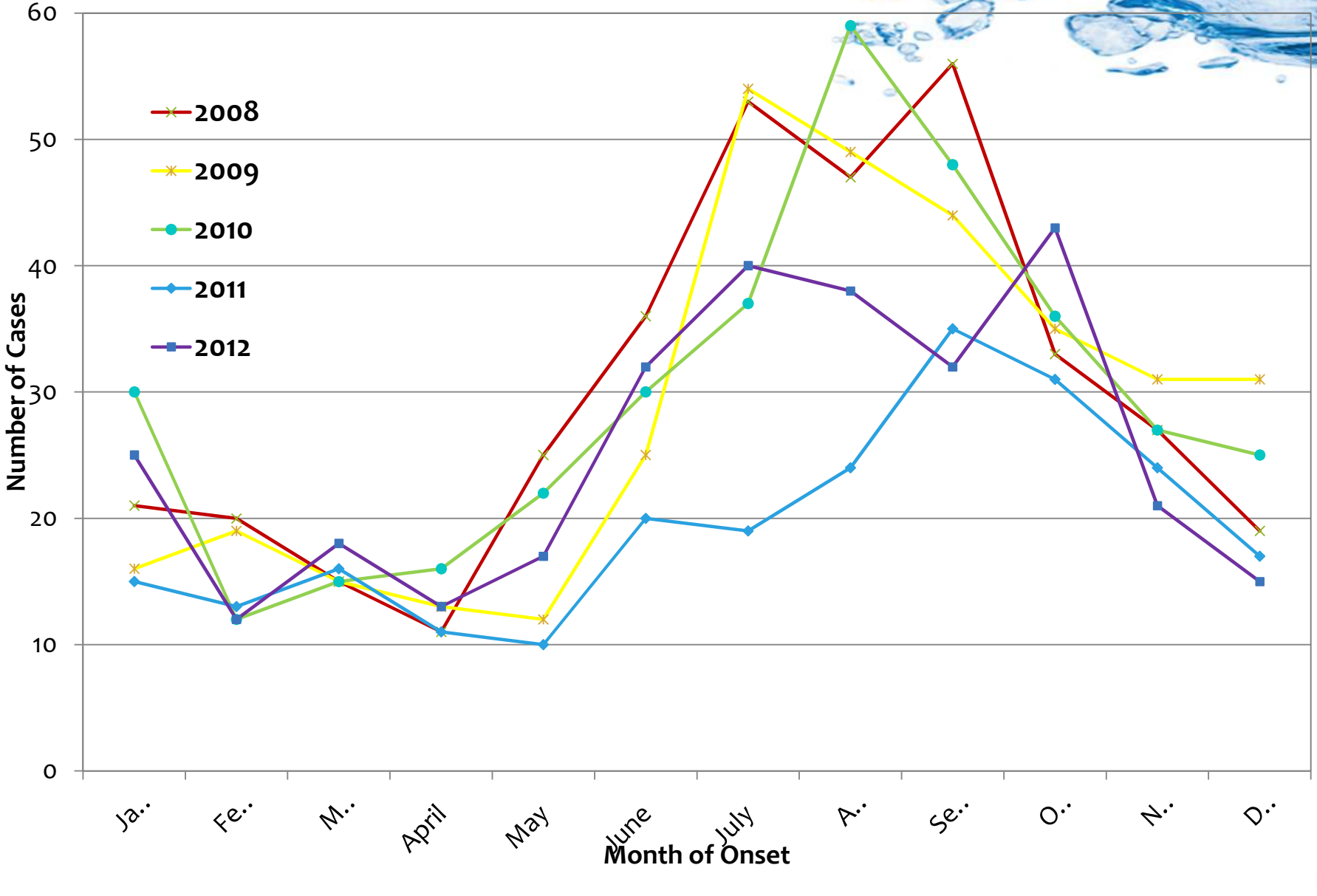
[a] *Cyprus, Malta, and Sweden did not report setting of infection*

Reported cases of Legionnaires' disease in Spain with source, 2012

Percentage (number)



Confirmed Cases of Legionnaires' disease by Month of Onset of Symptoms, 2008-2012



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Reported outcomes of LD and case fatality by reporting country EU/EEA 2010

Country	Survival n (%)	Dead n (%)	Unknown n (%)	Total n	CFR [a] %
Austria	62 (77.5)	18 (22.5)	0	80	22.5
Belgium	0	0	89 (100)	89	NA [b]
Bulgaria	1 (100)	0	0	1	0
Cyprus	2 (100)	0	0	2	0
Czech Republic	33 (86.8)	5 (13.2)	0	38	13.2
Denmark	124 (93.2)	9 (6.8)	0	133	6.8
Finland	23 (95.8)	1 (4.2)	0	24	4.2
France	1 194 (77.5)	158 (10.3)	188 (12.2)	1 540	11.7
Germany	634 (92.2)	50 (7.3)	4 (0.6)	688	7.3
Greece	9 (100)	0	0	9	0
Hungary	49 (81.7)	11 (18.3)	0	60	18.3
Ireland	11 (100)	0	0	11	0
Italy	387 (31.4)	75 (6.1)	770 (62.5)	1 232	NA
Lithuania	0	1 (100)	0	1	100
Luxembourg	9 (90.0)	1 (10.0)	0	10	10.0
Latvia	6 (100)	0	0	6	0
Malta	6 (100)	0	0	6	0
Netherlands	446 (95.9)	17 (3.7)	2 (0.4)	465	3.7
Norway	42 (87.5)	0	6 (12.5)	48	0
Poland	34 (94.4)	0	2 (5.6)	36	0
Portugal	100 (78.1)	3 (2.3)	25 (19.5)	128	2.9
Romania	1 (100)	0	0	1	0
Slovenia	56 (96.6)	2 (3.4)	0	58	3.4
Slovakia	4 (100)	0	0	4	0
Spain	657 (57.1)	51 (4.4)	442 (38.4)	1 150	NA
Sweden	0	0	100 (100)	100	NA
UK	11 (2.9)	36 (9.6)	329 (76.6)	376	NA
Total	**3 901 (62.0)**	**438 (7.0)**	**1 957 (31.0)**	**6 296**	**NA**
Subtotal [c]	**2 846 (85.0)**	**276 (8.2)**	**227 (6.8)**	**3 349**	**8.2**

[a] *Denominator: known outcomes (survivals and deaths)*

[b] *Not applicable where >25% of outcomes unknown.*

Long term outcomes

- Long periods in intensive care
  - Multi organ failure
  - Renal failure
  - Restrictive pulmonary disease / Breathing problems
  - Weakness and fatigue
  - Loss of extremities
  - Neurological problems
    - Depression
    - Poor memory and concentration
    - Retrograde amnesia
    - Cerebellar dysfunction –causing problems with balance, motor control
  - Many never work again

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Workplace exposure an under recognized problem in particular :-

* maintenance technicians of air-conditioning or water supply systems
* workers in places where mist machines are present
* dental practitioners
* workers of offshore oil and gas installations
* welders
* vehicle washers
* miners
* healthcare workers
* workers in biological treatment plants
* workers in an agricultural equipment manufacturing plant
* workers in the forestry industry
* professional drivers etc.

Why do we still have such a problem?

Buildings have many potential sources including :-

- **Building services**
  - **Cooling towers/Evaporative Condensers**
  - Humidifiers
  - Cleaning equipment
- **Industrial processes**
  - Waste water ponds
  - Industrial spray plants
  - Construction equipment
  - Air scrubbers
- **Drinking water outlets**
  - Ice dispensers and uses of ice
- **Domestic hot & cold water**
  - Hand washing,
  - Bathing inc. Showers
  - Toilet flushing etc.

- **Healthcare Equipment**
  - sonicator baths
  - nebulisers
  - clinical humidifiers
  - Dental chairs
- **Other**
  - Fountains
  - Water features
  - Fire systems
  - Irrigation
  - Misting devices
- **Pools**
  - **Spa pools**
  - Birthing pools
  - Whirlpool footbaths

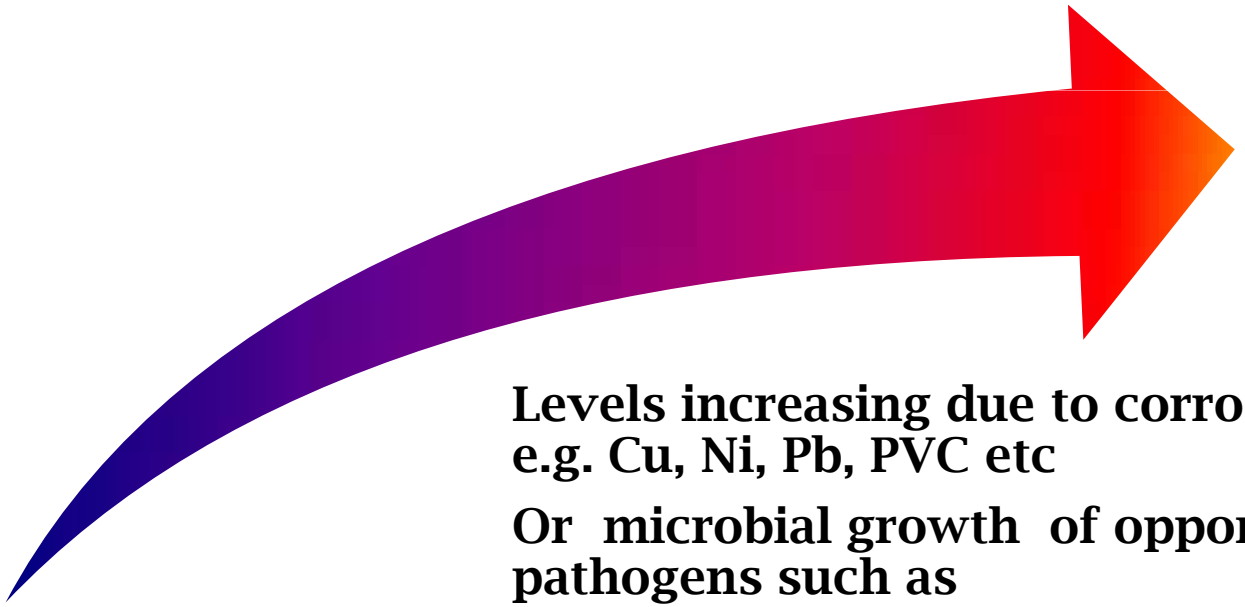
Some systems pose a greater risk

The quality of the supply water is an important factor

The use of water safety plans for source water to buildings input has improved

However: within poorly designed / poorly managed building water systems,

hazards may increase to levels that may cause harm to health (WHO)



infectious dose + susceptible persons = CASES

Levels increasing due to corrosion/ leaching e.g. Cu, Ni, Pb, PVC etc

Or microbial growth of opportunistic pathogens such as legionellae, pseudomonads, non tuberculous mycobacteria (NTMs) etc.

No or Low levels in the supply

Within Healthcare many additional potential sources ,with many routes of exposure not generally applicable to the population at large

direct modes of infection eg

- Aspiration an under recognised risk in healthcare
- inhalation via respiratory equipment; humidifiers
- contact e.g. washing wounds, during treatments;
- immersion such as bathing, hydrotherapy; whirlpool baths
- using contaminated water in procedures e.g,, entry points of catheters, oral hygiene

- **or indirectly eg**
  - when treated with instruments and / or equipment which were cleaned by contaminated water e.g. endoscopes, dialysis machines etc.
  - Infections have also been caused indirectly by using cleaning solutions or disinfectants diluted with contaminated water

a whole range of waterborne opportunistic pathogens

- Poses serious threats to vulnerable patients
- Many are difficult to diagnose
- Many have limited treatment options
- As a consequence there is an increased risk of:-
  - Morbidity (incidence of disease)
  - Longer patient hospital stays
  - Higher treatment costs
  - Patient Mortality

EUROPEAN HOSPITAL

Waterborne infections responsible for a high proportion of HAI

Tap water

by Professor Martin Exner

Hospital acquired infections affect about half a million people annually, and water is a seriou source of infection.

That water is a risky source of infection, is a fact recognised in the Water Guidelines of the World Health Organisation (WHO). However, although particularly dangerous micro-organisms, such as Legionella and Pseudomonas aeruginosa, ca multiply in a water pipe system, the fact that 'clean' w r from a tap might present such dangers is frequently ignored.

According to Professor Martin Exner, Director of the Institute for Hygiene, Bonn University: 'Up to now, between 10,000 and 12,000 Legionella infections have been said to occur in Germany every year. However, recent studies suggest that this number is significantly higher. The incidence of Legionella infections in Germany can be estimated at 25,000 to 30,000 per year. Today we know that at least 40 percent of all Pseudomonas infections, for example in intensive care units, can be traced back to the water pipe system,' he added. Experts also indicate that these infections are of significance in the domestic environment, especially for immuno-compromised people.

Professor Martin Exner

Today we know that 40% of all Pseudomonas infections , for example in intensive care units can be traced back to the water pipe system

Whilst water companies provide clean water, complex water installation systems provide excellent growth conditions for bacteria and ideal temperatures from 20-50 degrees Celsius. They can multiply in the biofilm, the slimy layer inside pipes, and are protected from disinfection and high temperatures. The organisms can then be transmitted during showers or face and hand washing. If Legionella or Pseudomonas are detected i water, counter measures must be taken by an operator. In hospitals, for example, disposable point-of-use filters, installed on showerheads or water taps, clean water by using high-tech membranes, and these are reported to be efficient.

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Waterborne pathogens in healthcare may also be a reservoir of antibiotic resistance


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Title	Pseudomonas aeruginosa: a formidable and ever-present adversary
Link	Click here for original resource http:
Author(s)	Kerr KG; Snelling AM
Abstract/Summary	Management of infections is difficult as P. aeruginosa is inherently resistant to many antimicrobials. Furthermore, treatment is increasingly problematic due to the emergence and spread of resistance. Given these challenges, it seems reasonable to identify strategies that would prevent acquisition by hospitalised patients. Environmental reservoirs of P. aeruginosa are readily identifiable, and there are numerous reports of outbreaks that have been attributed to an environmental source. There is emerging evidence from prospective studies to suggest that environmental sources, especially water, may have significance in the epidemiology of sporadic P. aeruginosa infections in hospital settings. A better understanding of the role of environmental reservoirs in pseudomonal infection will permit the development of new strategies and refinement of existing approaches to interrupt transmission from these sources to patients. J Hosp Infect. 2009 Dec;73(4):338-44. Epub 2009 Aug 21.
Publisher	Journal of Hospital Infection

∗19 patients admitted to an 8-bed SICU in a 700-bed university hospital were infected or colonized by a multidrug-resistant strain of *S. marcescens*. **Epidemiological evidence showed consumption of tap water from a contaminated faucet during receipt of oral medication was the mechanism of *S. marcescens* acquisition.**

Acquisition of multidrug-resistant Serratia marcescens by critically ill patients who consumed tap water during receipt of oral medication. Horcajada et al , Infect Control Hosp Epidemiol. 2006; 27(7):774-7

Emergence of multi-resistant Pseudomonas aeruginosa in a Western Australian hospital.

Multi-resistant Pseudomonas aeruginosa (MRPa) has been isolated from patients in a Western Australian teaching hospital with increasing frequency since first encountered in 2006.

Between 2006 and 2008 the number of patients with MRPa increased from three to nine per annum, and their location shifted from intensive care to a high dependency unit.

A novel water-saving device (aerator) in a staff hand basin was identified as a likely disseminator, with MRPa being isolated from biofilm in the basin's plumbing. The disposal of patient waste, surplus intravenous antibiotic infusions and solid items via hand basins were possible contributory factors

Inglis et al ; J Hosp Infect. 2010 Sep;76(1):60-5. Epub 2010

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How to manage the problem ?

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Would stricter legislation and guidelines vent cases?

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4 September 2013 Last updated at 16:16

Basildon Hospital fined over Legionnaires' disease deaths

Basildon Hospital said it had spent £3m trying to control the legionella bacteria

A hospital where two patients died from Legionnaires' disease has been ordered to pay £350,000 in fines and costs.

Chelmsford Crown Court heard the patients died in 2007 and 2010 after contracting the disease at Basildon Hospital in Essex. Six more patients were infected during the same period.

The hospital, which admitted failings under the Health and Safety at Work Act, said it "apologised unreservedly".

Related Stories

Legionella patients 'were failed'

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Hospital legionella cas action

Legionnaires' disease inq

A cooling tower at a factory near an outbreak of Legionnaires' disease showed signs of algae, slime and corrosion, an inquest has heard.

Three people died after contracting the disease in Glastonbury, in September 1998, the inquest jury in Taunton was told.

Rita Spencer, 68, of Ashcot, Somer Street, and Virginia Wall, 76, the same B&Q garden factory in the

The Imco tower was cleaned'

break of Legionnaires' ngdom, June 2012

C Evans[1], J Stevenson[1], M Llano[1], M Donaghy[2], on

th and Health Policy, Edinburgh, United Kingdom

Scotland, Glasgow, United Kingdom

3. The members of the team are listed at the end of the article

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With one man dead, 12 critically ill and 19 suspected new cases... Is penny pinching in your building putting you at risk of Legionnaires'?

By JEROME BURNE

PUBLISHED: 01:50, 7 June 2012 | **UPDATED:** 15:08, 7 June 2012

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Experts fear the worst of the latest outbreak of Legionnaires' disease may still be to come — and despite one death, 12 other people critically ill in an Edinburgh hospital and 19 more suspected of having the bug, the cause has still not been identified.

Perhaps even more worrying is that many of them are warning this may be just the start of a terrifying rise in the number of cases in Britain.

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Despite legislation and guidelines we still have problems due to

- **Poor Design**
  - Buildings are still not being designed to minimize the risks associated with the growth of opportunistic waterborne pathogens
    - Over storage provision of water
    - Inadequate insulation
    - Using materials which support growth
    - Thermostatic mixer valves to control outlet temperatures (balance of scalding risk)
    - Dead-legs & blind ends, long pipe runs
    - Intermittent use /stagnation
    - Portable buildings /sports pavilions, extensions (design)
- **Commissioning**
  - **Poor commissioning leading to system colonisation**
- **Variations** in:
  - water supply quality, water demand,
  - Occupancy, e.g partial, sub-lettings, (term time/weekends /seasonality)
- **energy saving targets,**
- **"green systems",**
  - solar heating,
  - rain water recovery/ recycled water
- **High risk equipment**
  - Eg Leisure complexes with spa pools, clinical equipment i.e nebulizers etc.
- **Mobile staff**
  - (training), experience, familiarity
- **Poor compliance**
- **Lack of training**
- **Lack of funds**

The WHO advocate the best way to manage the problem is to have a water safety plan for buildings water systems – should regulators be supporting this approach with legislation?

- WHO advocate the Water safety plan approach is used not only for water supplies but also for water systems in buildings for example
  - The Guidelines for drinking water quality (the 4th edition 2011) WHO state
- ***"All health-care facilities should have specific water safety plans as part of their infection control programme"***
- WSP plans should address issues such as
  - water quality and treatment requirements,
  - cleaning of specialized equipment and
  - control of microbial growth in water systems and ancillary equipment

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- Should legislation be aimed at where we have the biggest problems?
- At designers
- Commissioners etc.

Setting standards- historical perspective

- The first World Health Organization (WHO) international standards were published in 1958 when it became apparent that travellers could not be guaranteed they would have access to safe drinking water as global air travel increased in the 1950s and travel became more accessible to a greater number of people
- The WHO has continued to update and produce Guidelines for drinking-water quality (4th edition) which provide standards for safe drinking water
- These are intended to be used as the basis for developing legislation at international, national and local level
- The definition of drinking water is water not just used for drinking but for other domestic purposes too.

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Defining goals and objectives

- Legislation is usually developed at Government ministry /department level- as issues which need addressing are identified
- The drivers for new legislation and guidelines depends on the political agendas but is often driven by events such as large outbreaks ; public and press pressure
- The first step is to define the objectives- what do you want to achieve
  - Development of a comprhensive legislation framework for water quality based on WHO guidelines?
    - If so does that include?:
      - food ,
      - bottled water
      - water in healthcare (for treatment and diagnostics)
      - cooling (industry , comfort)
      - industrial process
      - recreational waters – bathing; pool; spas

Developing policy to fulfil goals

- What are the choices / how do we achieve the goals,
- what do we need to do and how?

- **A good policy is**
  - Is logical and simple
  - Defines actions to reach objectives quickly & easily
  - Takes into account overarching legislation & guidance
  - **Should be achievable (not too aspirational)**
    - Include only what is deliverable
    - Develop as achievements accomplished
    - Includes cooperation and stakeholder involvement

The implementation step:-enacting ;putting policy into action

- For any policy to be functional it is important that there is both the political will and financial resources to develop the necessary infrastructure
- Good governance is necessary to ensure safe water resources are used fairly enabling economic development at national; local and personal level and includes:-
  - goal setting; e.g. water accessibility and quality standards
  - the inclusion and participation of all relevant stakeholders
  - conflict resolution
  - managing change to reflect ongoing needs,
  - ensuring transparency and accountability
  - ensuring the resources needed for implementation are available
  - ensuring effective performance both in terms of financial and service delivery;
    - new and/ or amended legislation / operational procedures may be needed to ensure that the goals are achieved

Considerations when developing legislation / guidance

Is there sufficient infrastructure in place to ensure implementation ?

Resources needed include:-

- Expertise
  - water suppliers ; engineers and system managers; technical and operational staff; water treatment specialists
- Support services
  - legal and advisory services , public health specialists, planners
  - Accredited laboratories for microbiology , chemistry and radiology;
- Enforcers
  - Regulators; inspectors; auditors

Resources required 2 ;

- To measure effectiveness
  - Surveillance and administration systems;
- Training
  - Sufficient capacity to train all those involved in the implementation including
    - Regulators; inspectors; building owners and managers ;
    - Operational staff; samplers; technical / scientific staff sampling, analysing & interpreting results
    - Systems designers, manufacturers and installers; engineers and maintenance staff etc.,

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Legislation In Europe

- Traditionally derived solely from individual parliaments
- Now almost entirely as a result of European Parliament directives/regulations
- Still ratified in each country, but only minor amendments to EU Directive/Regulations can be made but additional requirements can be added at national level but not removed
- e.g. monitoring for *Cryptosporidium* added into UK Drinking Water Regulations

OVER RIDING LEGISLATION For WATER QUALITY is COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

* *Article 1:* **Objective**
* 1. This Directive concerns the quality of water intended for human consumption.
* 2. to protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean.

EU Directive includes a catch all

* **section 4 (2) Wholesome water**

  (a) that the water does not contain -

  (i) any micro-organism (other than a parameter) or parasite; or

  (ii) any substance (other than a parameter), at a concentration or value which would constitute a potential danger to human health;

* So whilst *Legionella* is not specifically mentioned EU Member States may add this and other parameters to their monitoring checklist, if deemed appropriate.

*

EU Health and safety legislation

- In most European countries, risks from Legionella are covered by laws, decrees etc. based on Directive 2000/54/EC (On the protection of workers from risks related to exposure to biological agents at work) at work)
  - Aimed at the minimisation of health risks from biological agents at the workplace.
  - The Directive describes the requirements for notification to the competent authorities (e.g. labour inspectorates) before the commencement of the work in cases where group 2, 3 and 4 biological agents are used. (*Legionella* is class 2)
  - Requires a risk assessment scheme aimed at prevention and control of exposure
  - To provide information, adequate training and health surveillance
  - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0054:EN:NOT

The UK as an example

Relevant Legislation for managing the risk from legionellae

ACTS

Health & Safety at Work Act

REGULATIONS

Management of Health and Safety at Work Regulations

Control of Substances hazardous to health

CODES OF PRACTICE

The Approved Code of Practice (L8)

GUIDANCE

HSG 274

Part 1-Evaporative Cooling Systems

Part 2-HCWS

Part 3-Others

also other guidance from the Department of Health and other Professional

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Regulatory background

Control of Substances Hazardous to Health Regulations 2002 (as amended)

* Regulation 6 – Suitable and sufficient assessment
* Regulation 7 – Prevention or control of exposure
* Regulation 8 – Use of control measures
* Regulation 9 – Maintenance, examination and test of control measures
* Regulation 12 –Information, Instruction and Training (*IIT*)

L8 (Sixth edition)
Published 2013

Management of Health & Safety at Work Regulations 1999 (Reg 3 and 5)

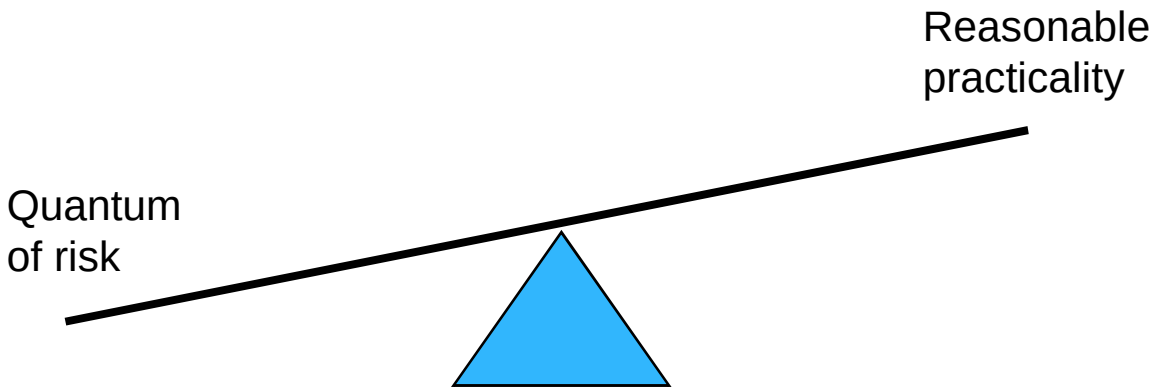
* Risk assessment
* Health & Safety arrangements
* Principles of prevention
* Health surveillance
* Health and safety assistance
* Emergency procedures
* Information for employees
* Co-operation and co-ordination

Codes of Practice and Guidance
ACoP-L8 and HSG 274

- Gives practical advice on how to comply with the Law
- Practical examples of good practice what is 'reasonably practicable'
  - Avoid exposure where reasonably practicable
  - Where this is not practicable a written scheme should be implemented and managed.
- It should include for each system;
  - An up-to-date plan
  - A description of its safe operation
  - The precautions taken
  - The checks carried out
  - Remedial actions if scheme is shown not to be effective
  - New guidelines for healthcare premises incorporate Department of Health guidelines
- Special legal status
- Burden of proof on duty holders
- If proved that you have breached the Code then you will have to show you complied in another way or guilt will be proven
-

So far as reasonably practicable

- *The degree of risk in a particular job or workplace needs to be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid or reduce the risk*
- Allows employer to balance the cost of taking action (in terms of time, inconvenience, money) against the risk being considered
- If the risk is insignificant against the cost, then the steps need not be taken



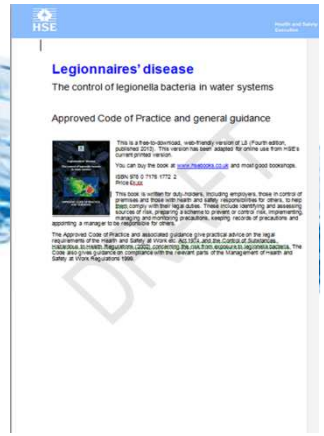
Time, trouble, cost and physical difficulty
(Edwards Vs NCB, 1949)

* " There is no need to prove that people are exposed to *L. pneumophila*, just that there is a risk that the organism may emerge"

(Court of Appeal 1993 Regina v The board of trustees of the Science Museum)

Challenges

The approved code of practice has been recently updated (2013-14)



* Government review
  * Red Tape Challenge – reducing the burden on business
    * Review of regulations
    * Review of all HSE external guidance
      * Proportionality
      * Focused on compliance
      * Accessibility
* Löfstedt report "Reclaiming health and safety for all"
  * Approved codes of practice included L8
  * Misconceptions as to what was law and what was guidance

* (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66790/lofstedt-report.pdf)

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Löfstedt conclusions-

- He concluded that, in general,
- *"there was no case for radically altering current health and safety legislation. The regulations place responsibilities primarily on those who create the risks, recognising that they are best placed to decide how to control them and allowing them to do so in a proportionate manner"*
- *"existing regulatory requirements are broadly right, and that regulation has a role to play in preventing injury and ill health in the workplace. Indeed, there is evidence to suggest that proportionate risk management can make good business sense"*
- *Nonetheless, there are a number of factors that drive businesses to go beyond what the regulations require and beyond what is proportionate and I have made recommendations to tackle those which relate to regulations.*
- *These will enable businesses to reclaim ownership of the management of health and safety and see it as a vital part of their operation rather than an unnecessary and bureaucratic paperwork exercise.*

However is compliance with legislation sufficient to protect public health?

- Potability criteria (as in the EU Drinking water directive) will not indicate the presence of legionellae, pseudomonas, etc.
- At organisation level many policies & risk assessments are geared to *Legionella* compliance and *P.aeruginosa* in healthcare
- How do you determine compliance?
  - For example
    - Achieving defined temperatures at outlets
    - All microbiological monitoring <100cfu/ml
    - Negative microbiological results?

End point monitoring limitations

- Monitoring samples represent a very small % of the system volume
- Compliance may be achieved at sample points but systems can have serious flaws in their design or operation which may not be picked up by intermittent sample taking e.g.
  - Fluctuations / interruptions in supply water quality
  - Localised low flow/ stagnation and biofilms
  - Flaws in system design (e.g. deadlegs / blind ends)
  - Temperature fluctuations
  - Breakdowns in treatment systems / operational procedures
  - Localised contamination hazards
    - e.g. animal/ bird /insect or sewage ingress
  - Contamination during maintenance / upgrades etc
  - Low / no usage

*

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Reliance on regulatory end product limits has been shown to fail in representing the infection risk :-

- 1998 Sydney Water detected high levels of *Cryptosporidium &Giardia*
- A Boil water notice issued
- But there were NO cases
- The incident highlighted:-
  - the limitations of water management based on end product monitoring,
  - a lack of a coordinated approach to dealing with water quality
  - poor risk communication.
- In response to the inquiry; in 1999 the Australian food legislation was revised;
- tap water now included in the definition of food and requiring a quality assurance system incorporating HACCP principles (Davison et al., 1999).

Another wake up call that monitoring was not sufficient:

In 2000 Walkerton, Canada , Outbreak of *E. coli* O157:H7 & *C. jejuni*

- **The report stated :-2300 ill with 7 deaths**
- **Due to run-off from farm manure and flooding**
- **Investigation found :**
  - **chlorine residuals not maintained,**
  - **poor operational procedures**
  - **falsified records**

* The Inquiry Recommendations included the adoption of a Total Quality Management system based upon the adoption of best practices and continuous improvement;
  * **'real time' process control** (e.g. continuous monitoring of turbidity, chlorine residual, and disinfectant contact time)
  * the effective operation of **robust multiple barriers** to protect public health;
  * **preventative rather than reactive strategies** to identify and manage risks to public health;
  * **effective leadership.**

O'Connor DR. The events of May 2000 and related events. Report of the Walkerton Inquiry (Part 1). Toronto: Ontario Ministry of the Attorney , General; 2002.

Sites with outlet temperatures > 50°C still legionella positive

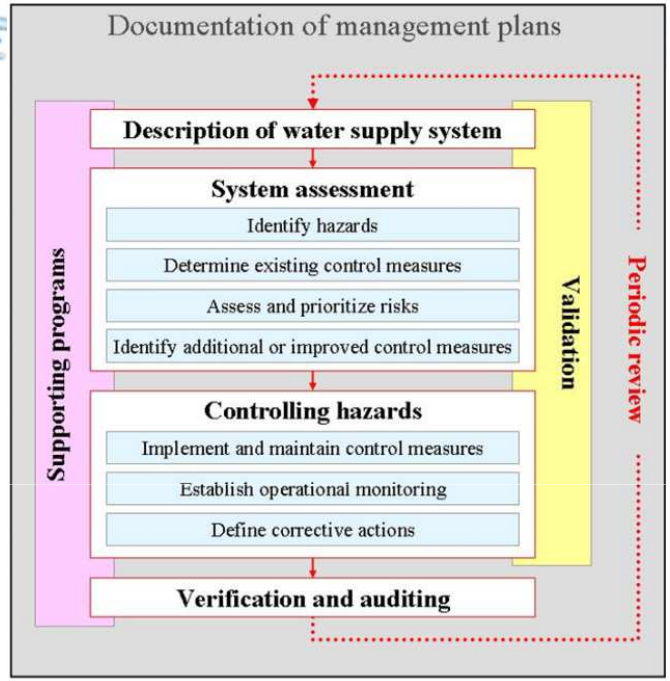
Table 6 Mean Log differences between qPCR (GU l^{-1}) and culture (CFU l^{-1}) at different temperature ranges

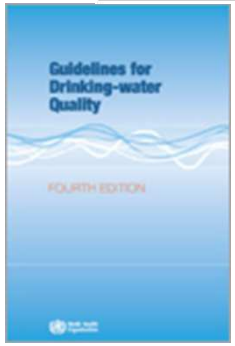
		Legionella spp			*L. pneumophila*		
T° Range	Number of samples	Mean Log PCR	Mean Log Culture	Mean Log difference	Mean Log PCR	Mean Log Culture	Mean Log difference
<=25°C	20	3.66	2.51	1.15	2.77	2.37	0.40
25 -30	13	3.65	2.60	1.05	2.76	2.52	0.24
30 -35	24	3.88	2.77	1.11	3.11	2.71	0.39
35 -40	24	4.28	2.92	1.36	3.18	2.83	0.34
40 -45	45	4.34	3.07	1.28	3.20	3.01	0.19
45 -50	29	4.05	3.03	1.02	3.35	3.03	0.31
50 -55	30	4.47	2.64	**1.83***	3.61	2.60	**1.01***
55 -60	69	4.42	2.52	**1.90***	3.60	2.52	**1.07***
>=60°C	21	4.43	2.30	**2.13***	3.44	2.28	**1.16***

*, result significantly different ($p < 0.05$ T test) to values for lower temperatures. Results were analysed for 275 samples

WHO Water Safety Plans

* Are based on identifying all significant risks to public health
* And are **the most effective means of consistently ensuring the safety of water**
* Are a comprehensive and documented risk management approach for the safe operation of water systems
* encompass all the steps from source through treatment and distribution to consumers.
* Ensure that effective controls and multiple barriers are applied to minimize risks to acceptable levels,
* Include monitoring of the controls and barriers to ensure that safety is maintained.
* Ensure supporting programmes are in place





(Guidelines for safe drinking water 4th edition (WHO 2011))

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Water Safety Plans fit into the WHO = Framework for Safe Water

Legionella and the prevention of legionellosis World Health Organization 2007 236pp $36
Eds: Bartram J, Chartier Y, Lee JV, Pond K & Surman-Lee S
ISBN-13 9789241562973 /ISBN-10 92 4 156297 8

Health-based targets – what is a safe limit?

Improve Health outcomes
Reduce incidence of Legionnaires' disease

Water safety plans
"The scheme for preventing or controlling the risks"

System assessment
Risk assessment; Review of control measures

Monitoring
Temperature; biocide levels; pH ;turbidity ; AOC legionellae; pseudomonads faecal indicators etc

Management & communication
Managing the risk-control plan: management responsibilities, training & competence
Validation of control measures

Surveillance
Verification by internal audit, external audit by regulator, microbiological monitoring

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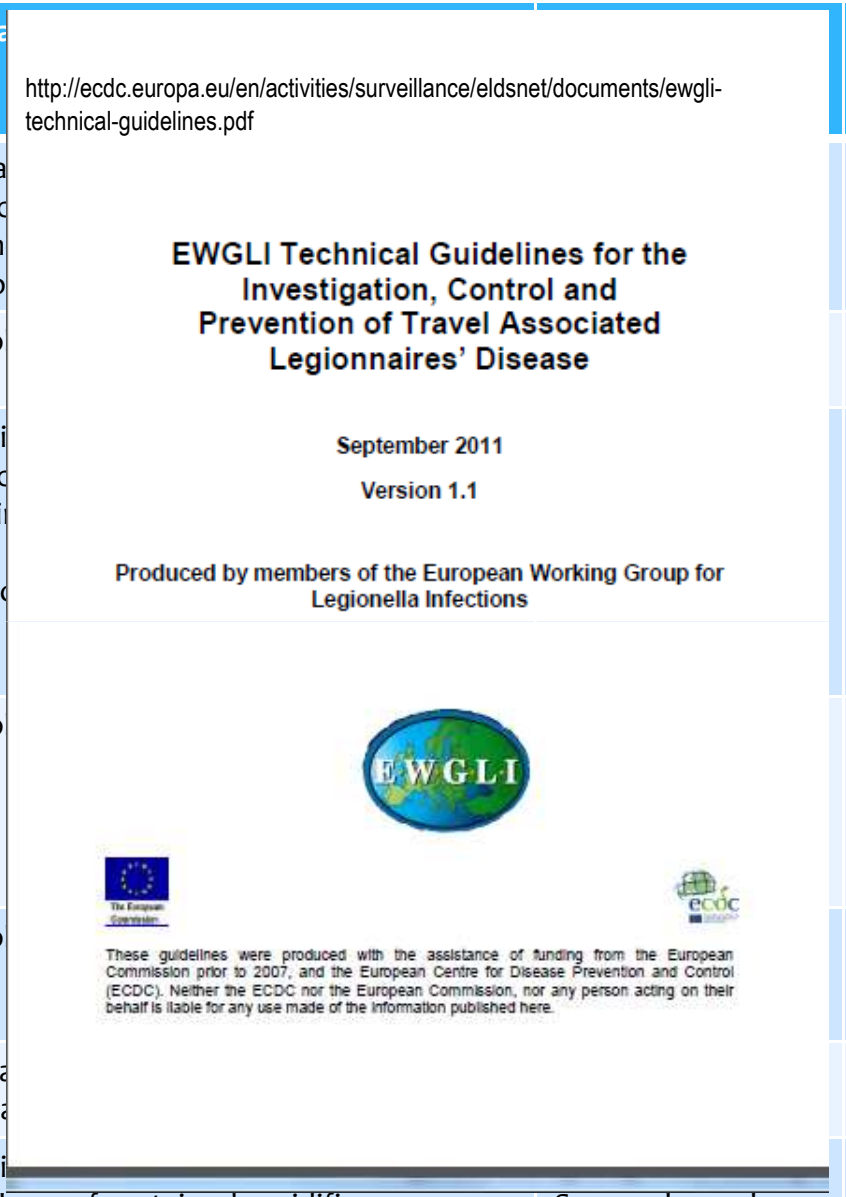
Health based targets

* Ideally should be universally accepted and ensure that water is safe for all uses and all types of user .
* **i.e. No harm should arise from water used for any purpose**
* However the basis for defining a target is not straightforward
* If we take a safe target for legionella in a building water system there is no international consensus on what a safe level is or the frequency of sampling; the volume to be tested or the method of analyses

Examples : survey of legionella targets (2010)

Country	Legislation or guidance	Applica		Methods	Alert / Action Levels
Austria	National guideline Legislation	Hot wa healthc Guidan spa po		ISO 11731	>1000cfu/L in HWS in high risk areas ND/100ml
Cyprus	National legislation	All pub		Not specified	Not specified
Germany	National legislation	HCWS i healthc Guideli spa poo		ISO 11731	>100 cfu/100ml >1000 cfu /100ml ND /1ml pool water 100ml after filtration
Italy	National legislation / guidelines	All pub HCWS,		As specified within legislation	Spa pools >100 cfu/L
Malta	National legislation	All pub		Not specified	Not specified
Netherlands	National legislation	Hospita HCWS a		NEN6265	spa pools >100cfu/L
Spain	Royal Decree	HCWS i natural spas, fountains, humidifiers, irrigation, fire fighting, other cooling devices	Spa pools yearly	ISO 11731	CTs and spa pools >100 cfu/L

http://ecdc.europa.eu/en/activities/surveillance/eldsnet/documents/ewgli-technical-guidelines.pdf



EWGLI Technical Guidelines for the Investigation, Control and Prevention of Travel Associated Legionnaires' Disease

September 2011

Version 1.1

Produced by members of the European Working Group for Legionella Infections

EWGLI

These guidelines were produced with the assistance of funding from the European Commission prior to 2007, and the European Centre for Disease Prevention and Control (ECDC). Neither the ECDC nor the European Commission, nor any person acting on their behalf is liable for any use made of the information published here.

Policies supporting this approach need to be defined before legislation is developed

In conclusion

* Just using compliance for specified limits within regulatory standards based on end product monitoring
* **Does not ensure that a system is safe!**
* Adopting a water safety plan approach is a systemic approach to ensuring the safety of water both in supplies and buildings
* Where legislation and guidance is developed ensure that good procedures are followed and include all stakeholders
* Beware of unintended consequences both in terms of bureaucracy and increased financial burden on business
* Ensure that there is the appropriate infrastructure and finance availabe before implementation

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