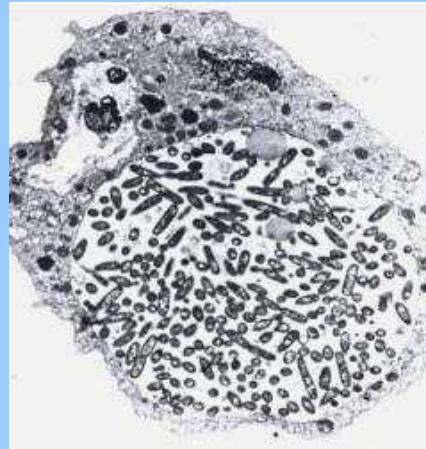
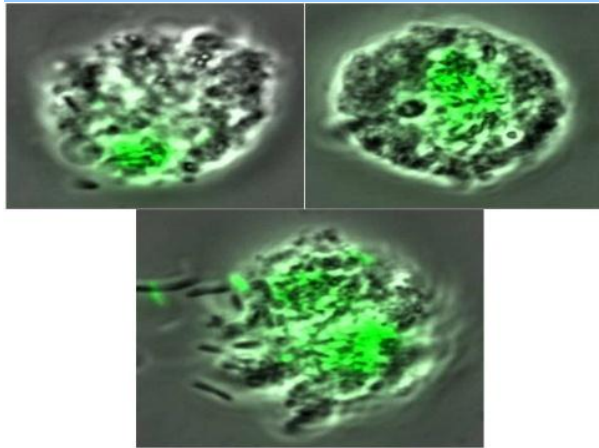


Legionella: More Than Just a Bacteriological Fascination!

Dr Satya Das

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Legionnaires' disease (LD) – a severe illness with pneumonia

- Incubation period 2 - 10 days, can be longer
- Fever, headache, dry cough, flu-like illness, confusion, diarrhoea
- ~ 10 - 40% mortality
- low attack rate

>50 *legionella species*

- At least 19 species associated with human infection
- *L. pneumophila* - 80-90% of all infections
- 16 serogroups within *L. pneumophila*
- Serogroup 1 - most common cause of illness

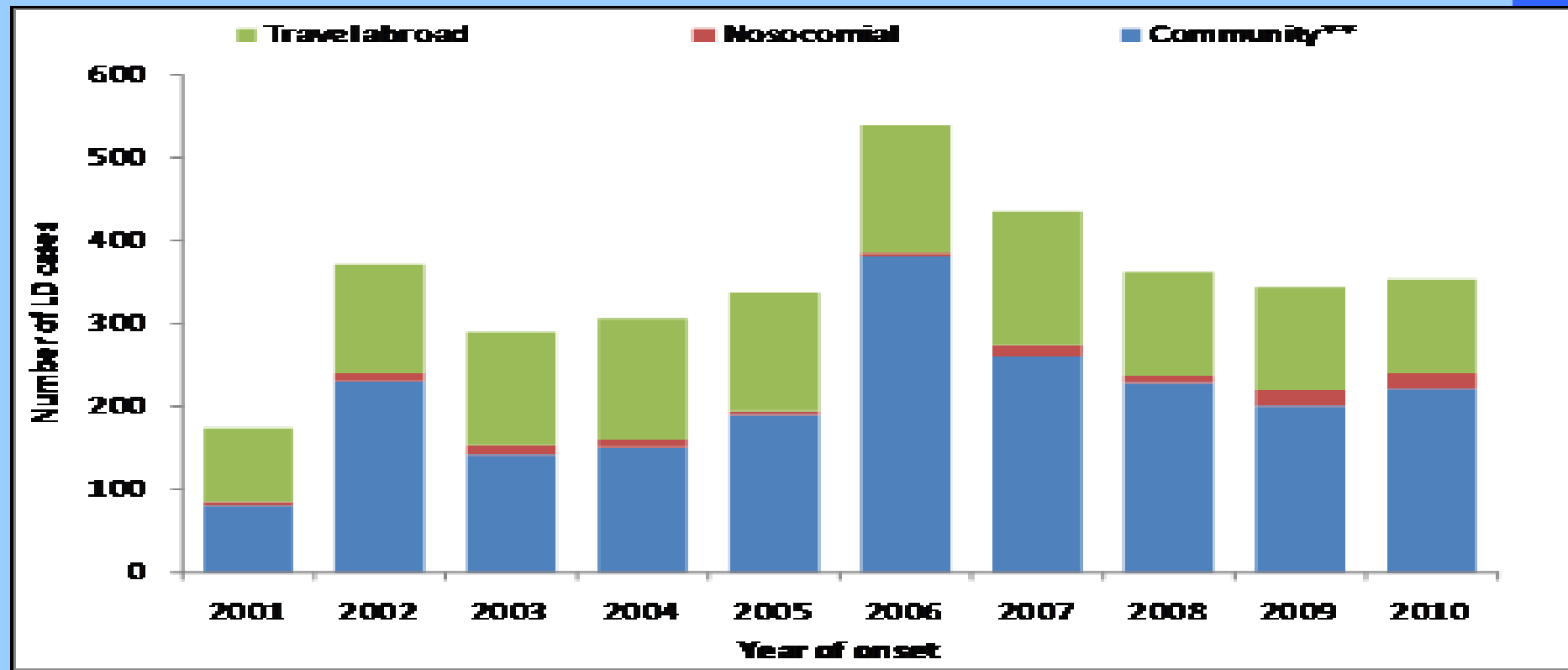
Pontiac fever – a mild illness without pneumonia

- Incubation period 12 - 48 hours
- Flu-like illness
- 0% mortality
- high attack rate

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About 400 cases LD per year in UK:

- 80% in people aged 50 years or older
- About four times more common in men than in women – 78% v 22%
- Increase in the number of nosocomial cases: 9 (2.5%) in 2008 compared to 18 (5.2%) in 2009 and 18 (5.1%) in 2010
- Highest number of cases over the 2008-2010 period were reported from the South East of England and London.



LD- Route of transmission

Inhalation of aerosol particles into the lung

– Particles must be small enough (<5/10 microns) to get down to the lung alveoli but large enough to contain at least one bacterial cell

- Aspiration can occur - especially for nosocomial infection
- **No cases of person to person transmission**

Ecology

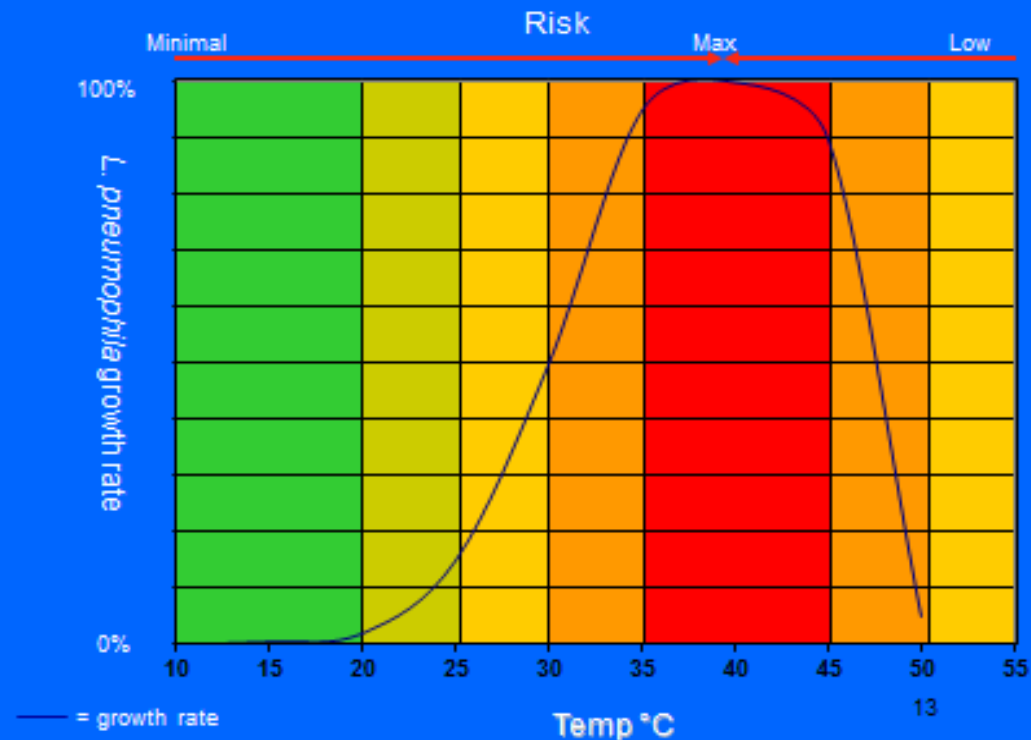
Widespread in natural aquatic environment. Factors >>increase *Legionella* growth:

- Stagnation
- Presence of nutrients, e.g. iron
- Presence of other aquatic microorganisms (Amoebae, Cyanocobacteria, Ciliates, Algae, Slime mold)
- **Water temperature > 20 °C and <50 °C**
- All systems which contain non-sterile water, operate within the range of 25-45 °C and have the potential to be aerosolised are high risk systems.

Growth Factors

- pH range 2.7 to 8.3
- Multiply in temperatures 25°C - 45 °C
- Optimum range 32 °C -42 °C
- Greatest increase @ 37 °C -42 °C

Water temperature, growth rate and risk



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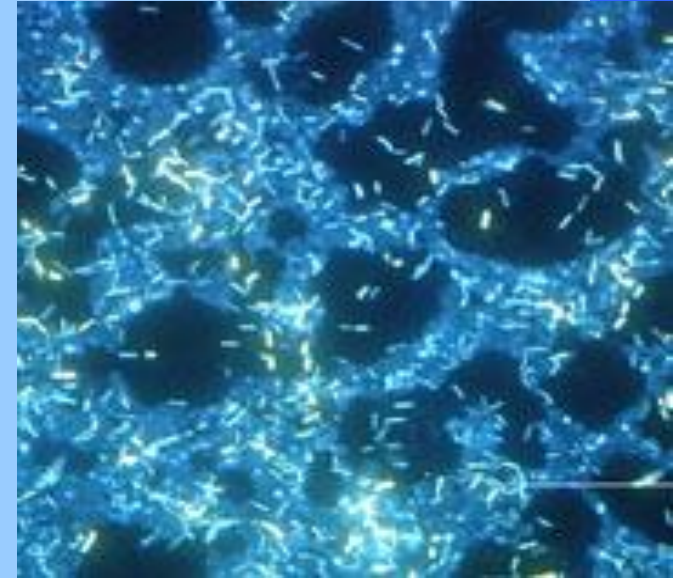
Biofilms support *legionellae* survival

A biofilm is a consortium of micro-organisms growing at interfaces:

- Air / water
- Surface / water

Stages of biofilm formation:

1. Non specific binding on surfaces.
2. Colonisation – hydrophobicity and electrochemical nature of substratum is important.
3. Glycocalyx formation – protect microcolonies.



ce to



Biofilms and legionella

Legionella Bacteria are commonly found in:

- Lakes, rivers, ponds, soil
- Municipal water supply
- Hot water systems in building installations
- Cooling circuits
- In amoebas and other micro organisms

Reproduction takes place in biofilms, sheltered from the disinfectant!

Cross section through aged system pipe work



Food is also:

CO₂

Metal ions (also on surfaces)

Nitrate

Ammonium

Sulfate



Also clean mains water is susceptible to infection !

Sources of *Legionella*

- **Industrial sites with water cooling devices or large buildings with wet cooling systems used for air conditioning**

Hot and cold water systems used in:

Hospitals

Hotels/holiday accommodation/office buildings

Whirlpool spas

Cruise ships

Domestic premises

Fountains/car washes

- **Humidifiers**
- **Respiratory therapy equipment**
- **Potting composts**

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Water drops falling onto a hard surface

Bubbles rising to the water surface and bursting

Rain

Running a tap

Running shower

Flushing a toilet

Spraying plants

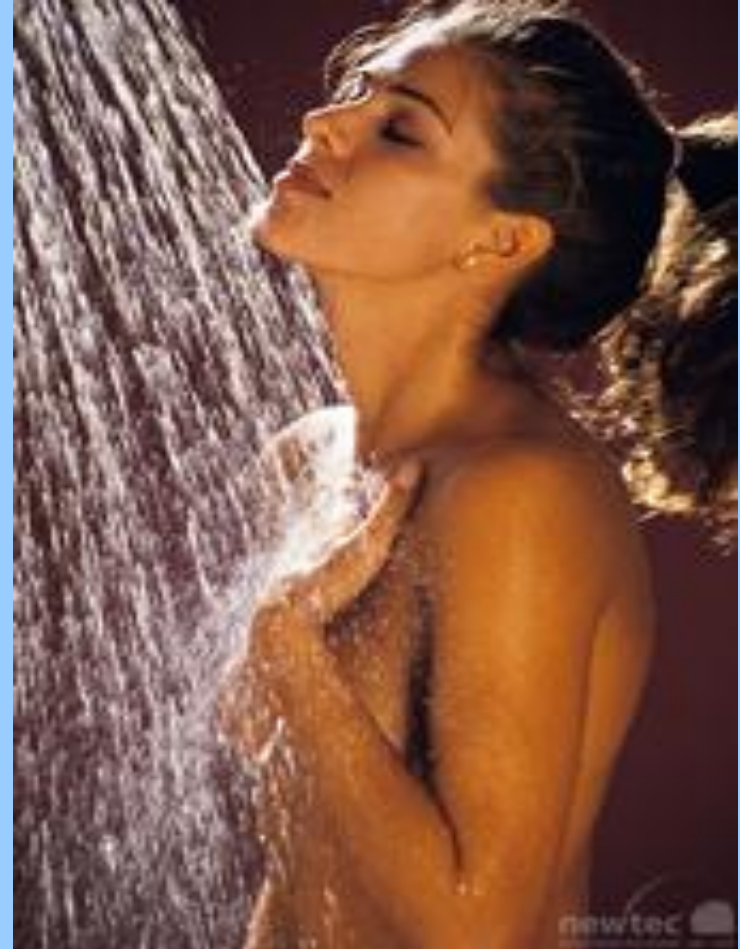
Humidifiers

Water running over pack of cooling towers

Wave formation

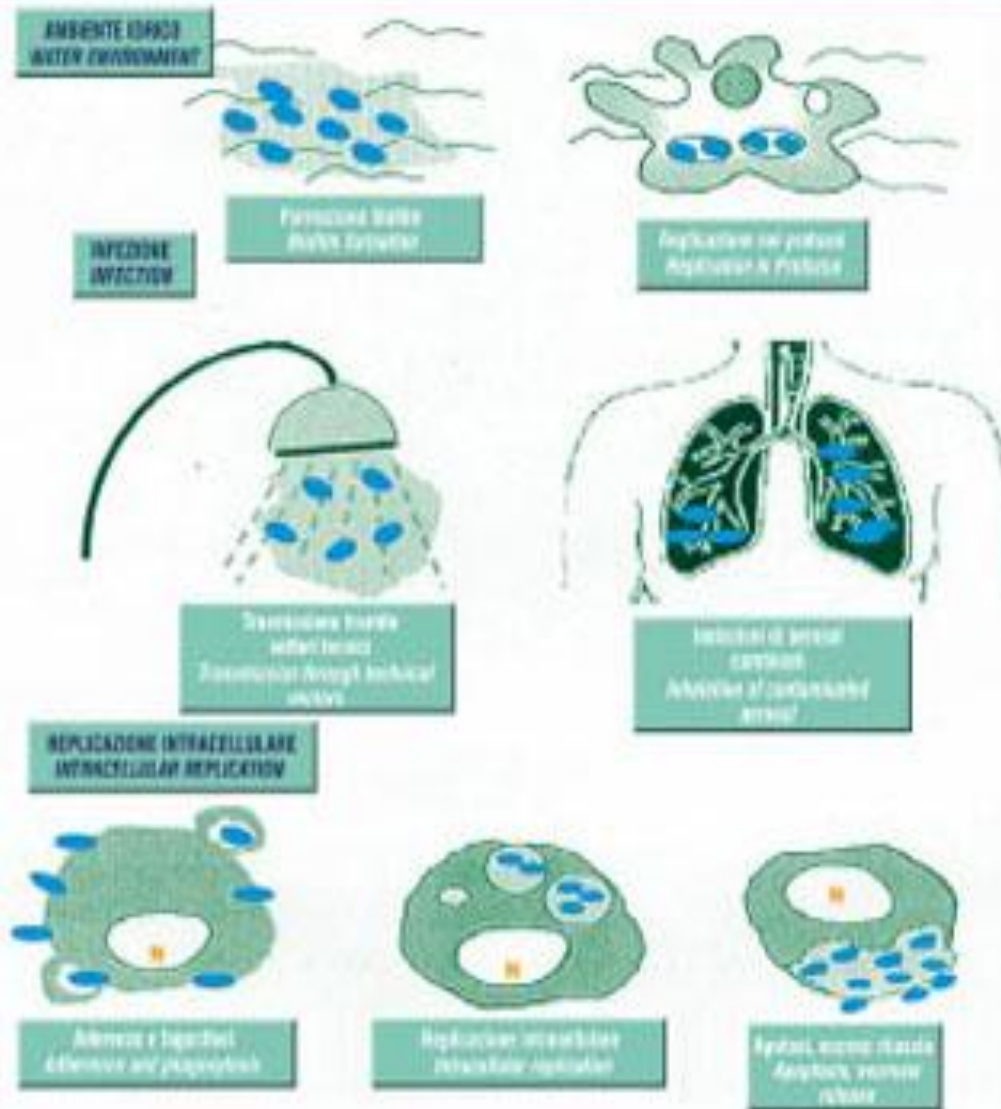


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Routes of human contamination starting from water: a) *Legionella* is present in biofilm in the environment and it multiplies in Protozoa; b) *Legionella* uses a "technical vector" to colonise human airways; c) After penetrating into macrophages *Legionella* multiplies in their vacuoles causing the death of the host cell through its necrosis and apoptosis



56 year old man with Multiple myeloma

PMH- Type 2 DM; Penicillin allergy (rash only)

- **17/3/10- Admitted to Haem-Oncology ward (BS1 at Barts) for autologous stem cell transplantation following high dose melphalan.**
- **Week 2- Febrile, neutropaenic.** Blood cultures taken. **1st line empiric antibiotic treatment commenced (Meropenem)**
- **27/3/10- Blood culture grew *Pseudomonas aeruginosa*, resistant only to ciprofloxacin.**
- **2/4/10-Continued to be febrile & unwell + hypoxic & haemodynamically unstable.** Amikacin, Vancomycin & AmBisome added.

3/4/10- Transferred to ITU for cardiovascular & respiratory support

WATTS, STANLEY

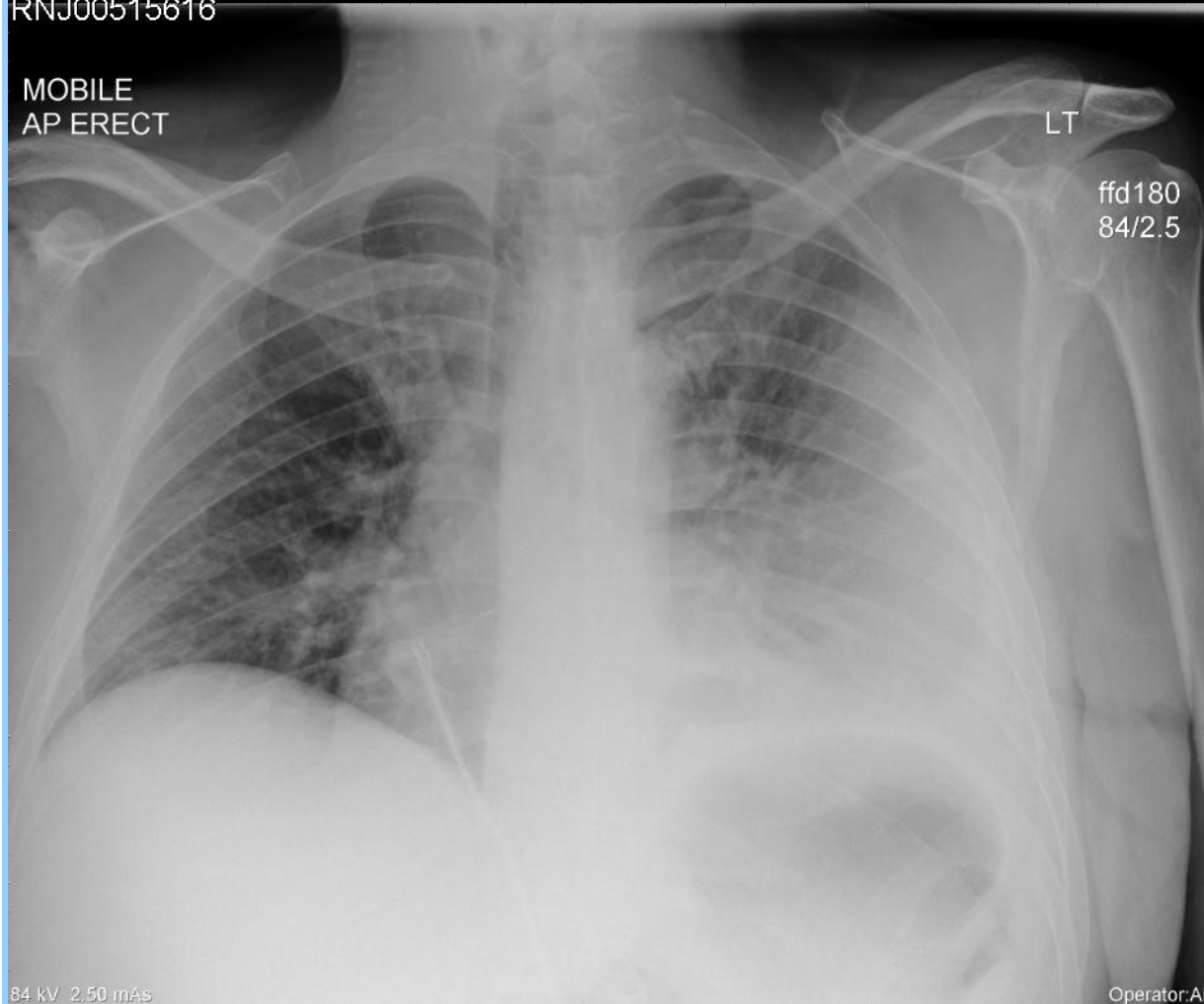
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MOBILE
AP ERECT

LT

ffd180
84/2.5



Chest radiograph on admission to ITU demonstrating a moderate-sized left-sided pleural effusion

84 kV 2.50 mAs

Operator:AP

03/04/2010, 16:13:44

A1

- **CT scan chest- Pneumonia, probably Pseudomonal**
- **4/4/10- BAL performed: Culture negative** (on antimicrobials).
- 7/4/10- Sputum culture positive for Aspergillus but serum galactomannan negative
- 10/4/10- Vancomycin & Amikacin stopped. Condition improved. Slowly weaned off inotropes
- **15/4/10- Transferred back to the Ward. Patient bed bound**
- 18/4/10- Meropenem stopped. AmBisome continued.

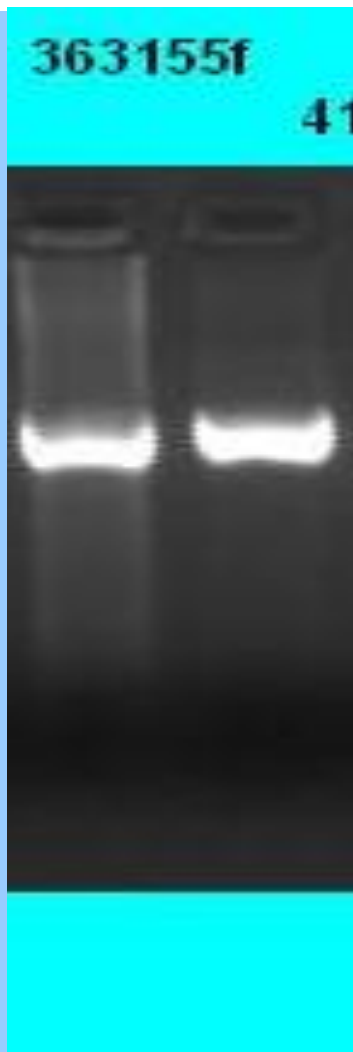
- **Continued to improve.** Occasional fever. Deranged LFTs. Repeat blood cultures- no growth
- **12/5/10- CMV viraemia confirmed** (viral load 57,000). Commenced on IV ganciclovir
- **Beginning of June 2010- Low grade fever.**
 - **Chest X-ray- Left sided pleural effusion**
 - **Commenced on IV Clarithromycin** (Penicillin allergic)- 5 day course

- **7/6/10- Began to spike high temperature**
- **CT scan chest: Cavitation left lower lobe** (in previous area of consolidation) + features of an **empyema**.
- Restarted on meropenem (already on clarithromycin)
- Blood cultures- Only skin contaminants

- **8/6/10- CT guided pleural aspiration + insertion of chest drain**
- **Gram stain- Pus cells+++; Culture- No growth**
- **Continued to spike + unwell**
- **14/6/10- Empyema fluid referred for 16S PCR testing.**

16S rDNA & Sequencing

- **Extract** total **DNA from the sample** using a QiaGen kit
- **Amplify** any bacterial DNA (ribosoma DNA) present in the extract **using 2 sets of primers targeted at highly conserved regions of the 16S rRNA gene (i.e. broad-range bacterial primers)**
- The amplicons generated are 1200 to 1400bp depending on the primer set used.
- Each extracted sample is run at 2 concentrations with each primer set (and with an **inhibition control** to be sure the extract is not inhibiting the PCR reaction).
- Thus each sample has 4 PCR reactions (plus 2 inhibition controls for that extract).
- Each PCR plate also includes **negative and positive controls**
- **Amplification (PCR) products** of the correct size are **sequenced**.



The **initial sample (363155f) produced strong bands** with both primer sets and in both concentrations (undiluted template & 1:10 diluted template).

Sample	sequence match:	matching by:
Empyema fluid/pus (Sample 8/6/10, processed 14/6/10- results reported 16/6/10)	<i>Legionella pneumophila</i>	1316/1323 (99%)
Pus (25/6/10)	<i>Legionella pneumophila</i>	1307/1329 (98%)
Lung tissue (CT surgery- 30/7/10)	<i>Legionella pneumophila</i>	1280/1285 (99%)
Pus from lung cavity/abscess (30/7/10)	<i>Legionella pneumophila</i>	1318/1321 (99%)

PCR product sequenced- matched ribosomal gene sequences for *Legionella pneumophila*. Subsequent samples processed in the same way produced comparable results.

- IV Clarithromycin restarted 16/6/10. Switched over to **Levofloxacin 18/6/10**
- **Referred to Respiratory Physician at LCH for management of empyema + consideration for decortication** if failed to respond to antibiotic treatment
- Patient's condition improved. Bone marrow showed signs of regeneration. Temperature settled. Chest drain removed as stopped draining
- **Repeat sampling (empyema fluid) PCR positive for *L.pneumophila*. Urinary Legionella antigen test consistently negative** (NB detects only Serogroup 1)
- **Beginning of July- Further deterioration in condition-** chest drain re-inserted. Imipenem and clarithromycin started (3 weeks course- stopped 30/7/10).
- **28/7/10- Had Cardiothoracic surgery- Lung abscess found. Resected & sent for culture – no growth. 16s PCR positive for LP.**
- **Patient recovered slowly- Discharged home.**

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Coronal view from CT chest shows a left sided middle and lower lung consolidation with a large parenchymal abscess and a small amount of additional pleural fluid.

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Actions taken once LP positive result became known on 16/6/10

- Estates team (**Trust/Site Nominated Legionella Person**) informed by Infection Control team (ICT)
- **Water samples taken from the affected ward for microbiological testing** by Phase Technology (**High numbers of LP sero group (Sgp) 2-14 isolated from the great majority of the water outlets tested** (final results read after 10 days incubation)
- Corrective actions instigated by SFS including: **fitting point of use filters** (taps & shower heads) (at least as a temporary measure), **chlorination and pasteurisation of the main water tanks** (i.e. chemical & thermal disinfection respectively), **cleaning & descaling of the Thermostatic mixing valves (TMV)**, and **regular flushing of water outlets** (at least twice weekly). NB **Chlorine dioxide plant subsequently installed** (continuous dosing of disinfectant). Maintaining temperature at water outlets: <20°C for cold water & >50°C for hot water.
- ICT became aware of LP positive result in water samples on Friday **2/7/10-Urgent SI meeting arranged**
- **HPA/CCDC informed.**

Other immediate actions taken after SI meeting on 2/7/10

- **Patient information leaflet** prepared & distributed (IP & OP). Also for **OHD**
- **Press Statement** prepared (just in case!)
- **Until filters were fitted, patients moved to another ward in the new building**
- **Use of ice machine discontinued**
- **Unused taps + dead legs to be identified**
- **SFS to monitor and replace filters monthly**

Other immediate actions taken after SI meeting on 2/7/10 (2)

- **High index of clinical suspicion** in order to detect other cases of LD.
- **Testing for LP-** Patients with suggestive clinical features: legionella urinary antigen test; respiratory samples (e.g. sputum) for legionella culture, DIFT & PCR
- **Clarithromycin added to febrile neutropaenia empiric therapy protocol** (until 3 negative samples from previously positive LP water outlets in the ward,)
- **Ciprofloxacin already part of prophylaxis protocol** for neutropaenic Haem-Onc patients. ? **Prevented further cases of LP from occurring, i.e. an outbreak**
- **Further samples taken from other areas of Barts hospital-** same building, ICU building and other “high risk” areas

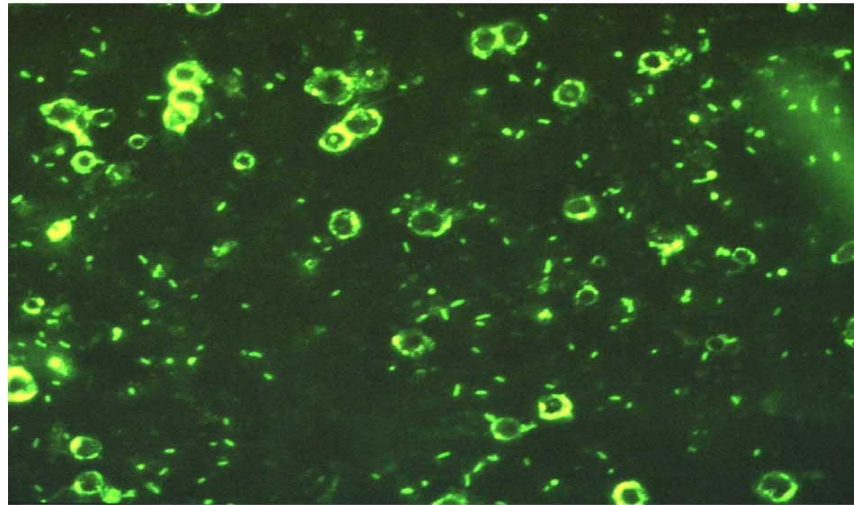
CfI, Colindale

- **Original sample (empyema fluid) sent** to Dr Tim Harrison at Centre for Infections (CfI, HPA, Colindale) **for confirmation & further analysis**
- **LP confirmed by using *L.pneumophila* specific (*mip* gene) PCR**
- **Direct Immunofluorescence** (DIF using species specific MCA) on a smear of empyema fluid- **Numerous LP seen**
- **DIF using serogroup (Sgp) specific MCAs (1,3,4,5,6,8,10) identified the strain of LP as Sgp 10**
- Repeated attempts at **culture negative- non-viable**

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DIF directly on sample of empyema fluid

(Courtesy of Dr Tim Harrison)



CfI, Colindale (2)

- **Nested PCR DNA- based sequencing** on sample- LP strain identified as **an unique SBT allelic profile '7,6,17,28,13,11,F'** (not been seen previously at CfI)
- **Serology** (Paired sera 22/6/10 & 6/7/10): Detection of antibody against monovalent antigens of LP Sgp 1-6 & 8 **by IIF** (validated Ags for Sgps 9-15 not available). Both samples **seropositive for Sgp 4 (titre 32) & Sgp 8 (titre 64)**
- Sgp 4,8,10 share some **cross reactive antigens**. Thus serology above **consistent with Sgp 10 infection at some time**

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Investigation of Environmental (water) samples taken from the Ward

- Sample from water outlets in ward taken by Phase Technology (PT) and ***sent to an accredited laboratory, Roben's Centre for Public & Environmental Health, University of Surrey (Guildford) for quantitative Legionella culture & sero-grouping*** –water sampling then repeated at agreed intervals (weekly, then monthly, etc).
- **Originally 10 water samples positive for LP Sgp 2-14**
- **Bacterial suspensions** (prepared from 2 colony picks of LP Sgp 2-14) **sent to CfI, Colindale for further characterisation**

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Results from Roben's Institute- Water samples taken from BS1 ward 21/6/10

Lab reference number	Phase Technology sample number	Sample point	Legionella isolated
06618	PL 50977	Room 7 shower wash hand basin mixed	L.pneumophila Sg2-14
06620	PL 50979	Room 7 hallway wash hand basin mixed	L.pneumophila Sg2-14
06621	PL 50980	Room 6 shower wash hand basin mixed	L.pneumophila Sg2-14
06622	PL 50981	Room 6 shower mixed	L.pneumophila Sg2-14
06623	PL 50982	Room 6 hallway wash hand basin mixed	L.pneumophila Sg2-14
06624	PL 50983	Room 5 shower wash hand basin mixed	L.pneumophila Sg2-14
06625	PL 50984	Room 5 shower mixed	L.pneumophila Sg2-14
06626	PL 50985	Room 5 hallway wash hand basin mixed	L.pneumophila Sg2-14
06627	PL 50986	Room 4 shower wash hand basin mixed	L.pneumophila Sg2-14
06629	PL 50988	Room 4 hallway wash hand basin	L.pneumophila Sg2-14 & species (labelled 3 & 4 on cryovials)

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CfI, Colindale- Further Investigation of LP positive water samples

- **DIF** on bacterial suspension using LP serogroup specific MCA identified all as **Sgp 3**, except one pick was **Sgp 6**, and the other was **Sgp 10**.
- **DNA sequence typing of the Sgp 10 strain** identified it as: **SBT `7,6,17,28,13,11,F'**.
Identical to that found in the patient's sample
- **Conclusion:**
 - ❖ **Unusual strain of LP (Sgp 10, SBT `7,6,17,28,13,11,F')** detected in patient and also in the Ward's water supply, which was contaminated by a complex mixture of closely related LP strains
 - ❖ **Seems most probable that the patient acquired the infection in the ward**

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Phase Technology- Water sample result

SAMPLE DATE	CO N	CLIENT	SITE	LOCATION1	LOCATION 2	SAMPLE TYPE	SAMPLE NUMBER	RESULT
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 3rd Floor Bodley Scott	Room EWB.3.21 Cleaners Cupboard	CWS	PL52151	L.pneumophila Sg.3 50cfu/L/day5
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 3rd Floor Bodley Scott	Dirty Utility Main Room	HWS	PL52152	L.pneumophila Sg.6 250cfu/L/day5
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 3rd Floor Bodley Scott	Drug Prep	Mixed	PL52153	L.pneumophila Sg.6 15000 cfu/L/day5
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 3rd Floor Bodley Scott	Room 4 Wash Hand Basin	Mixed	PL52155	L.pneumophila Sg.3 1100cf u/L/day5
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 3rd Floor Bodley Scott	Room 4 Wash Hand Basin	CWS	PL52156	L.pneumophila Sg.3 400cfu /L/day5
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample Basement Pet Area	EWB.-1.39 WHB	Mixed	PL52176	L.pneumophila Sg.3 1800cf u/L/day5
06-Aug-10	mf	Sbhskan	Glouhous	Re sample 6th Floor	Room 14 Wash Hand Basin	Mixed	PL52182	L.pneumophila Sg.3 150cfu /L/day5
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 2nd Floor WG Grace Ward	QE.2.42 Patients Shower WHB	Mixed	PL52133	L.pneumophila Sg.1 300cfu/L/day5
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 2nd ITU Ward	ITU Wash Hand Basin Left Hand Side Fire Exit	CWS	PL52129	L.pneumophila Sg.1 1300cf u/L/day5
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 2nd ITU Ward	QE.2.26 Male Changing	CWS	PL52131	L.pneumophila Sg.1 900cfu/L/day5

Phase Technology- Water sample result

06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 1st Floor Bodley Scott 1	Room 7 Hallway WHB	Mixed	PL52158	L.pneumophila Sg.3 u/L/day5	350cf
06-Aug-10	mf	Sbhskan	Eastsbh	Re sample 1st Floor Bodley Scott 1	Room 4 Shower WHB Pre TMV	CWS	PL52171	L.pneumophila Sg.10 fu/L/day5	150c
06-Aug-10	mf	Sbhskan	QEllwing	Sample 3rd Floor Vicary Ward	QE.3.25B Gents Wash Hand Basin	Mixed	PL52120	L.pneumophila Sg.1 /L/day5	450cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 3rd Floor Vicary Ward	QE.3.25B Gents Wash Hand Basin	CWS	PL52121	L.pneumophila Sg.1 /L/day5	100cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 3rd Floor Vicary Ward	QE.3.36C Ladies Wash Hand Basin	Mixed	PL52125	L.pneumophila Sg.1 /L/day5	250cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 3rd Floor Vicary Ward	QE.3.36D Ladies Wash Hand Basin	Mixed	PL52126	L.pneumophila Sg.1 /L/day5	650cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 4th Floor Harvey Ward	QE.4.11 Wash Hand Basin	CWS	PL521808	L.pneumophila Sg.1 L/day5	50cfu/
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 4th Floor Harvey Ward	QE.4.27D Wash Hand Basin	CWS	PL52114	L.pneumophila Sg.1 /L/day5	100cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 1st Floor Eye Theatre	QE.1.13C Wash Hand Basin	Mixed	PL52138	L.pneumophila Sg.1 /L/day5	100cfu
06-Aug-10	mf	Sbhskan	QEllwing	Re sample 1st Floor Eye Theatre	QE.1.13C Wash Hand Basin	CWS	PL52139	L.pneumophila Sg.1 u/L/day5	1600cf

LPResult Final	Sample Date	PL No	LPResult Final	Sample Date	PL No	LPResult Final		Sample Date	PL No	LPResult Final		Sample Date	PL No	LPResult Final
L.pneumophila Sg.2-14 1650cfu/L	30/06/2010	51127	NOT DETECTED	23/07/2010	51487	NOT DETECTED		23/07/2010	51488	NOT DETECTED		30/07/2010	51987	NOT DETECTED
L.pneumophila Sg.2-14 1850cfu/L	30/06/2010	51128	L. Species 100 cfu/L	07/07/2010	51220	L. Species 50 cfu/L		23/07/2010	51490	NOT DETECTED		23/07/2010	51489	NOT DETECTED
L.pneumophila Sg.2-14 1300cfu/L	30/06/2010	51125	L. Species 100 cfu/L	07/07/2010	51219	L. Species 50 cfu/L		23/07/2010	51492	NOT DETECTED		23/07/2010	51491	NOT DETECTED
L.pneumophila Sg.2-14 1850cfu/L	30/06/2010	51126	NOT DETECTED	23/07/2010	51494	L.pneumophila Sg.2-14 & L.species 150cfu/L		23/07/2010	51493	NOT DETECTED		30/07/2010	51990	L.pneumophila Sg.6 450cfu/L
L.pneumophila Sg.2-14 1700cfu/L	30/06/2010	51124	NOT DETECTED	23/07/2010	51496	L.species 300cfu/L		23/07/2010	51495	NOT DETECTED		30/07/2010	51991	L.pneumophila Sg.6 50cfu/L
L.pneumophila Sg.2-14 1750cfu/L	30/06/2010	51123	NOT DETECTED	23/07/2010	51500	NOT DETECTED		23/07/2010	51499	NOT DETECTED		30/07/2010	51992	NOT DETECTED
L.pneumophila Sg.2-14 14400cfu/L	30/06/2010	51122	L.pneumophila Sg.2-14 1000 cfu/L	08/07/2010	51232	NOT DETECTED	0	23/07/2010	51498	NOT DETECTED		23/07/2010	51497	NOT DETECTED

Report

Review of Measures to Control Legionnaires disease At St Bartholomew Hospital

Final Version

Prepared by

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Laboratory of Gastrointestinal Pathogens
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Centre for Infections
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London.
NW9 5EQ

18th August 2010

Visited Barts on 14th & 16th
July 2010:

- Reviewed policies, systems & procedures in place for control of LD at Barts
- Check results of Microbiology & temperature monitoring systems in Legionella Log book
- Inspected hospital site & relevant facilities
- Interviewed key personnel re LD prevention & control
- Participated in SI (initial observations presented)
- Recommendations

Figure 1: Inside the main cold water storage tank; (001152) = 20.3°C.



Figure 2: Slight sediment at the bottom of cold water storage tank.
Tank was last chlorinated on 19/11/09 by Phase Technology.

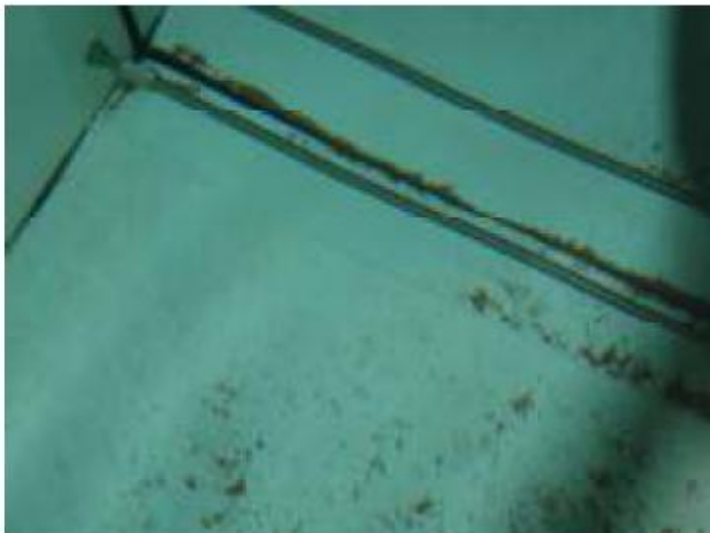


Figure 3: Wash hand basin in QEII



Pipework is very close together. Incorrect installation of the cold pipe above the hot pipe. Heat rising from the hot pipe will cause the cold pipe (above) to warm up. Lagging is therefore required to minimise heat gain in the cold feed.

Cold = 27.1°C
Hot = 56.7°C

Figure 5: Stagnant water in deadlegs



Deadleg: pipework leading to disused outlet

Blind end where the pipework had been capped off.

Figure 6: Stagnant water in deadlegs



Pipework buried into the brick work of the wall. This runs from QE/2/11A to QE/2/05 where the wash hand basin has been removed as it was being used as a storing area.

Figure 8: QE/5/49; Rarely used outlets should be removed.
Cold = 30.5°C Hot = 58.6°C



Figure 9: QE/2/1 ITU Bay 1; The cold water pipe is probably holding stagnant water



Cold = 31.2°C
Hot = 33.3°C

TMV

Pipe work is very close together and not lagged. Incorrect installation of cold pipe above the hot pipe.

Summary of recommendations for St. Bartholomew hospital

		Priority (1=high)	Date for completion
Item	Water System		
1	Survey the water systems for deadlegs and blindends. Audit the use of outlets and identify where TMVs need to be fitted and where TMVs are fitted unnecessarily e.g. staff only areas. This survey must include all rooms including those which are locked and office areas. Removed TMVs or outlets which have been identified as not required. Including their associated pipework which should be taken right back to the circulating hot water or cold main supply.	1	30 th September 2010
2	Hot water should be circulated at temperatures close to 60°C. The temperature of the hot water in the return pipework should be close to this due to the constant flow of hot water within this circuit. This ensures the water in each of the hot tap reach 50°C within 1minute. In well designed systems the temperature of the water returning to the water heater will be within 5°C of the flow leaving the heater.	1	30 th September 2010
3	Daily flushing of infrequently used outlets should be maintained for all buildings and the flushing programme can be reviewed with consideration to reduce the frequency once the system is under control based on microbiological data. The responsibility for flushing of infrequently used outlets should be defined. There should be a list of infrequently used outlets and a written protocol for flushing. The list should be a reviewed regularly to reflect changes in ward usage. A log of the flushing regime should be recorded for audit purposes.	1	31 st August 2010
4	Check the capacity of the two cold water storage tanks is appropriate for the demand in East Wing (i.e. turnover at least once in 24 hours).	1	31 st August 2010
5	Once the engineering aspects have been addressed, then disinfection of the system (including flushing through the outlets)	2	31 st December 2010

Contributing factors-identified in BLT SI report

- **Ward moves - Decommissioning process:** Some areas of the Hospital had been vacated during the months of May and June. The area which was vacated in the same building as the affected patient was **not fully decommissioned** as the Trust had not decided on its future use. Water supply was not isolated back to the main valve.
- **No protocol for managing an empty Trust area** which was not being refurbished or demolished
- **No agreed communications plan** to inform the operational clinical teams of issues and cascade the information
- **In the preceding months cold water temperatures had been recorded as $>23^{\circ}\text{C}$, increasing risk of legionella growth.**
- Regional temperatures had been high - there had been the **longest period of high summer temperature for days**
- Thermostatic mixing valves (TMV) widely used for anti scald protection. TMV lead to ideal temperature conditions for growth of legionella within the pipe work

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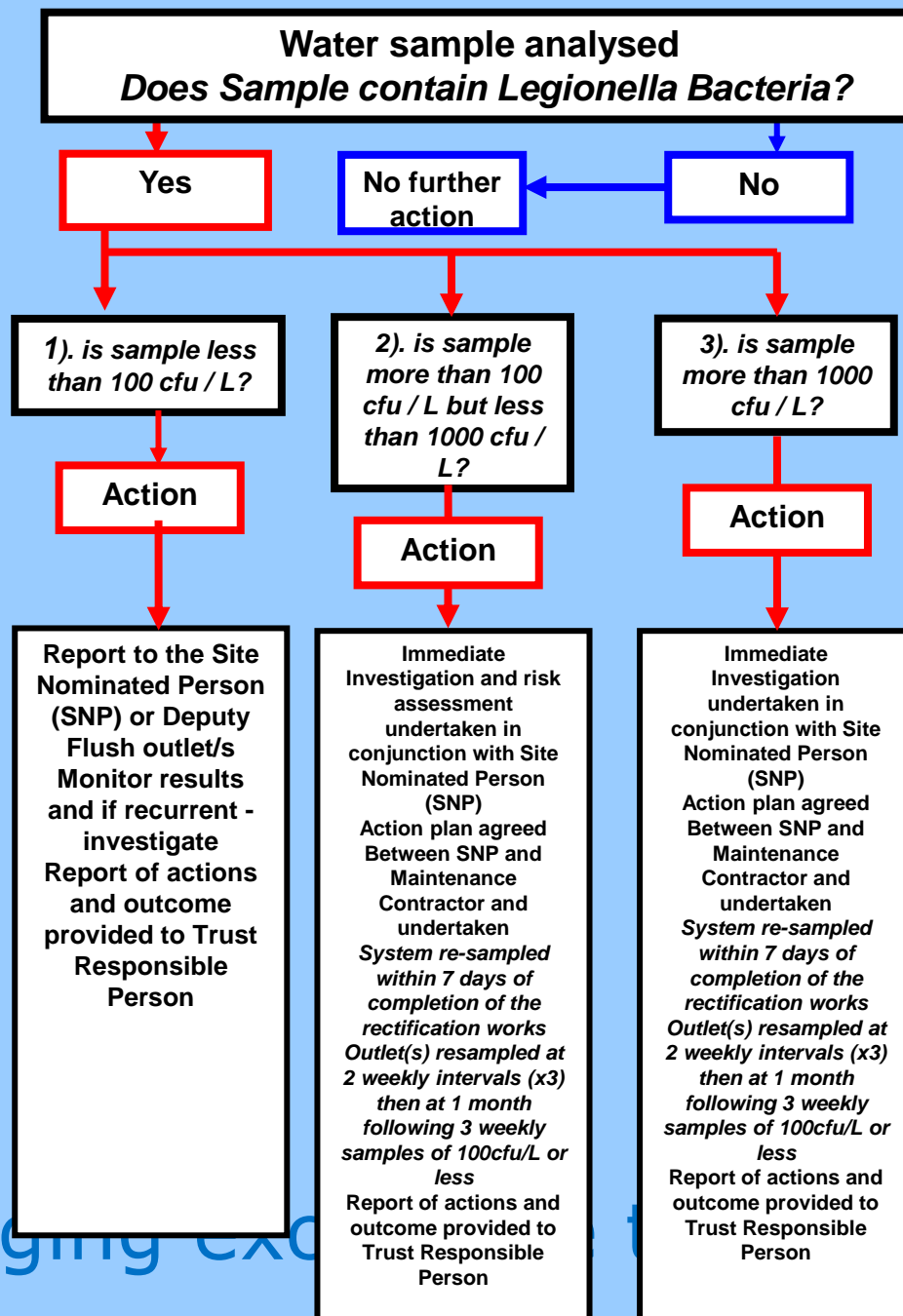
SI report- Recommendations/Action Plan

- **The Legionella Management Policy must be reviewed and ratified**
- The operational management plan should be issued
- The trust should form and convene the **Water Management Committee**
- The Water Management committee to agree **a programme of training** for the local prevention and reduction of legionella risks
- To **review the water testing regime** for general management of samples and possible sampling of other pathogens (i.e. *P.aeruginosa* and *E coli*)
- An **internal communication protocol** should be agreed and included in the Legionella policy
- An external communication plan for contacting other services and clinics should be agreed to ensure they are aware of potential symptomatic patients and methods of treatment
- To **agree a flushing programme with formal responsibilities and accountabilities**
- The Statutory upgrading programme should be accelerated to ensure the **installation of the chlorine dioxide plant and removal of dead legs.**

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BLT POLICY FOR THE MANAGEMENT AND CONTROL OF LEGIONELLA BACTERIA IN WATER SERVICES

TRUST CORE POLICY	
REVIEW	January 2013
APPROVAL/ADOPTED:	Infection Control Committee Policy Working Group
DISTRIBUTION:	Policy Liaison Officers for distribution to all staff.
RELATED DOCUMENTS:	Control of Substances Hazardous to Health Incident Reporting Policy Risk Management Strategy/Policy
AUTHOR/FURTHER INFORMATION:	PB, Interim Director of Estates & Facilities



Conclusion

- **Very rare case of Legionella infection: not pneumonia but empyema & lung abscess**
- **Very rare strain of LP- Sgp 10, with unique SBT allelic profile '7,6,17,28,13,11,F'**
- **Same strain also recovered from the ward's water samples (along with other Sgps also). Therefore source of infection?**
- **Water outlets at home not sampled. Other sources?**
- **Does chronic colonisation with LP occur? NB Macrophages live for a long time!**
- **Diagnosis would not have been possible without molecular techniques (culture negative, urinary legionella antigen negative (NB detects only Sgp 1)**
- **Resulted in lots of works to control legionella in the hospital's water supply/WDS + £££££ Protocol amended & tightened up, including roles & responsibilities, communication.**
- **But may have helped to prevent an outbreak- high mortality, bad publicity + legal nightmare (HSE, Courts)!! Ciprofloxacin as standard prophylaxis in our neutropaenic protocol probably also played an important part in this.**

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Acknowledgement

- BLT/SFS staff
- HPA, Colindale- Dr Tim Harrison, Dr Sandra Lai, Prof Nick Phin
- Dr Simon Cathcart, CCDC (NE & NC London HPU)

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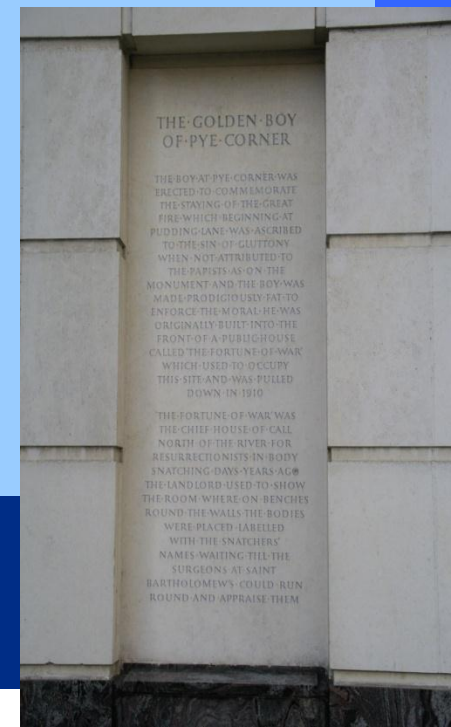
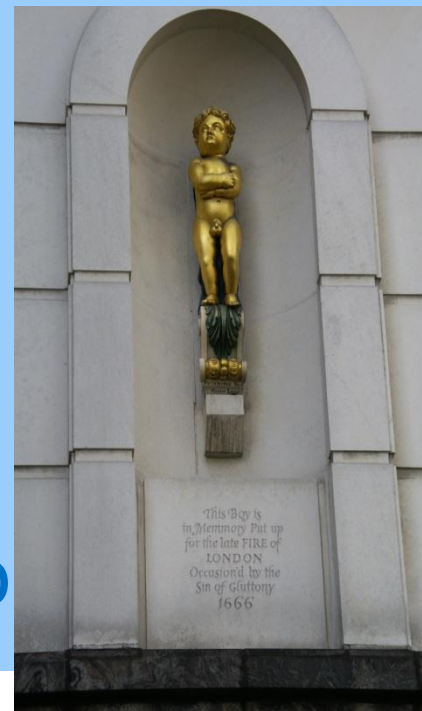
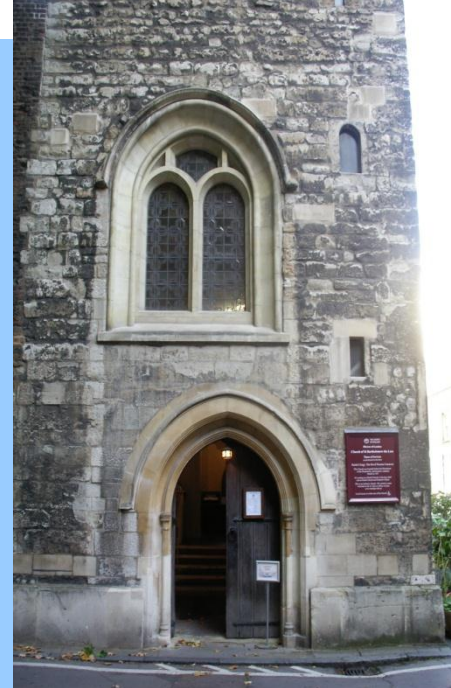
References (UK Code of Practice Documents):

1.L8. Legionnaires' disease: The control of legionella bacteria in water systems: Approved Code of Practice and guidance 3rd Edition 2000. Published by Health & Safety Executive (HSE UK). <http://www.hse.gov.uk/pubns/priced/l8.pdf> .

2.HTM 04-01. The control of Legionella, hygiene, “safe” hot water, cold water and drinking water systems (Part A and Part B). Published by Space for Health 2006 (<http://www.spaceforhealth.nhs.uk/> Space for Health is the gateway to healthcare premises technical guidance published by the four UK Health Organisations of England, Scotland, Northern Ireland and Wales).

Department of Health (DH UK)'s Health Technical Memorandum (HTM) outlines the principles involved in the design, installation and testing of hot and cold-water supply, storage and distribution systems in healthcare premises. It is applicable to new and existing premises.

<http://www.whtlimited.com/doc/lib/98/htm-04-01-part-b-20061009113435.pdf>



Any Question?



THANK YOU!

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