The Portuguese Legionella Outbreak: Lessons learned

Paula Rosa
Coordenadora da Unidade de Pneumologia
First Legionella Outbreak - 1976
Philadelphia convention of the American Legion
182 cases
29 deaths (15.9%)
Table 2. Reported cases and notifications of Legionnaires’ disease per million, by reporting country, EU/EEA, 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases (n)</th>
<th>Population (n)</th>
<th>Notification rate (n/million)</th>
<th>Average difference between 2012 and 2008–11 rates (%)</th>
<th>Age-standardised notification rate (n/million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serbia</td>
<td>82</td>
<td>2,055,496</td>
<td>39.9</td>
<td>53</td>
<td>37.7</td>
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<td>Latvia</td>
<td>48</td>
<td>2,041,763</td>
<td>23.5</td>
<td>215</td>
<td>23.6</td>
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<td>5,589,516</td>
<td>22.8</td>
<td>-1</td>
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<td>1,312</td>
<td>60,829,096</td>
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<td>13</td>
<td>19.1</td>
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<td>46,194,775</td>
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<td>-11</td>
<td>20.2</td>
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<td>France</td>
<td>1,258</td>
<td>65,327,724</td>
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<td>-5</td>
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<td>Netherlands</td>
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<td>17.6</td>
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<td>81</td>
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<td>-28</td>
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<td>11,994,455</td>
<td>9.6</td>
<td>-57</td>
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<td>10.0</td>
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<td>775,011</td>
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<td>62,989,151</td>
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<td>-12</td>
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<td>Estonia</td>
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<td>4,900,034</td>
<td>2.4</td>
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<td>Estonia</td>
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<td>-40</td>
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<td>-44</td>
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<td>Slovakia</td>
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<td>5,404,322</td>
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<td>-20</td>
<td>0.8</td>
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<tr>
<td>Poland</td>
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<td>-58</td>
<td>0.2</td>
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<td>21,355,649</td>
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<td>-34</td>
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<td>0</td>
<td>7,327,224</td>
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<td>-100</td>
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<tr>
<td>EU/EEA total</td>
<td>5,852</td>
<td>599,005,430</td>
<td>11.5</td>
<td>4</td>
<td>10.8</td>
</tr>
</tbody>
</table>

* Not applicable when information on age was not available for >5% of cases
Figure 1. Notification rate of Legionnaires' disease in the EU/EEA* by year of reporting, 1995–2013

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European Legionnaires’ Disease Surveillance Network (ELDSNet)


Notificação clínica - DDO

Notificação laboratorial

Sistema Nacional de Vigilância Epidemiológica

Courtesy of Prof. Teresa Marques
European Legionnaires’ Disease Surveillance Network (ELDSNet)

This website is part of the ECDC (European Centre for Disease Prevention and Control) network.

Health Topics Publications Data & Tools Activities

ELDSNet

European Legionnaires’ Disease Surveillance Network (ELDSNet)

ELDSNet, which is coordinated by ECDC, carries out surveillance of Legionnaires disease (pneumonia form of legionellosis), involving all EU Member States, Iceland and Norway, identity relevant public health risks, enhance prevention of cases and monitor epidemic trends.

This section of the ECDC website describes the network and its background and participating institutions. It also provides useful information on Legionnaires’ disease (a "publications") as well as the methods (EU case definition) and some results (see section "monthly report of surveillance through ELDSNet.

In the accommodation site list, ELDSNet publishes the name of hotels or other tourist accommodation that may pose a possible risk for Legionnaires’ disease to travellers.

The network coordinators at ECDC can be contacted at eldsnet@ecdc.europa.eu.

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases (n)</th>
<th>Population (n)</th>
<th>Notification rate (n/million)</th>
<th>Average difference between 2012 and 2011-11 rates (%)</th>
<th>Age-standardised notification rate (n/million)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>15</td>
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<td>100</td>
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<td>100</td>
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<tr>
<td>Germany</td>
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<tr>
<td>Greece</td>
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<td>0.0</td>
<td>11</td>
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<td>2,000,000</td>
<td>22</td>
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<td>22</td>
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<td>Iceland</td>
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<td>400,000</td>
<td>7.5</td>
<td>0.0</td>
<td>7.5</td>
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<td>Italy</td>
<td>13</td>
<td>1,000,000</td>
<td>13</td>
<td>0.0</td>
<td>13</td>
</tr>
<tr>
<td>Netherlands</td>
<td>36</td>
<td>3,000,000</td>
<td>12</td>
<td>0.0</td>
<td>12</td>
</tr>
<tr>
<td>Portugal</td>
<td>140</td>
<td>10,000,000</td>
<td>14</td>
<td>0.0</td>
<td>14</td>
</tr>
<tr>
<td>Slovenia</td>
<td>81</td>
<td>2,000,000</td>
<td>41</td>
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<td>41</td>
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<tr>
<td>Spain</td>
<td>7</td>
<td>1,000,000</td>
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<tr>
<td>Sweden</td>
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<td>1,000,000</td>
<td>9</td>
<td>0.0</td>
<td>9</td>
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<tr>
<td>Switzerland</td>
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<td>4</td>
<td>0.0</td>
<td>4</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>12</td>
<td>3,000,000</td>
<td>4.4</td>
<td>0.0</td>
<td>4.4</td>
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<tr>
<td>U.S.</td>
<td>11</td>
<td>5,000,000</td>
<td>11</td>
<td>0.0</td>
<td>11</td>
</tr>
</tbody>
</table>

* Not applicable when information on age was not available for >3% of cases

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Figura 2: Número de casos de DL notificados por grupo etário por milhão de habitantes por ano em Portugal de 2004 a 2013

Legionella spp

- Recognized in 1979, it is an intracellular facultative, gram negative aerobic bacillus.
- More than 50 species and 70 serotypes are known.
- The most frequently responsible for disease is Legionella pneumophila serotype 1.
- It multiplies ideally at temperatures between 25 and 45°C.

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Legionnaires’ Disease in Europe

Figure 5. Reported cases and notifications of Legionnaires’ disease per million, by reporting country, EU/EEA, 2014

Figure 3. Reported cases of Legionnaires’ disease by month of onset, EU/EEA, 2008–2012
Legionnaires’ Disease in Europe

Ten largest reported clusters of Legionnaires’ disease, 2009–2014

<table>
<thead>
<tr>
<th>Rank</th>
<th>Reporting country</th>
<th>Year of reporting</th>
<th>Cases No.</th>
<th>Probable setting of infection</th>
<th>Probable source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Portugal</td>
<td>2014</td>
<td>403</td>
<td>Community-acquired</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>2</td>
<td>Spain</td>
<td>2010</td>
<td>51</td>
<td>Community-acquired</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>3</td>
<td>Spain</td>
<td>2012</td>
<td>39</td>
<td>Community-acquired</td>
<td>Decorative fountain</td>
</tr>
<tr>
<td>4</td>
<td>Portugal</td>
<td>2012</td>
<td>36</td>
<td>Community-acquired</td>
<td>Unknown</td>
</tr>
<tr>
<td>5</td>
<td>Spain</td>
<td>2009</td>
<td>25</td>
<td>Community-acquired</td>
<td>Unknown</td>
</tr>
<tr>
<td>6</td>
<td>United Kingdom</td>
<td>2012</td>
<td>23</td>
<td>Community-acquired</td>
<td>Spa pool</td>
</tr>
<tr>
<td>7</td>
<td>Spain</td>
<td>2010</td>
<td>22</td>
<td>Community-acquired</td>
<td>Water system</td>
</tr>
<tr>
<td>8</td>
<td>Poland</td>
<td>2010</td>
<td>19</td>
<td>Community-acquired</td>
<td>Water system</td>
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<tr>
<td>9</td>
<td>Spain</td>
<td>2012</td>
<td>18</td>
<td>Travel-associated</td>
<td>Pool</td>
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<tr>
<td>10</td>
<td>UK</td>
<td>2010</td>
<td>15</td>
<td>Community-acquired</td>
<td>Multiple unknown sources</td>
</tr>
</tbody>
</table>

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Legionnaires’ Disease
Disease of civilization

D. dos Legionários – doença da civilização?

Bactéria ubíqua da água ambiente

Reservatórios artificiais, criados pelo homem, que amplificam o inóculo

Rede predial de águas (depósitos, chuveiros e torneiras);
Torres de arrefecimento;
Humidificadores;
Equipamentos de terapia respiratória;
Instalações termais;
Piscinas: jacuzzis;
Fontes decorativas;
Terra e adubos

Hospedeiro suscetível

Aerossóis < 5µm

Courtesy of Prof. Teresa Marques.
Review

Determination of viable legionellae in engineered water systems: Do we find what we are looking for?

Alexander K.T. Kirschner

**ABSTRACT**

In developed countries, legionellae are one of the most important water-based bacterial pathogens caused by management failure of engineered water systems. For routine surveillance of legionellae in engineered water systems and outbreak investigations, cultivation-based standard techniques are currently applied. However, in many cases culture-negative results are obtained despite the presence of viable legionellae, and clinical cases of legionellosis cannot be traced back to their respective contaminated water source. Among the various explanations for these discrepancies, the presence of viable but
The Portuguese Legionella Outbreak: Lessons learned

Pneumonia in Vila Franca Xira Hospital

- Pneumonia
- Admissions

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The Portuguese Legionella Outbreak: Lessons learned

- 6 nov

- First confirmation
- Authorities alerted
- Provide information - authorities - community
- Strengthen teams
- Provide information - authorities - community
- Strengthen teams
- Provide information
- Defining strategies

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The Portuguese Legionella Outbreak: Lessons learned

- First confirmation
- Authorities alerted
- Provide information - authorities - community
- Strengthen teams
- Provide information - authorities - community
- Strengthen teams
- Provide information
- Defining strategies
The Portuguese Legionella Outbreak: Lessons learned

**Figure 2**
Mapping of cases of Legionnaires’ disease by place of residence, Vila Franca de Xira, Portugal, notified by 14 November 2014 (n = 250)

- Authorities alerted
- Provide information - authorities - community
- Strengthen teams
- Provide information - authorities - community
- Strengthen teams
- Provide information
- Defining strategies

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The Portuguese Legionella Outbreak: Lessons learned

- Authorities
- Provide information - authorities - community
- Strengthen teams
- Provide information - community
- Defining strategies

Distribuição de “Novos casos” por data de início de sintomas, data de diagnóstico e data de internamento

Curva epidémica por data de início de sintomas

Courtesy of Prof. Teresa Marques
Factos relevantes

- Alerta na manhã de dia 7 de novembro dado pelo Diretor clínico do HVFX para a ACES do Estuário do Tejo e pelo laboratório para a DGS;
- Monitorização da assistência aos doentes: inquérito epidemiológico;
- Criação e primeira reunião da Task Force, a que se seguiram reuniões diárias;
- Início das investigações epidemiológicas, ambientais, meteorológica e da qualidade do ar e laboratoriais;
- Início de trabalhos de georreferenciação de dados epidemiológicos.

Task Force, coordenada pelo Diretor Geral da Saúde

- Agência Portuguesa do Ambiente (APA)
- Administração Regional de Saúde LVT
- Departamento de Saúde Pública, ARS LVT
- Direção-Geral da Saúde (DGS)
- Entidade Reguladora dos Serviços de Águas e Resíduos
- Empresa Portuguesa das Águas Livres
- Inspeção-Geral da Agricultura, do Mar, do Ambiente e do Ordenamento do Território (IGAMAOT)
- Instituto Nacional de Saúde Doutor Ricardo Jorge (INSA)
- Instituto Português do Mar e da Atmosfera (IPMA)

Coutesy of Prof. Teresa Marques
Factos relevantes

- Montagem de rede de referenciação hospitalar. Diagnóstico e acompanhamento dos doentes;
- Esclarecimento junto da opinião pública;
- Medidas de controlo, seguindo o princípio da precaução: água da rede pública e torres de arrefecimento de unidades industriais;
- Modelação da curva epidémica. Discussão de cenários de dispersão atmosférica;
- Importância dos resultados microbiológicos - Possível link (?) entre algumas amostras clínicas e duas amostras de água ambiental.

Coutesy of Prof. Teresa Marques
The Portuguese Legionella Outbreak: Lessons learned

Back to Vila Franca de Xira

6 nov
- First confirmation

7 nov
- Authorities alerted
- Provide information - authorities - community

8 nov
- Strengthen teams
- Provide information
- - authorities - community

9 nov
- Strengthen teams
- Provide information
- Defining strategies
The Portuguese Legionella Outbreak: Lessons learned

6 nov  7 nov  8 nov  9 nov

Protocol

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Objectives:

1. Guide the diagnostic investigation
2. Standardize therapy
3. Avoid admission and allow for rapid discharge
4. Characterization of the patients and the disease
Diagnostic and therapeutic guidance: ER and Wards

Hospital discharge

Home visit (if indicated)

Telephonic follow-up

Outpatient clinic follow-up

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The Portuguese Legionella Outbreak: Lessons learned

ER Protocol

Epidemiological context

Treatment guidelines

Admission criteria

Indication for discharge

Positive cases

Probable cases

Negative cases
First antibiotic administration in the ER

Sputum samples for culture

Positive cases

Indication for discharge

Outpatient clinic scheduling

If indicated, request for support of home team

ER Protocol

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Outpatient clinic scheduling

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Antibiotic prescription
Sputum sample for culture
Probable cases

Indication for discharge

ER Protocol

Probable cases

Sputum sample for culture
Antibiotic prescription
Outpatient clinic scheduling

The Portuguese Legionella Outbreak: Lessons learned
The Portuguese Legionella Outbreak:
Lessons learned

Information
Patients and families

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The Portuguese Legionella Outbreak: Lessons learned

Protocol
Hospital admission

Laboratory tests: blood and sputum

Treatment options

Guidelines for UCI admission

Guidelines for Hospital discharge

Written information

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Protocol
Post discharge

Patient contacted by phone

Outpatient clinic

Telephone number for patient contact

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The Portuguese Legionella Outbreak: Lessons learned

Patient contacted by phone

Outpatient clinic
The Portuguese Legionella Outbreak: Lessons learned

- Co-morbidities and Medication
- Anthropometric data and risk factors
- Clinical presentation
- Microbiology results
- Treatment
- Complications
- Clinical evaluation after discharge
- Patient Orientation

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Female 125 (33.2%)
Male 252 (66.8%)
Median age 59 years (22-92)

403 cases
377 Positive
26 Probable
Deaths 14 (3.5%)
The Portuguese Legionella Outbreak: Lessons learned

Admission by hospital

Casos registados por Legionella por Hospital - ARSLVT

Transfer of patients

403 cases
377 Positive
26 Probable
Deaths 14 (3.5%)
The Portuguese Legionella Outbreak: Lessons learned

Patients evaluated at Vila Franca Xira Hospital

196 Positive (52%)
4 discharged
113 transferred
79 admissions

403 cases
377 Positive
26 Probable
Deaths 14 (3.5%)

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The Portuguese Legionella Outbreak: Lessons learned

Patients evaluated at Vila Franca Xira Hospital

196 Positive (52%)

- 4 discharged
- 113 transferred
- 79 admissions

7 deaths (3.5%)
- 20 Intermediate care unit
- 9 ICU

403 Cases
- 377 Positive
- 26 Probable
- Deaths 14 (3.5%)

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The Portuguese Legionella Outbreak: Lessons learned

Patients evaluated in the Outpatient Clinic

- 225 Patients
  - 141 positive (37.4%)
    - 130 positive urine Ag
    - 11 negative urine Ag
  - 21 probable (80.8%)
  - 63 negative

403 Cases
377 Positive
26 Probable
Deaths 14 (3.5%)
Male predominance (59.8%)
Mean age 59 years (23-94)
With Co-morbidities (93.2%)
  - Smoking (60.5%)
  - Arterial hypertension (52.5%)
  - Diabetes (25.9%)
Severe pneumonia: Invasive ventilation -33.3%
Mean Hospital admission: 9.7 days
We suspect that person-to-person transmission probably occurred when Patient 2 cared for her severely ill son. Factors that suggest person-to-person transmission include the severity of the illness in Patient 1, the very close contact with Patient 1, and the fact that Patient 2 was in a ventilated room where there was no extra oxygenation. In addition, the timeline of the events was highly coherent (i.e., the symptoms in Patient 2 developed 1 week after the close contact with Patient 1; this is consistent with the typical incubation period of Legionnaires' disease — a median of 6 to 7 days).
Conclusões

- O surto foi controlado em duas semanas;

- Para a sua grande magnitude contribuiu a coincidência de condições meteorológicas, ambientais e microbiológicas favoráveis à sobrevivência e disseminação da bactéria implicada, associada à concentração urbana;

- A articulação intersetorial e prontidão de intervenções conjuntas concorreram para a celeridade da investigação e para o controlo rápido do surto.

Courtesy of Prof. Teresa Marques
Conclusões

• Na maioria das amostras clínicas em que foi possível caracterizar o agente, verificou-se que se tratava de *L. pneumophila* sg1 com o *ST 1905*, perfil molecular desconhecido até agora na base de dados europeia;

• Apenas duas amostras de água, colhidas na torre de uma das empresas, apresentavam este mesmo perfil molecular;

• Todas as bactérias *Lp* sg1 isoladas em cultura (clínicas e ambientais) reagiram com o *Mab 3/1* (virulência).
Conclusões

Recomendações deixadas pela Task Force

- Criação de legislação específica que enquadre atuação dos responsáveis por equipamentos que produzam e libertem aerossóis;
- Normas de orientação clínica que especifiquem situações em que devem ser pedido diagnóstico laboratorial de DL e metodologias a utilizar;
- Consolidar e reestruturar a Vigilância epidemiológica;
- Ações de formação e divulgação.

Courtesy of Prof. Teresa Marques
The Portuguese Legionella Outbreak: Lessons learned

• Legionella exists, and Portugal is a high-risk country
• It can appear as a sporadic case, a cluster or an outbreak
• In an outbreak the following is essential
  – Information
    • Who, where, when
    • Sputum sample collection
  – Organization
    • What, how
  – Team work
• Person-to-person transmission?
The Portuguese Legionella Outbreak: Lessons learned

Plan

Team work

Information

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Lessons learned

Outbreak. Lessons learned.

Legionella (also) loves the sun!