"Technical aspects of water safety in hospitals,,

Dr. Blacky Alexander

Akkr. Inspection point cleaning, sterilisation and disinfection

VAMED-KMB
180 persons with pneumonia
27 of which died

CDC-Atlanta insulated a hitherto unknown bacterium from corpse material

legionella
The culprits under the microscope: Legionella

(Gram preparation)
### Clinical picture of Legionella - infections

<table>
<thead>
<tr>
<th></th>
<th>Legionella pneumonia</th>
<th>Pontiac fever</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>attack rate</strong></td>
<td>low (&lt;1%)</td>
<td>high</td>
</tr>
<tr>
<td><strong>incubation period</strong></td>
<td>mostly 2-10 days</td>
<td>24–48h</td>
</tr>
<tr>
<td><strong>symptoms</strong></td>
<td>Cough Fever</td>
<td>flu-like symptoms</td>
</tr>
<tr>
<td></td>
<td>&gt;39°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diarrhoea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confusion</td>
<td></td>
</tr>
<tr>
<td><strong>chest x-ray</strong></td>
<td>infiltrates</td>
<td>inconspicuous</td>
</tr>
<tr>
<td><strong>Duration of the disease</strong></td>
<td>weeks</td>
<td>2-5 days</td>
</tr>
<tr>
<td><strong>diagnosis</strong></td>
<td>Urinary antigen test culture</td>
<td>urinary antigen test</td>
</tr>
<tr>
<td></td>
<td>PCR</td>
<td></td>
</tr>
<tr>
<td><strong>Therapy</strong></td>
<td>quinolones, macrolides, possibly doxycycline or tigecycline</td>
<td>symptomatically</td>
</tr>
<tr>
<td><strong>lethality</strong></td>
<td>approx. 10% of</td>
<td>unincreased</td>
</tr>
<tr>
<td><strong>Reporting obligation A/D/CH</strong></td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

Predisposing factors for Legionella infections

<table>
<thead>
<tr>
<th>factors</th>
<th>relative risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>men</td>
<td>1.5 - 3</td>
</tr>
<tr>
<td>Age (50 - 60 a)</td>
<td></td>
</tr>
<tr>
<td>diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td>smoking</td>
<td>1.9</td>
</tr>
<tr>
<td>chronic bronchitis, emphysema</td>
<td>3.7</td>
</tr>
<tr>
<td>carcinoma</td>
<td>11</td>
</tr>
<tr>
<td>immunosuppression</td>
<td>26</td>
</tr>
<tr>
<td>transplant</td>
<td>340</td>
</tr>
</tbody>
</table>
AGES - National Reference Centre for Legionella Infections.
Predisposing factors for Legionella infections

Trip abroad or overnight stay 1-2 days away from home

Occupation (coach) driver was independent risk factor in a Dutch national case-control study

Transmission of Legionella to humans

Inhalation of aerosol containing Legionella e.g. from showers, from water jet regulators, from open cooling towers, from dental units, from whirlpools or in door fountains.

Inhalation of Legionella containing dust e.g. from compost soil

Aspiration of water containing Legionella

No transmission from person to person

2016 for the first time?

Sources of Legionella infections

Source: Infection reservoirs of Legionella according to Exner et al. (1987)
Sources of Legionella infections

• Hot water systems operating at temperatures below 60° C
• Cold water stagnating at temperatures above 20° C
• Evaporative recooling systems (open cooling towers and cooling units)
• poorly maintained whirlpools and therapy tubs
• Humidifiers (with aerosol formation), car washes and windscreen washers
• Water attractions in buildings (fountains, waterfalls)
• dental units
• thermal water
• warm surface water
• compost soil
• wastewater treatment plants
• wet fire pipelines
Factors favouring the growth of Legionella in water

Temperatures from 25 - 50° C (optimal 35 - 45° C) Stagnation of the water

Coexistence with other microorganisms, e.g. pseudomonads; formation of biofilms

propagation in amoebae

Presence of organic substances and ferrous salts

Certain plastic surfaces in fittings or pipelines
Legionellen-Antikörper im Blut der Bevölkerung
Vergleich zweier Bevölkerungsgruppen mit unterschiedlicher Exposition durch das hauseigene Warmwassersystem

Gesundheitsamt der Stadt Frankfurt a.M.
Abteilung Umweltmedizin und Hygiene
Braubachsgr. 15-22
D-60311 Frankfurt/M
Berichterstatter: Dr. U. Heudorf
Frankfurt a.M., im September 2000
The health department in Frankfurt has examined 2 settlements: 

*On the one hand* the 53 inhabitants of the home settlement ("exposed") with frequent positive proofs of Legionella in the central hot water system,

*on the other hand* 92 inhabitants of the Goldsteinsiedlung ("Controls") with decentralised hot water supply systems without major legionella problems.

The authors conclude that

Although the Legionella contamination of the hot water in the home settlement has been known for years (and corresponding remediation measures have been taken), no legionella-related illnesses of the residents have been known so far. The investigation did not reveal any evidence of legionellosis among the inhabitants of the home settlement. However, they were more likely to have positive Legionella antibodies.
Contrary to popular belief, there is insufficient evidence that showering is a risk factor for the acquisition of Legionella.

The RKI: "In environmental investigations, Legionella was also found on shower heads. However, when showering, there is little aerosol formation, so it is unlikely to be more risky than contact with tap water from a tap."

path of infection
An infection usually occurs through the inhalation of aerosols containing Legionella, but also the (micro)aspiration of contaminated water can lead to an infection in rare cases.

In particular, Legionella-containing amoeba particles are of importance for the transmission, since Legionella activate their virulence genes intracellularly.

The infection by Legionella-containing amoeba particles also explains the dose-effect paradox in the occurrence of Legionellosis: missing infections despite contaminated water systems or infections despite minimal contamination.

Factors favouring the growth of Legionella in water
Factors favouring the growth of Legionella in water – no wonder …
Climate change: Legionella in cold water

Credit: © Kwest / Fotolia
temperature controls
Sinks - Rinsing

11_14_220
21.06.2018 (Nachmittag)
KW-Temperatur mit 17.5°C am Auslauf
Sinks - Rinsing

11_14_220
22.06.2018 (Früh / Vormittag)
KW-Temperaturverlauf mit Zeit
(am Tag davor war dort KW mit einer Temp. von ca. 16°C => Erwärmung über Nacht).
Sinks - Rinsing

11_13_560
22.06.2018 (Früh / Vormittag)
KW-Temperaturverlauf mit Zeit
(am Tag davor war dort KW mit einer Temp. von ca. 16°C => Erwärmung über Nacht).
Sinks - Rinsing

Nach 1 Stunde spülen => KW Temp. 20°C
Sinks - Rinsing
Sinks - Rinsing
Sinks - Rinsing
Sinks - Rinsing
Sinks - Rinsing
possible new ways: looping through
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- Rehabilitation Centers
- Nursing Homes
- Thermal Spas & Wellness Resorts
- Health and Medical Wellness Centers
- Laboratories
- Research Facilities
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• In more than 80 countries on five continents
• Strategic partnership with 6 leading university clinics
• Providing services for round 670 hospitals – with 153,000 beds worldwide
• PPP-pioneer in health care: 25 PPP-models implemented in Austria and Germany
• Leader in Austrian health tourism and medical wellness market
  (VAMED Vitality World: ~ 3,2 million guests, 9 resorts in Austria & Hungary)
• Leader in the Austrian private rehabilitation sector
Thank you!

create. health. manage. care. enjoy. vitality.