

Biological Risks Affecting Building Environments

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Key Presentation Topics

- Identify historic/emerging biological risks affecting buildings and describe how and why these risks are occurring
- Discuss how biological risks can impact your building environments

Key Presentation Topics

- Address major criteria for building owners, operators, and managers to consider now and in the future
- Considerations for investigations and reporting and communicating results
- Discuss possible proactive activities and approaches

Introductory Remarks

- Use of *italics* in slides
- Sources for more information
 - ◆ US EPA
 - ◆ NIOSH/CDC
 - ◆ City, County, State Health Depts.
 - ◆ Many others - WWW
- Please participate - Questions? (ask for examples)

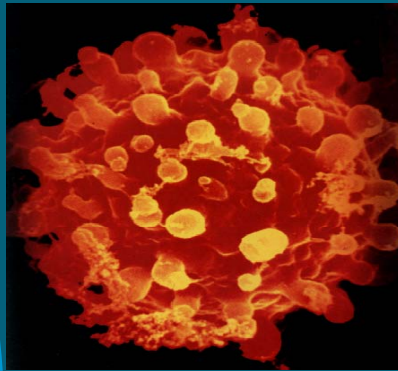
How and Why These Biological Risks are Occurring

- Naturally occurring agents are present in the built environment via normal routes of transmission or (e.g., Legionella, fungal spores, allergens)
- These agents can be amplified above normal levels inadvertently in HVAC, water, insulation and other building systems (e.g., Legionella, fungi, etc.)

How and Why These Biological Risks are Occurring

- Unnatural agents can be introduced into the environment artificially (e.g., terrorism agents such as anthrax, ricin, etc)

Histoplasma capsulatum



Examples of Biological Risks

- Examples of normally *non-invasive* or treatable organisms that have become altered by *antibiotic resistance*
 - ◆ MRSA (methicillin resistant Staphylococcus aureus),
 - ◆ Tuberculosis
 - ◆ Streptococcus (strep throat)
 - ◆ Enterococci

How and Why These Biological Risks are Occurring

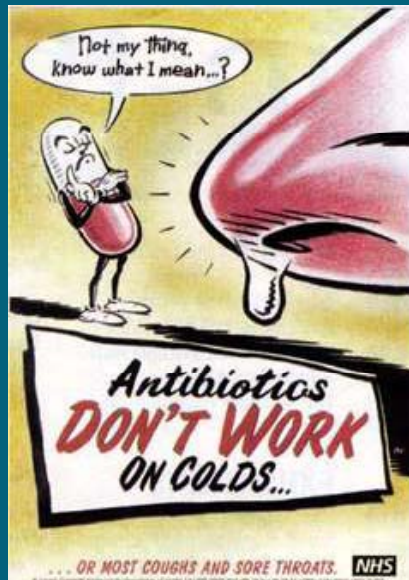
- Normally treatable *bugs* becoming resistant due to misuse of antibiotics



biopsy.wordpress.com/category/superbugs

Why Antibiotic Resistance Occurs

Bad/Over
Prescribing



www.hullcc.gov.uk/.../medicine_we_need.html

Why Antibiotic Resistance Occurs

Overuse in the food chain



<http://www.scq.ubc.ca/wp-content/uploads/2006/08/antibispread.jpg>

Considerations When Assessing Biological Risks

- Population *susceptibility* – increase in *Immunocompromised* individuals
 - ◆ *Opportunistic* pathogens
- Population *sensitivity* – increase in response to agents (e.g., allergic and asthmatic individuals)
- Differentiation between chemical, physical and biological agents

Considerations When Assessing Biological Risks

- Fiscal and Aesthetic Considerations:
 - ◆ Tenant complaints, fear mongering, rumors and gossip ⇒ reputation
 - ◆ New and/or increased maintenance requirements ⇒ costs
 - ◆ Loss of tenants ⇒ revenues
 - ◆ Physical/structural damages

Risk-Related Terms of Art

- HAZARD
- RISK
- SAFETY

Term of Art Definitions

- HAZARD
 - ◆ Potential to do harm
- RISK
 - ◆ Probability of harm
- SAFETY
 - ◆ Attainment of acceptable risk

How Do Most People Identify Risk?

RISK = HAZARD x OUTRAGE

Peter Sandman, PhD www.psandman.com

Risk Perspectives

Traditional Answers:

1. *The conservative's answer:* The public is stupid, irredeemably irrational on risk issues. So protect public health, but ignore public opinion.
2. *The liberal's answer:* The public is educable but ignorant. So explain the data better.
3. *The corporation's answer:* The public is manipulated by sensational mass media or radical activist groups. So fight the propaganda battle better.
4. *The activist's answer:* The public is right; the experts have been misled or bought off. So base public policy on public opinion.

Peter Sandman, PhD www.psandman.com

Examples of Biological Health Risks

- **Building Related Illness (BRI):**
 - ◆ *Building Related Illness (BRI)* includes identifiable illnesses with traceable and repeatable agents/causes
 - ◆ Not the same as *Sick Building Syndrome (SBS)* which has no specific effect/cause
 - ◆ BRI associated with chemical, physical, and biological agents – today we will focus on biological agents

BRI Modes of Transmission

Common modes of *transmission*

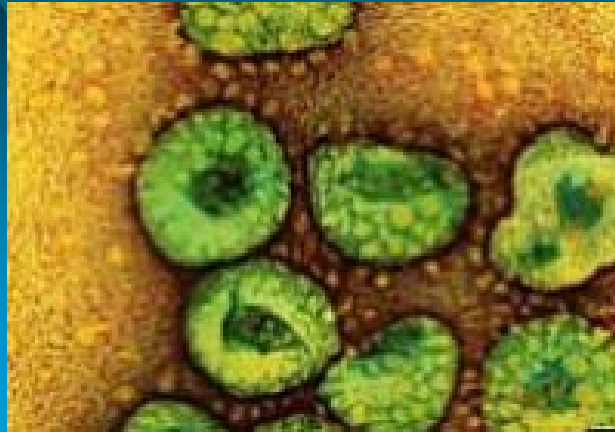
- Airborne
- Water Borne
- Surface Borne
- Person to Person Contact

BRI Modes of Transmission

- AIRBORNE
 - ◆ Most biological agents, if the agent is small enough to become airborne
 - ◆ Transmitted by the receptor breathing air containing the agent – *dissemination* and *viability* are key considerations
 - ◆ Examples include SARs and other viruses (e.g., avian flu, fungal spores, allergens, and terrorism agents)

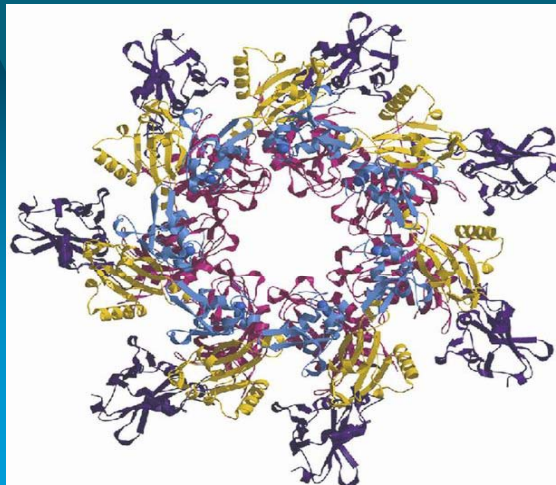
BRI Modes of Transmission

- SARs Virus



BRI Modes of Transmission

- Anthrax

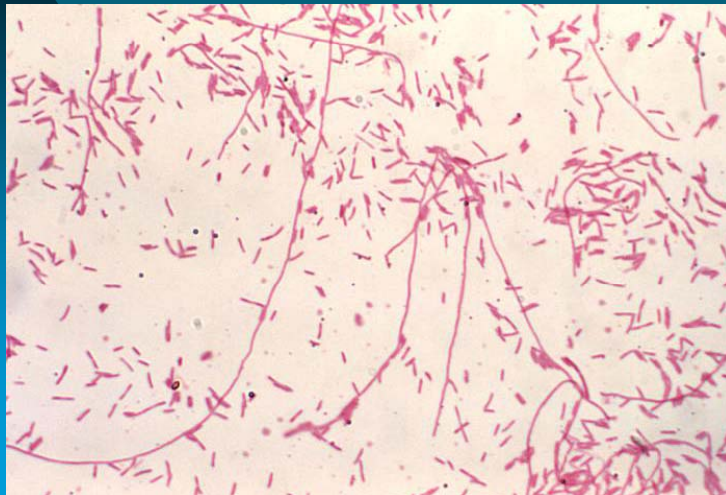


BRI Modes of Transmission

- WATER BORNE
 - ◆ Limited number of biological agents due to need to survive - typically present in improperly treated system
 - ◆ Transmitted by the receptor accidentally consuming contaminated liquids or breathing *aerosols* containing the agent generated by equipment
 - ◆ Examples include Legionella, Mycobacterium, and fecal coliforms

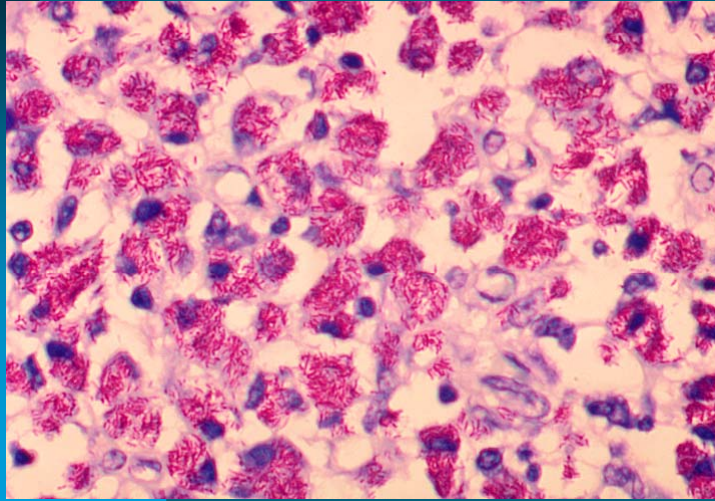
BRI Modes of Transmission

- Legionella bacteria



BRI Modes of Transmission

- Mycobacterium

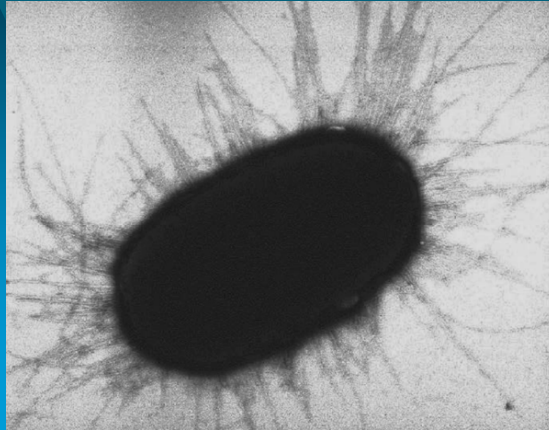


BRI Modes of Transmission

- SURFACE BORNE
 - ◆ Typically bacteria and viruses that are transferred onto a surface and then transmitted to the *receptor* who touches that surface with the hand
 - ◆ Examples include cold viruses, fecal organisms (E. coli, salmonella, etc.)

BRI Modes of Transmission

- E. coli

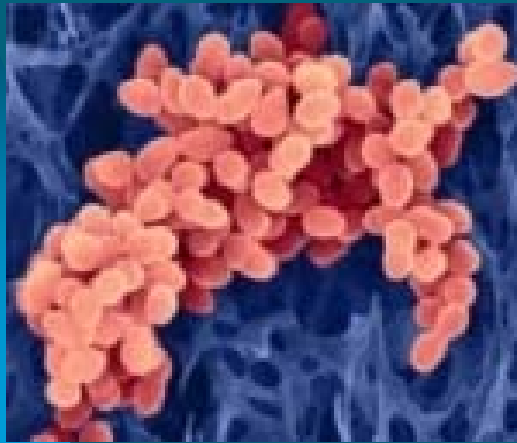


BRI Modes of Transmission

- PERSON TO PERSON CONTACT
 - ◆ Most biological agents, if the receptors are in intimate contact
 - ◆ Transmitted from person to person by direct contact (e.g., skin to skin) or less often via contact with human aerosolized agent (e.g., coughing)
 - ◆ Examples include MRSA and STDs and could also include Enterococci

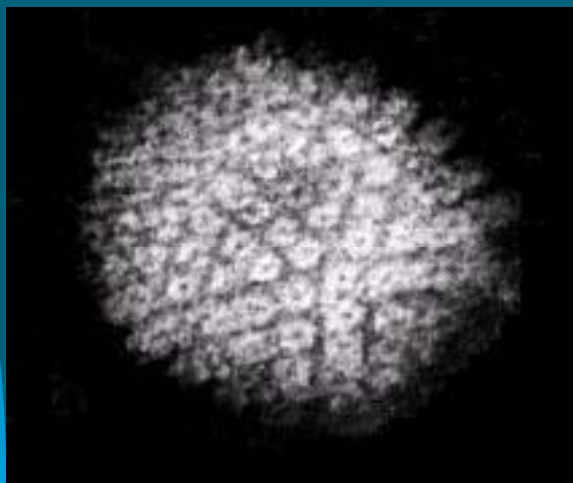
BRI Modes of Transmission

- MRSA bacteria



BRI Modes of Transmission

- Herpes simplex virus



Risk Management Criteria to Consider Now and In the Future

- What agents might be present in your facilities?
- Are persons in your facility at *risk*?
- How do you minimize risks to facility personnel and occupants if present?
- Is your facility prepared to deal with an agent-based *pandemic* or *outbreak*?

Example Pandemic Planning Publications

BUSINESS PANDEMIC INFLUENZA PLANNING CHECKLIST

As the threat of pandemic influenza increases, business will play a key role in protecting employees health and safety as well as limiting the impact to the economy and society. Planning for pandemic influenza is critical to your business. The Department of Health and Human Services and the Federal Emergency Management Agency (FEMA) have developed the following checklist to help business owners and managers assess their preparedness for a pandemic influenza outbreak. It is intended to provide a starting point for planning and is not intended to be used as a substitute for professional advice.

1.1 Plan for the impact of a pandemic on your business:

- Identify a pandemic coordinator and assign with defined roles and responsibilities for preparation and response planning. The pandemic coordinator should include input from labor representatives.
- Identify essential operations and other critical inputs (e.g., raw materials, supplies, and customer critical products) and develop specific response actions to ensure continuity during a pandemic.
- Develop and practice an illness management plan, including employee in other job identification, release, and return to work procedures.
- Develop and practice a communication plan to notify an employee or customer in advance of your pandemic and/or during a pandemic (e.g., office of absence or work gathering, need for hygiene equipment).
- Develop general response of a pandemic on company business functions using multiple possible scenarios and allow employees to have specific instructions.
- Develop general response of a pandemic on business critical systems and operational level (e.g., operations, customer relations).
- Plan for the ability to receive information from community public health, emergency management, and other sources and make immediate links.
- Establish an emergency communication plan and other protocols. This plan includes identification of key contacts (e.g., local, state, or federal agencies) including suppliers and customers, and protocols for handling and communicating business and employee issues.
- Implement an assessment to test your plan, and revise periodically.

1.2 Plan for the impact of a pandemic on your employees and customers:

- Encourage and allow for employee absence during a pandemic due to factors such as personal illness, family member illness, community emergency activities and operations, school and business closures, and public transportation closures.
- Implement policies to modify the frequency and type of face-to-face contact (e.g., hand-shaking, meeting in meetings, other specific shared environment) among employees and between employees and customers under CDC recommendations.
- Develop and track annual absence records for employees.
- Encourage employee concern and availability of influenza services during a pandemic, and prepare an action as needed.
- Encourage employee concern and availability of community and school services during a pandemic.
- Identify employees and key contacts with special needs, and prepare the requirements of such persons on your preparation plan.

Revised 4/08
November 2005
CDC

HHS Pandemic Influenza Plan

U.S. Department of Health and Human Services
November 2005

The Role of the Industrial Hygienist in a Pandemic

John R. Edwards, P. Eng

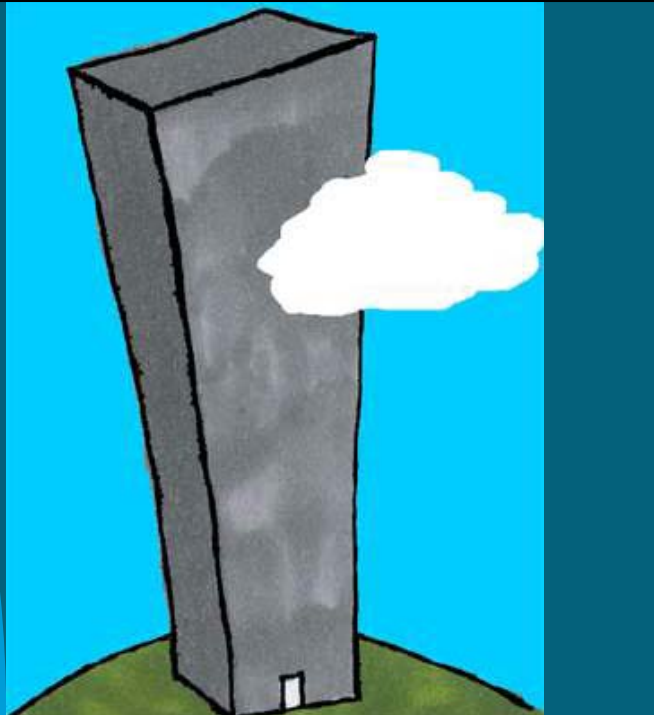
U.S. Department of Health and Human Services

Proactive Planning Activities and Approaches

- Identify biological agents and sources with conditions conducive to agents
- Determine whether alternative equipment or methods are available to minimize exposure or risk
- Develop programs and plans to manage risks and address *community-associated illnesses*

What is in
the
Clouds?

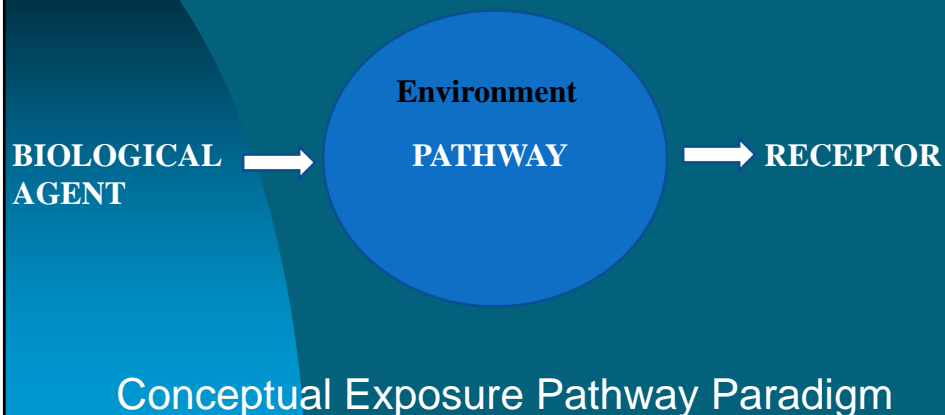
What is in
the
Sand?



Identifying Agents: Investigations

- Goal still to assess agent-related hazard(s), translate into risk, and identify benchmarks to fairly compare risks
- Agents often have unknown exposure limits, lack of *consensus standards*, or individual sensitivity differences
- Need to educate occupants on usefulness and limitations of biological investigations

Biological Investigation Methodology



Investigations

- Identify the purpose and priority of the investigation
- Can the purpose be translated into an achievable *hypothesis* with a measurable outcome?
- Are appropriate methods available to generate “useful” data to test the hypothesis

Reporting and Communication

- Report what is useful from an information standpoint
- Report what the investigation findings mean and what they don't mean



Reporting and Communication



- Don't overemphasize or stretch the results or conclusions
- Hypothesis +/-
- Set up achievable goals and solutions
- **Follow Through!**

Equipment and Methods

- Can your equipment be modified to minimize or prevent the introduction or *dissemination* of biological agents?
- Can your current disinfection or other biological control methods be modified or improved to minimize *propagation*?
- Can your system be modified to prevent/minimize exposure to workers and occupants?

Equipment and Methods

- Only use approved means and methods for controlling biological agents



Equipment and Methods

- Validate or verify the controls you have installed
- Be wary of cheap fixes - you generally get what you pay for
- There is no panacea – consider the short and long-term costs and benefits



Planning and Prevention

- Use of *BMP* and/or risk-based decision making criteria
- Involves *TPA* approach and use of professional judgment
- Potential use of models predict scenarios and to estimate concentrations (e.g., for hard to measure/culture organisms like Legionella)

Sometimes It's the Little Things



Conclusions

- Building owners, operators and managers will be increasingly faced with new IEQ issues based on emerging and changing agents
- Facilities must assess their potential risks related to biological agents and manage them accordingly
- Planning and preparation is the best defense against BRI, community-associated, and pandemic agents

Open Here to Learn Everything
You Need to Know About
Microbiology...

