Overdiagnosis and Public Health:

Inventing an Epidemic in Moldy Montreal Schools
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MD, ScD, FRCPC

Preventing Overdiagnosis,
Quebec City, August 2017
Conflicts of Interest:

• Former Public Health Director for the Western Part of Montreal

• Ad hoc consultant to the Montreal School Commission (CSDM) (worker compensation claims)
How to Invent an Epidemic

- Illness
- Population
- Agent
- Exposure

Epidemic
How to Invent a Major Epidemic

- Interest Groups
- Politicians
- Media
- $$$

Major Epidemic
Agent
Criteria

- Widespread
- Looks dangerous
- Bad reputation

The Perfect Candidate: MOLD
Mold is all around us

Ambient air mold concentrations in diverse environments

<table>
<thead>
<tr>
<th>Environment</th>
<th>CFU / m3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior</td>
<td>1 000</td>
</tr>
<tr>
<td>Agriculture (normal)</td>
<td>1 000 - 10 000</td>
</tr>
<tr>
<td>Agriculture (rotten hay)</td>
<td>1 000 000 000</td>
</tr>
<tr>
<td>Bakery</td>
<td>100 - 1 000</td>
</tr>
<tr>
<td>Compost Center</td>
<td>10 000</td>
</tr>
<tr>
<td>Household Trash</td>
<td>10 000</td>
</tr>
<tr>
<td>Office Building</td>
<td>100 - 1 000</td>
</tr>
<tr>
<td>Humidifier</td>
<td>100 - 1 000</td>
</tr>
<tr>
<td>Paper Mill</td>
<td>1 000</td>
</tr>
<tr>
<td>Saw Mill</td>
<td>1 000 000</td>
</tr>
<tr>
<td>Peat Moss Production</td>
<td>100 000 000</td>
</tr>
</tbody>
</table>

Source: Les bioaérosols en milieu de travail, IRSST 2001
Airborne mold found in 126 work environments

<table>
<thead>
<tr>
<th>Mold Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillium sp.</td>
<td>100</td>
</tr>
<tr>
<td>Aspergillus sp.</td>
<td>90</td>
</tr>
<tr>
<td>Cladosporium sp.</td>
<td>79</td>
</tr>
<tr>
<td>Alternia sp.</td>
<td>35</td>
</tr>
<tr>
<td>Mycellia sterilia</td>
<td>34</td>
</tr>
<tr>
<td>Acremonium sp.</td>
<td>19</td>
</tr>
<tr>
<td>Basidomycètes</td>
<td>18</td>
</tr>
<tr>
<td>Phoma sp.</td>
<td>18</td>
</tr>
<tr>
<td>Trichoderma sp.</td>
<td>15</td>
</tr>
<tr>
<td>Stachybotrys chartarum</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: Les bioaérosols en milieu de travail, IRSST 2001
Mold found in 1096 American homes

<table>
<thead>
<tr>
<th>Mold Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cladosporium cladosporiodes</td>
<td>99</td>
</tr>
<tr>
<td>Eurotium amstelodami</td>
<td>98</td>
</tr>
<tr>
<td>Aurobasidium pullulans</td>
<td>94</td>
</tr>
<tr>
<td>Epicoccum nigrum</td>
<td>93</td>
</tr>
<tr>
<td>Mucor sp.</td>
<td>92</td>
</tr>
<tr>
<td>Aspergillus sp.</td>
<td>90</td>
</tr>
<tr>
<td>Alternia alternata</td>
<td>88</td>
</tr>
<tr>
<td>Cladosporium herbarum</td>
<td>84</td>
</tr>
<tr>
<td>Cladosporium sphaerospermum</td>
<td>82</td>
</tr>
<tr>
<td>Walleremia sebi</td>
<td>75</td>
</tr>
<tr>
<td>Penicillium sp.</td>
<td>66</td>
</tr>
<tr>
<td>Acremonium strictum</td>
<td>57</td>
</tr>
<tr>
<td>Stachybotrys chartarum</td>
<td>35</td>
</tr>
<tr>
<td>Trichoderma sp.</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: Vesper et al, Development of an environmental relative moldiness index for US homes, JOEM 2007, 49: 829-33
Looks dangerous
Bad Reputation

Stachybotrys chartarum, anyone?
Illness
Recognized medical effects of mold

- **Infection**
  - Very ill, debilitated, immunocompromised
- **Irritation**
  - Massive Exposure
- **Intoxication**
  - Ingestion only
- **Allergy**
  - Asthma, hay fever, skin reactions
Sources

Institute of Medicine
Damp Indoor Spaces and Health, National Academy of Science, Washington, DC, 2004

WHO (Europe)
Dampness and Mould, WHO guidelines for indoor air quality, 2009

American College of Occupational and Environmental Medicine

American Academy of Allergy, Asthma and Immunology

Institut National de la Santé Publique du Québec
Les risques à la santé associés à la présence de moisissures en milieu intérieur, MSSS, 2002
Population
Why not try schools?

Vulnerable population
Great potential for community angst
Since 2003-2006, two schools with widespread, non-specific health complaints among teachers, purportedly due to the work environment
Health complaints among teachers at two Montreal Elementary Schools

- Fatigue
- Headache
- Eye irritation
- Dry skin
- Nasal congestion, rhinitis, sinusitis, post-nasal drip, bleeding
- Sneeze
- Allergies
- Dizziness
- Frequent colds
- Acute sinusitis
- Acute bronchitis
- Chronic nasal symptoms
- Asthma
- Chronic cough without asthma
- Joint Pain
- Chronic disease with immune suppression

Source: Questionnaire distributed to school personnel by the MPHD
But these symptoms do not always correspond to symptoms of mold-related illnesses recognized by expert groups....

So what do you do?
Answer:

- Broaden the case-definition!
Illnesses caused by mold according to the Montreal Public Health Department

- Rhinitis or rhinosinovitis (acute/chronic/infectious/irritative/allergic)
- Chronic cough, wheezing, dyspnea, in the absence of another diagnosis
- Asthma (new onset or aggravated), severe or poorly controlled
- Common upper and lower respiratory tract infections (any biological agent)
- Internal ear problems (pain, tubular dysfunction, vertigo)
- Allergic dermatitis, eczema
- Conjunctivitis, pharyngitis, laryngitis (infectious/irritative/allergic)
- Aggravated COPD
- Hypersensitive pneumonitis, other interstitial pulmonary diseases
- Insomnia
- Obstructive sleep apnea
- Chronic fatigue
- Fibromyalgia or chronic pain
- Serious fungal infections in severely immuno-suppressed persons
- Mental illness
- Inflammatory arthritis and other inflammatory diseases

Source: Dr Louis Jacques, 8e Journée de formation interdisciplinaire, FMSQ, 13 novembre 2015
Why the difference?

- Treat studies using survey (questionnaire) data on a par with those using objective clinical/laboratory data.
  - eg: Asthma

- Overgeneralize results obtained from one population or environment to significantly different populations or environments
  - eg: Children (infants) vs. Adults
    - Home vs. School

- Do not consider bias
  - Selection
  - Observation
  - Confounding (alternative explanations)
## Teachers v. other working women:

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Teachers (%)</th>
<th>Other working women (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye symptoms (2 wks)</td>
<td>7.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Nasal symptoms (2 wks)</td>
<td>8.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Throat symptoms (2 wks)</td>
<td>5.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Wheezing (2 wks)</td>
<td>28.4</td>
<td>16.4</td>
</tr>
<tr>
<td>Chest symptoms (last 3 yrs)</td>
<td>19.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Ever physician Dx asthma</td>
<td>13.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Current physician Dx asthma</td>
<td>8.8</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Exposure
Diseases caused by airborne contaminants require exposure to airborne contaminants.

But what if mold contaminants are not found in the air?
Answer:

- Broaden the exposure definition!
MPHD definition of “mold exposure” in schools:

- Measurable quantities of airborne mold or mold spores (very little found)
- Visible mold (window sills, bathrooms, sinks, etc.)
- Hidden mold (attics, basements, crawl spaces, behind/inside walls)
- Mold odor, damp odor
- Dampness, condensation
- Water stains
- Water damage (current or previous)
- Google street view of building
If you cannot measure it, then it is not science

Lord Kelvin
The Epidemic
Affected Montreal schools, children, personnel

- 50/214 schools affected
  - 29 schools prioritized
  - 8 schools closed
    - 1 school which was torn down
    - 2 schools which were abandoned
- 10 000 students affected by school closures
- Approx. 600 personnel with health complaints
- Approx. 40 worker compensation claims
- $46.6 million for immediate renovations
- $30 million for surveillance and detection
- $324.7 million for maintenance

Sources: Couillard, Kathleen, Moisissures dans les écoles, OIIQ Nov 2013
La Presse, Le J. de Montréal, Radio Canada, (diverses dates)
What about the children?

Primary school B:
- 190 children at risk
- 171 parents who answered questionnaire about their children
- 100 children with symptoms
- 39 for whom clinical evaluation was suggested
- 22 made appointments
- 16 showed up
- 6 with rhinitis including
  - 1 with more severe respiratory problems in need of further investigation (results not available)
The Press (etc.)
Des problèmes de moisissures dans une deuxième école de la CSDM

Mould problem forces N.D.G. students into another school

Moisissures: la liste des écoles touchées s'allonge

Écoles aux prises avec des moisissures: le maire Coderre veut aider la CSDM

ACDSA
Citizens for Democratic and Autonomous Schools / Citoyens pour la Démocratie dans l'école

Mon école est pourrie

Foul air, failing grades in our schools
Conclusion
There was no true “epidemic” in moldy Montreal schools

The perceived “epidemic” was due to the following factors:

- Poorly defined case definition (overdiagnosis)
- No objective laboratory diagnostic criteria (more overdiagnosis)
- Poorly defined exposure criteria (even more overdiagnosis)
- Uncritical literature review
- Bias
- Pressure from interest groups
- Financial considerations on the part of school board/-unions
- Alarmist reporting by the media
- No attempt by the MPHD to set the record straight (they, in fact, made the situation worse)