When risk becomes a reality; behind the scenes of an Aspergillus investigation

Jessica Fullerton
When risk becomes a reality; behind the scenes of an Aspergillus investigation

• Jessica Fullerton

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Aspergillus

• A common mould (type of fungus)
• Ubiquitous in nature
• 180 species, <40 known to cause human disease
  • Aspergillus fumigatus – most common
  • A. flavus, A. terreus, A. niger
Invasive pulmonary Aspergillosis

- Compromised immune systems
  - Transplant patients
  - Cancer patients
  - Patients receiving immuno-suppressive therapy
- High mortality rate
- Incubation period is unclear - likely varies depending on dose and host immune response
- Treatment – antifungals (voriconizole)
Case definition

• How to classify a hospital-acquired case
  • Bed history
  • Length of stay
  • Previous hospital visits
  • Personal risk factors
    • Occupation
    • Recreational activities (i.e. gardening)
    • Drug use
    • Immunocompromised status
  • Previous chest x-ray/CT
  • Onset of respiratory symptoms/previous respiratory symptoms
TGH Aspergillus Story

- Cluster of Aspergillus respiratory infections among heart transplant patients
- 5 nosocomial pulmonary Aspergillus cases representing a variety of species were identified from May 2013 to November 2013
The investigation

• An extensive, thorough investigation was launched spanning several months
• No other transplant population affected
• No other transplant hospital affected
• No common patient links pre-admission e.g. hotels
• No common patient links once admitted to UHN e.g. ORs
• Contact with Trillium Gift of Life – no other heart transplant sites reporting cases of aspergillus, no donor related issues
The investigation

• Each case was investigated and analyzed in terms of case definition, bed history, procedures performed, clinic visits, proximity to maintenance and/or construction work, and timing and scope of such work

• HVAC systems were investigated including ductwork, outdoor air intakes and filters

• Air sampling
  • OR
  • MDRD
  • CVICU
  • Transplant units

• Environmental samples
  • OR surfaces
  • HVAC diffusers in patient rooms
  • Respiratory Therapy equipment
The investigation

- Observed heart transplant procedures
The investigation

- Followed the path of the patient
  - Pre-admit → POCU → OR → CVICU → clinic follow-up
- No IPAC breaches noted
- Visual observations of environment
- Collected air sampling at each location
### Environmental swabs

<table>
<thead>
<tr>
<th>Date</th>
<th>Item Swabbed</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 20, 2013</td>
<td>OR rooms 6, 12, 5, 17, 4 ventilators; ABS, Flexi, Mini</td>
<td>No fungus isolated</td>
</tr>
<tr>
<td>November 21, 2013</td>
<td>RT ventilators: AV 4 exhalation assembly, flow transducer and inspiratory port; 840 #5 exhaust assemble, exhaust port, inspiratory port; AV 9 water trap, water trap assembly, inspiration port, heated wire pigtail, exhalation port</td>
<td>No fungus isolated</td>
</tr>
<tr>
<td>December 20, 2013</td>
<td>Injector modules of nitrous oxide machines (013, 045, 185, 007, 067, 20087, 070, 053, 023, 096, 147, 291, 046, 006)</td>
<td>No fungus isolated</td>
</tr>
<tr>
<td>May 16, 2014</td>
<td>CPD environment swabbed including RT equipment processing area; CICU environment swabbed (room 430 cupboards/clean linen and equipment); CICU environment swabbed (clean linen cart)</td>
<td>No fungus isolated</td>
</tr>
<tr>
<td>Date of Sampling</td>
<td>Area/Room</td>
<td>Result</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>November 25, 2013</td>
<td>OR 1</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CPD RT room</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>Cath lab 1</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 523</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 536</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 552</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>Apheresis/photophoresis nursing station</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>Echo lab room 540</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>MOT 7A room 158</td>
<td>1 A. niger spore</td>
</tr>
<tr>
<td></td>
<td>MOT 7B room 132</td>
<td>No growth</td>
</tr>
<tr>
<td>November 26, 2013</td>
<td>OR 5</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>OR 6</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>Cath lab bay area</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CCU room 430</td>
<td>No growth</td>
</tr>
<tr>
<td>December 5, 2013</td>
<td>CVICU patient room 550</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 549</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 548</td>
<td>No growth</td>
</tr>
<tr>
<td>February 25, 2014</td>
<td>Middle section, OR#6, 2nd floor</td>
<td>No growth</td>
</tr>
<tr>
<td>February 25, 2014</td>
<td>Middle section, PT room 2GW554, 2nd floor</td>
<td>No growth</td>
</tr>
<tr>
<td>February 25, 2014</td>
<td>Middle section Pt room 2GW554 vacant, 2nd floor</td>
<td>No growth</td>
</tr>
<tr>
<td>February 25, 2014</td>
<td>Middle section, reception, PCV, 2nd floor</td>
<td>No growth</td>
</tr>
<tr>
<td>February 25, 2014</td>
<td>Outdoors</td>
<td>No growth</td>
</tr>
<tr>
<td>July 9, 2014</td>
<td>CVICU patient room 547</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 542</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU patient room 526</td>
<td>No growth</td>
</tr>
<tr>
<td></td>
<td>CVICU nursing station</td>
<td>No growth</td>
</tr>
</tbody>
</table>
HVAC investigations

• Confirmed annual preventive maintenance on air handling units
• AHU examined and showed clean filters
• Fan maintenance for ORs adequate, no fan shutdowns
• Duct inspection and cleaning protocol – every 6 months
• Filter changes as per schedule
• No major HVAC work in timeframe of cases
• Cleaning of diffusers – doesn’t routinely happen, who’s job is it?
HVAC investigations

- Diffuser audit – environmental swabs of diffusers
Construction/maintenance activities

• Medical Device Reprocessing Department (MDRD) scope washer/disinfector install
• Inpatient washroom remediation and renovation spanning multiple floors/units
• Cardiac clinic renovation
• Building maintenance – above ceiling work on inpatient units
MDRD scope cleaner/disinfector install project
Inpatient washroom mould remediation and upgrade

• Solid hoarding
• Diligent contractor
• No negative pressure issues
• Third party environmental consultant
Renovation of cardiac clinic spaces

• Solid hoarding
• Diligent contractor
• No mould
• Minimal scope
• Negative pressure issues – no digital log, only magnehelic
Facilities ceiling access

• Containment cube was used, but unsure how diligent
Construction/maintenance activities

- Construction activity happening inside the building, but remote from cardiac patients
  - Negative pressure room upgrade project
  - Nutrition project renovation
  - Nuclear medicine renovation
  - 9 EN and 10 EN renovation
Exterior construction activities

• Lots of activity in vicinity of building
  • Old nursing residence demo
  • Women’s College Hospital demo
  • University Ave entrance landscaping
Demolition of The Nursing Residence, Photo by UHN

Demolition of Women’s College Hospital, Photo by Harvey McGrath

Demolition of Women’s College Hospital, Photo by Priestly Demolition Inc.
The patient impact

• Immeasurable impact to those affected
• All heart transplant patients started on fungal prophylaxis
• When prophylaxis was ceased, an increase of cases was observed
• Prophylaxis continues to this day
The financial impact

• Many, many man hours of investigation
• Air sampling and environmental sampling costs
• Healthcare costs
  • Additional medication and procedural costs
  • Extended length of stay
Conclusions

• Although epidemiology supports a nosocomial cluster, no clear source was ever identified
• This is typical for fungal outbreaks as the source is often a point in time occurrence that cannot be detected with subsequent sampling
• Ongoing vigilance to activities that result in spore disruption is critical
Proactive approach

• Control dust generation
• Prevent dust from infiltrating patient care areas
• Look outside your walls!
• Increased fungal surveillance
Successful risk management

• Commitment
• Understanding
• Cooperation

Multidisciplinary Team!!!
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