Ochrobactrum anthropi, Klebsiella oxytoca, and Stenotrophomonas maltophilia: What do we do with these?! 

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Background

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• An infection preventionist from a local hospital contacted Minnesota Department of Health (MDH) epidemiologists about a cluster of 4 patients with *Ochrobactrum anthropi (OA)* bacteremia

• All patients were from the same surgical floor

• MDH epidemiologists initiated an investigation and notified PFGE

• Additional bacterial species were identified from the original patients by the reporting hospital
  - *Klebsiella oxytoca (KO)* and *Stenotrophomonas maltophilia (SM)*
All Positive Blood Cultures (n=35) for
*K. oxytoca* (KO), *O. anthropi* (OA), and/or
*S. maltophilia* (SM) for Case-Patients

<table>
<thead>
<tr>
<th>Number of Blood Cultures</th>
<th>Week and Month</th>
<th>Week and Year of Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oct</td>
<td>2010</td>
</tr>
<tr>
<td>2</td>
<td>Nov</td>
<td>2010</td>
</tr>
<tr>
<td>3</td>
<td>Dec</td>
<td>2010</td>
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<tr>
<td>4</td>
<td>Jan</td>
<td>2010</td>
</tr>
<tr>
<td>5</td>
<td>Feb</td>
<td>2010</td>
</tr>
<tr>
<td>6</td>
<td>Mar</td>
<td>2011</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td></td>
<td></td>
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<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
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</tbody>
</table>
**Klebsiella oxytoca**

- Aerobic Gram negative rod
- Formerly *Aerobacter sp.*
- Ubiquitous in nature
- *Klebsiella spp.* Responsible for 8% of nosocomial infections in the US and Europe
- Tends to colonize mucosal membranes, but can colonize anywhere
Ochrobactrum anthropi

- Aerobic Gram negative rod
- Formerly *Achromobacter* sp.
- Common soil organism
- Becoming increasingly common as an opportunistic and nosocomial infection
- Can be found in indwelling medical devices like catheters and drainage tubes
**Stenotrophomonas maltophilia**

- Aerobic Gram negative rod
- Formerly *Pseudomonas sp.* and *Xanthomonas sp.*
- Commonly found in aqueous environments
- Increasingly common as an opportunistic and nosocomial infection
- Multi-drug resistant
- Can colonize breathing tubes, urinary catheters, and the respiratory tract
PFGE testing

• MDH Microbiology lab received the first OA and KO isolates from the hospital in late February
  – SM isolates received in early March

• Lab personnel did a literature search for PFGE protocols for each organism
  – PulseNet summary of PFGE for other organisms had protocols for KO and SM
  – Found several journal articles with PFGE protocols for OA
Initial trial – KO and OA

*K. oxytoca* and *O. anthropi*

KO and OA samples were initially run with the *Salmonella* PulseNet protocol.
Ochrobactrum anthropi trials

Salmonella

Listeria

GAS - fast

Staph - fast

B. pertussis

XbaI  SpeI

XbaI  SpeI

XbaI  SpeI

XbaI  SpeI

XbaI  SpeI
Initial trial - SM

Routine Salmonella  S. maltophilia

SM samples were initially run with the Salmonella PulseNet protocol
## Final protocols

<table>
<thead>
<tr>
<th>Organism</th>
<th>Agarose plug casting</th>
<th>Enzymes (1&lt;sup&gt;st&lt;/sup&gt; &amp; 2&lt;sup&gt;nd&lt;/sup&gt;)</th>
<th>Initial and final switch times</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>K. oxytoca</em></td>
<td>PN E. coli protocol *</td>
<td>XbaI, Spel</td>
<td>2.2 s and 64.0 s (PN Salmonella)</td>
</tr>
<tr>
<td><em>O. anthropi</em></td>
<td>PN Listeria protocol</td>
<td>Spel, XbaI</td>
<td>2.2 s and 64.0 s (PN Salmonella)</td>
</tr>
<tr>
<td><em>S. maltophilia</em></td>
<td>PN E. coli protocol</td>
<td>XbaI</td>
<td>2.2 s and 64.0 s (PN Salmonella)</td>
</tr>
</tbody>
</table>

* No proteinase K was added to plug.

- Run with H9812 Standard
- Digested for up to 2 hours
Epidemiology results

Many areas of the hospital were investigated:

- Microbiology lab
- Phlebotomy practices
- Environmental contamination
- Surgical and anesthetic practices
- Pharmaceutical contamination (manufacturer, pharmacy, or staff)
**Klebsiella oxytoca PFGE results**

<table>
<thead>
<tr>
<th>ID</th>
<th>Type</th>
<th>Details</th>
<th>PFGE-XbaI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Blood</td>
<td>FDA, hydromorphone bag C (#2BC)</td>
<td>KOXY2*</td>
</tr>
<tr>
<td>21</td>
<td>Blood</td>
<td>FDA, hydromorphone bag D (#2CA)</td>
<td>KOXY2</td>
</tr>
<tr>
<td>26</td>
<td>Blood</td>
<td>FDA, hydromorphone bag D</td>
<td>KOXY1</td>
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<tr>
<td>5</td>
<td>Blood</td>
<td>SCH, hydromorphone bag A</td>
<td>KOXY1</td>
</tr>
<tr>
<td>18</td>
<td>Blood</td>
<td>FDA, hydromorphone bag C (#2BB)</td>
<td>KOXY1</td>
</tr>
<tr>
<td>21</td>
<td>Blood</td>
<td>SCH, hydromorphone bag B</td>
<td>KOXY1</td>
</tr>
<tr>
<td>21</td>
<td>Blood</td>
<td>SPCU bathroom drain</td>
<td>KOXY9*</td>
</tr>
<tr>
<td>26</td>
<td>Blood</td>
<td>Surgery 1A drain</td>
<td>KOXY8*</td>
</tr>
</tbody>
</table>

**PFGE Pattern**

<table>
<thead>
<tr>
<th>PFGE Pattern</th>
<th>KOXY1</th>
<th>KOXY2</th>
<th>KOXY3</th>
<th>KOXY8</th>
<th>KOXY9</th>
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<tbody>
<tr>
<td>KOXY1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>KOXY2</td>
<td>&gt;10</td>
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<tr>
<td>KOXY3</td>
<td>&gt;10</td>
<td>2</td>
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</tr>
<tr>
<td>KOXY8</td>
<td>&gt;10</td>
<td>&gt;10</td>
<td>&gt;10</td>
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<tr>
<td>KOXY9</td>
<td>&gt;10</td>
<td>&gt;10</td>
<td>&gt;10</td>
<td>&gt;10</td>
<td>--</td>
</tr>
</tbody>
</table>

*Indicates unrelated

**Indicates closely related**
### Ochrobactrum anthropi PFGE results

**PFGE-SpeI**

**ID** | SourceSite                  | MN Spe1 PFGE
--- | -----------------------------|------------------------
N/A  | FDA, saline bottle (#1A)    | OANT9*                 
N/A  | FDA, saline bottle (#1B)    | OANT9                 
7    | Blood                       | OANT4                 
18   | Blood                       | OANT4                 
5    | Blood                       | OANT4*                
3    | Blood                       | OANT4                 
21   | Blood                       | OANT4                 
20   | Blood                       | OANT4                 
14   | Blood                       | OANT6                 
14   | Blood                       | OANT6*                
N/A  | Quality control organism    | OANT5*                
N/A  | Cornea                      | OANT7*                

#### PFGE Pattern

<table>
<thead>
<tr>
<th>PFGE Pattern</th>
<th>OANT4</th>
<th>OANT5</th>
<th>OANT6</th>
<th>OANT9</th>
</tr>
</thead>
<tbody>
<tr>
<td>OANT4</td>
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<tr>
<td>OANT5</td>
<td>&gt;10</td>
<td>--</td>
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</tr>
<tr>
<td>OANT6</td>
<td>2</td>
<td>&gt;10</td>
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<tr>
<td>OANT9</td>
<td>3</td>
<td>&gt;10</td>
<td>5</td>
<td>--</td>
</tr>
</tbody>
</table>

- **Green** indicates unrelated
- **Yellow** indicates closely related
- **Blue** indicates possibly related
**Stenotrophomonas maltophilia**

**PFGE results**

<table>
<thead>
<tr>
<th>ID</th>
<th>Type</th>
<th>Details</th>
<th>MN Xba1 PFGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>SCH</td>
<td>hydromorphone bag A</td>
<td>SMALT1</td>
</tr>
<tr>
<td>26</td>
<td>SCH</td>
<td>hydromorphone bag B</td>
<td>SMALT1*</td>
</tr>
<tr>
<td>15</td>
<td>Blood</td>
<td></td>
<td>SMALT1</td>
</tr>
<tr>
<td>N/A</td>
<td>Surgery 1A</td>
<td>drain</td>
<td>SMALT6*</td>
</tr>
</tbody>
</table>

**PFGE-Xbal**

**Dice (Tol 1.5%-1.5%) (H>0.0% S>0.0%) [0.0%-100.0%]**

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**PFGE Pattern**

<table>
<thead>
<tr>
<th>PFGE Pattern</th>
<th>SMALT1</th>
<th>SMALT6</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALT1</td>
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<td></td>
</tr>
<tr>
<td>SMALT6</td>
<td>&gt;10</td>
<td>--</td>
</tr>
</tbody>
</table>

- Indicates unrelated
- Indicates closely related
- Indicates possibly related
PFGE Results from Patient Isolates, Narcotic bags, and Saline Bottle

Bacteremias

Hydromorphone Bags

Saline Bottle

Hydromorphone Bag C # 21
Hydromorphone Bag A # 21
Hydromorphone Bag B # 26
Hydromorphone Bag D # 26

Saline Bottle A

OANT9

KOXY1

KOXY2

SMALT1

KOXY1

KOXY1

KOXY1

KOXY1

KOXY3

KOXY2

KOXY1

KOXY1

OANT4

OANT4

OANT4

OANT4

OANT4

SMALT1
Acknowledgements

MDH lab
Selina Jawahir, Victoria Lappi, Jackie Mahon, Dave Boxrud

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Aaron DeVries, Jane Harper, Lindsey Lesher, Melissa Schaefer, Richard Danila, Ruth Lynfield