

MEET THE EXPERTS Outbreak Investigations

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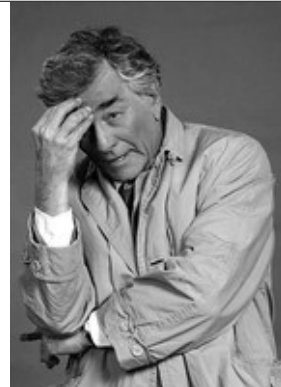
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SPICE web site - <http://www.unc.edu/depts/spice/>

Past

Columbo –
Shoe leather
investigator

ICP -
Deductive
reasoning – leads
to a conviction by
statistical
association



Today

Team Approach

-Technology driven

- Infection Preventionist
- Healthcare epidemiologist
- Public health experts
- Microbiologist



Definitions

- **Endemic**
 - threshold or baseline rates of infection, determined by surveillance data
- **Epidemic**
 - increase above the expected level or baseline
 - usually consider 3 cases in a given area an outbreak, but one case of an unusual organism is considered an outbreak

Reasons for Conducting an Outbreak Investigation

- High morbidity or mortality is occurring
- Problem is unique or unusual
- Possibility of litigation or political
- Identify contributing factors to control outbreak so it doesn't happen again

Steps for Outbreak Investigations 101

- Confirming the presence of an outbreak
- Altering key partners
- Performing a literature review
- Establishing a preliminary case definition
- Developing methodology for case finding
- Preparing line list epidemic curve
- Observing and reviewing implicated patient care activities
- Evaluate need for environmental sampling
- Implement control measures

Follow-up Steps for Outbreak Investigation 101

- Redefine case definition
- Continue case finding and surveillance
- Reviewing regularly control measures
- Consider whether analytical study be done
- Evaluate success of control measures
- Write a report
- Revise policy or procedures if implicated

Most Common Healthcare-Associated Infections (HAI) Outbreaks - SPICE

1. Orthopedic/Laminectomy, TKR, THR
2. Bronchoscopy
3. MRSA/VRE/ESBL/Norovirus/C diff
4. CABG/TCV
5. Unusual equipment/procedure (e.g., eye)

Examples of Favorite Outbreaks and What I've Learned

Description of Pseudoepidemic of *R. rubra*

- 200 bed eastern North Carolina community hospital
- Between March and June, 30 of 56 (54%) patients undergoing bronchoscopy had a bronchial washing positive for *R. rubra*

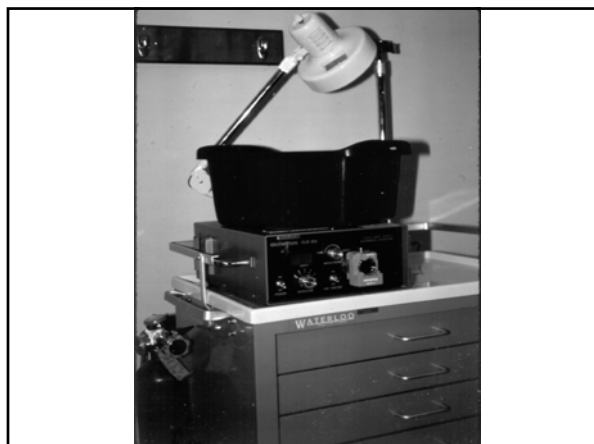
Hoffmann KK, Weber DJ, Rutala WA, *Pseudoepidemic of Rhodotorula rubra* in patients undergoing fiberoptic bronchoscopy. *Infect Control Hosp Epidemiol.* 1989;10:511-14.

R. Rubra - Case Definition and Review of Cases

- Epidemic investigation was initiated in July
- Case was defined as a bronchial washing that grew *R. rubra* during the previous three months
- Hospital charts of all cases were reviewed

Rhodotorula rubra - Epidemiology and Microbiology

- Fungus in family Cryptococcaceae
- Worldwide distribution
- Part of soil flora
- Occasionally isolated from human skin or GI trace
- May cause serious infection in both normal and immunocompromised persons



R. rubra - Review of Bronchoscopic Procedure

- Bronchoscopic procedure
 - local anesthesia
 - bronchoscope cleaned, followed by 20 min 2% glutaraldehyde soak, rinsed with tap water
 - stored in open hanging rack
 - channel cleaning brushes dipped in detergent, rinsed with tap water, stored
- Other bronchoscopy equipment (biopsy accessories, xylocaine)

R. Rubra - Environmental Evaluation

- Environmental cultures of various supplies/equipment obtained by swabs; streaked on sabourauds agar
- Water samples filtered through 0.22 μm filter; plated onto sheep blood agar
- TSB used to sample inner lumens of the bronchoscope

R. Rubra - Results of Environmental Cultures

Leak test tub water	+
Channel cleaning brushes (long, medium)	+
Other environmental cultures (bronchoscopes inner lumen, bronchoscope light source, biopsy brushes, sink aerator, short channel cleaning brush)	-

Develop Hypothesis

- Common source host factors or exposures to develop best guess about mode of transmission
- Investigational methods
 - Selective culturing
 - Observation
 - Questioning personnel
 - Simulation

Control Measures of Pseudoepidemic of *R. rubra*

- High-level disinfection of all equipment used for cleaning
- Complete air drying of bronchoscopes prior to storage
- Storage of bronchoscopes in closed cabinets
- Additional case one month after instituting above control measured led to:
 - 70% ethyl alcohol rinse following tap water rinse

Endophthalmitis Outbreak

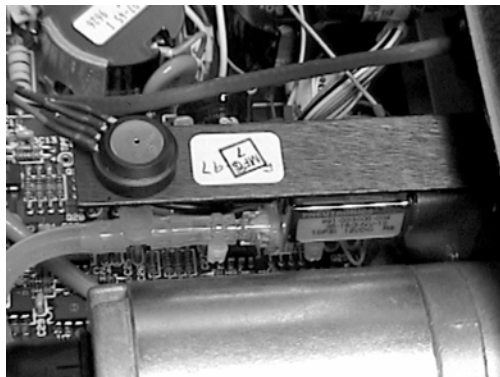
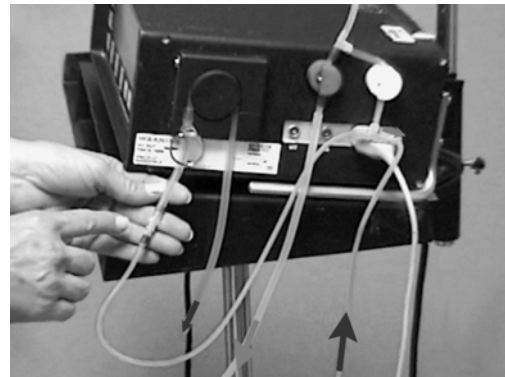
- 5 of 8 (60%) patients presented with severe post-operative endophthalmitis within 48 to 72 post-cataract extraction
- All patients had surgery on same day, same room
- Same surgeon
- All cases had surgery on right eye, all non-infected left eye

What to do first?

- Literature – previous outbreaks
- Culture results → 3 patients had a vitreal tap → grew *P. aeruginosa* → 2 negative
- Save isolates
- Contact FDA for report of similar outbreaks

Observations – Site Visit

- Outbreak occurred on a Tuesday after a 4 day holiday break
- Interviews of staff
- Environmental sampling – 53 cultures – products, equipment, environment
 - Sink drains, potable water, soap dispensers, waterpick, phaco internal tubing, air pump, all multidose vials (used before, during and after surgery), unopened irrigating salts solutions, and eye ointments
- Simulation requested



Results

- 3 patient isolates and phaco internal tubing isolate were identical by PFGE
- All other *Pseudomonas* strains different from other locations
- Manufacturers instructions were followed
 - Manufacturer had in the previous 2 years changed recommending the routine changing of the internal tube because of user complaints about costs AND stopped recommending end of day disinfection of internal system.

Neonatal (*Staphylococcus aureus*) Pustulous rash outbreak

- 150 bed hospital outbreak
- All cases were newborn males who had undergone circumcision procedure and post-discharge required antimicrobial treatment for severe pustulous diaper rash
- 36 cases in 6 months, all 17 cultured MSSA

Investigation

- Environmental culturing and circumcision procedure equipment – negative
- Added glove wearing for diaper changes and limited post circumcision care to one HCW
- Cultured all HCWs (anterior nasal swabs and hand cultures)
- 14 HCWs had *S. aureus* positive cultures
- 13 of 17 case isolates were PFGE tested, all molecular matched
- Molecular tested case to HCWs by PFGE
 - 3 HCWs (2 RN, 1 LPN) matched identically
- One HCW had a chronic cough, second had a concealed dermatitis

Cluster of TB Cases Post-Bronchoscopy

- 3 patients with identical strains by restriction fragment length polymorphism (RFLP) had undergone bronchoscopy on the same day at Hospital A
- 3 laboratories that handled sputum investigated; potential contamination ruled out

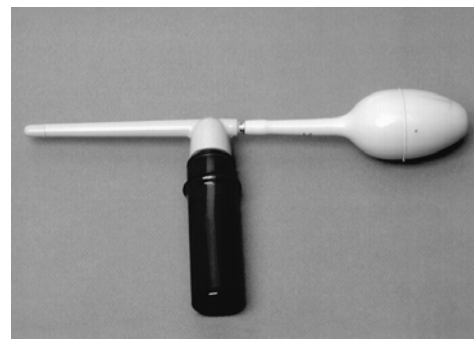
Am J Infect Control 2001;29:1-6

Investigation

- Patient A – biopsy confirmed granulomatous pulmonary TB
- Patient B – follow-up not obtained
- Patient C – Emergency Room traumatic bronch; patient expired
- Patient D – 6 weeks post bronchoscopy diagnosed with ocular TB

Investigation

- Clinical history – community links between patients; none identified
- Bronchoscopes – documentation – none were reused patient to patient
- Simulation – Steris machine for reprocessing scopes and other reuseable equipment (atomizer)
- Questioning revealed – Main technician off for the day. Second technician's mother was hospitalized. Cross trained tech assisted.



Summary of Bronchoscope Investigation

- Atomizer reprocessed inadequately in Steris (lumen size) and not pre-cleaning
- TB can survive in Lidocaine (bacteriostatic)
- After single use, 75% of atomizer lumens and 42% of fluid reservoirs reported contaminated
- Technicians reported reuse of used atomizer nozzle (switch out) from previous patients

Outbreaks are opportunities for improvement

