
INFECTION CONTROL DURING CONSTRUCTION: FOCUS ON CDC/HICPAC RECOMMENDATIONS

David J. Weber, M.D., M.P.H.

Professor of Medicine, Pediatrics & Epidemiology

Medical Director, Hospital Epidemiology

University of North Carolina at Chapel Hill

LECTURE TOPICS

- Examples of outbreaks
- *Aspergillus*: Epidemiology
- Construction and renovation guidelines
- Management of damage from water leaks

TYPICAL CONSTRUCTION/RENOVATION SITE



RELEVANT GUIDELINES

- 2003: Guidelines for preventing health-care-associated pneumonia (HICPAC)
- 2003: Guidelines for environmental infection control in health-care facilities (CDC, HICPAC)
- 2000: Guidelines for preventing opportunistic infections among hematopoietic stem cell transplant recipients (CDC, IDSA, ASBMT)
- American Institute of Architects Academy of Architecture for Health. Guidelines for Design and Construction of Hospital and Health Care Facilities , 2006. (telephone #: 888-272-4115)
- Construction and Renovation, 3rd Edition ,and Infection Prevention for Construction DVD, Association for Professionals in Infection Control and Epidemiology, 2007 (\$173 member price) APIC store: www.apic.org/
- APIC Text of Infection Control and Epidemiology, 3rd ed. Association for Professionals in Infection Control and Epidemiology, 2009. www.apic.org/
- ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers

LIMITATIONS OF GUIDELINES

- Largely based on outbreak investigations
- Corollaries of above
 - Focus is on preventing epidemic infections (rather than sporadic infection)
 - Recommendations often not based on randomized clinical trials
 - Focus on preventing infection in HSCT patients in protected environment

SELECTED OUTBREAKS DUE TO CONSTRUCTION, RENOVATION, OR CONTAMINATED AIR HANDLING SYSTEMS

| Year-Author | Organism | Population | Epidemiologic Factors | Remedial/ Preventive Measures |
|--------------------------|---|----------------------------|--|---|
| 1990, Fox et al. | <i>Penicillium</i> sp. <i>Cladosporium</i> sp. | OR | Ventilation duct lined with contaminated fiberglass insulation | Decontamination of HVAC ductwork; filter replacement |
| 1992, Hruszkewycz et al. | <i>Penicillium</i> sp. <i>Aspergillus</i> sp. | Laboratory pseudo-outbreak | Improper airflow during renovation near lab; false ceiling | Sealed ceilings; proper use of hoods and appropriate airflow controls |
| 1994, Iwen et al. | <i>Aspergillus</i> sp. Mixed fungi | BMT unit | Improper airflow; suspected infiltration from windows | Sealed windows and balanced airflow; replaced HEPA filters |
| 1995, Anderson et al. | <i>Aspergillus</i> sp. | Pediatric oncology unit | Improper airflow from clinical waste disposal room | Sealing of disposal room and use of HEPA filtered vacuum cleaners |

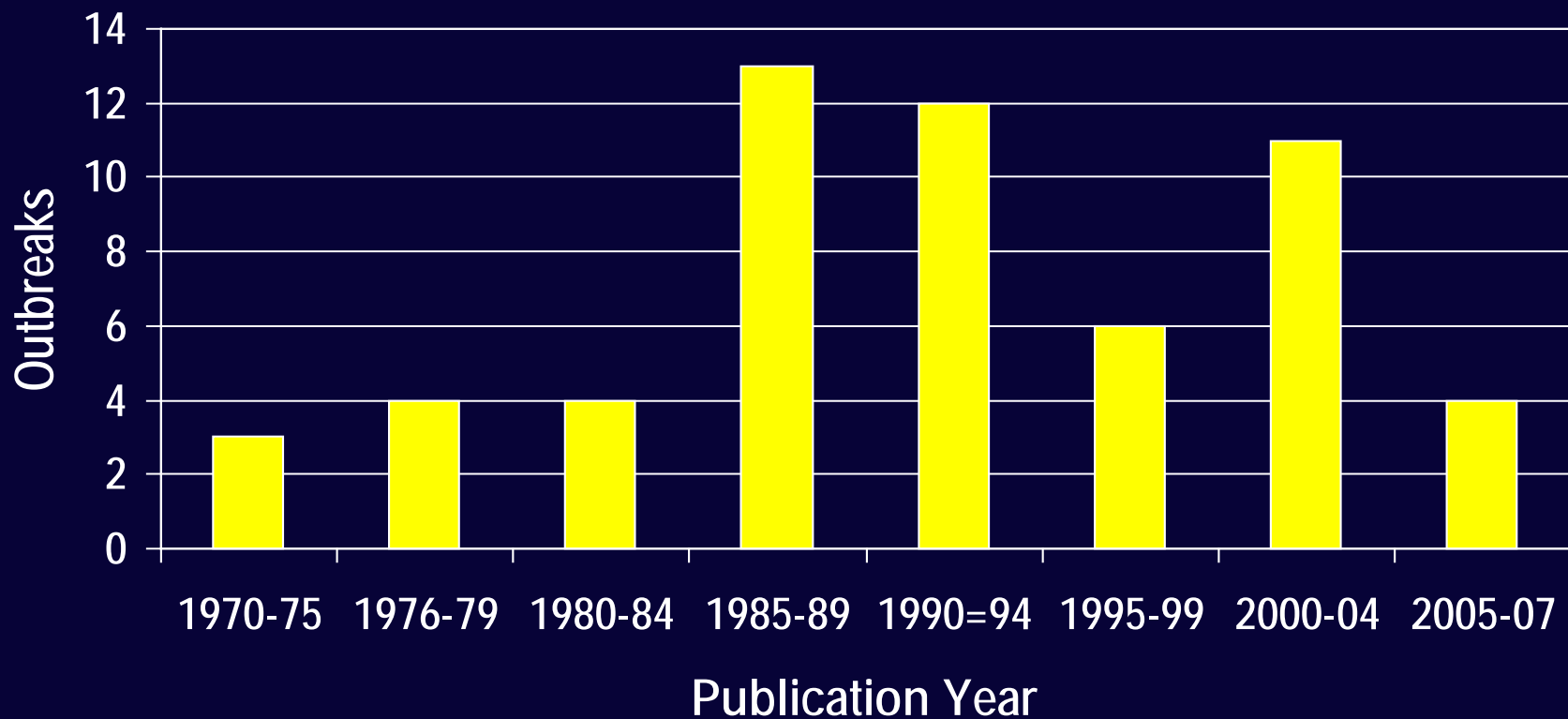
SELECTED OUTBREAKS DUE TO CONSTRUCTION, RENOVATION, OR CONTAMINATED AIR HANDLING SYSTEMS

| Year-Author | Organism | Population | Epidemiologic Factors | Remedial/ Preventive Measures |
|-----------------------|----------------------------|-----------------------------|--|--|
| 1996, Pittet et al. | <i>Aspergillus</i> sp. | COPD | Air filter replacement | Monitor filter function; replaced filters |
| 1997, Kumari et al. | MRSA | Orthopedic patients | Ventilation grills | Cleaned, maintained pressure relationships |
| 1997, Fridkin et al. | <i>Acremonium kiliense</i> | Ambulatory surgery – system | Poorly designed HVAC; contaminated humidifier | Redesign; changed HEPA filters; proper HVAC maintenance |
| 2002, Anaissie et al. | <i>Aspergillus</i> sp. | BMT | Concentration of airborne fungi on shower surfaces | Clean shower floor with detergent prior to use of shower |

MOST COMMON PATHOGENS ASSOCIATED WITH CONSTRUCTION OR RENOVATION OUTBREAKS

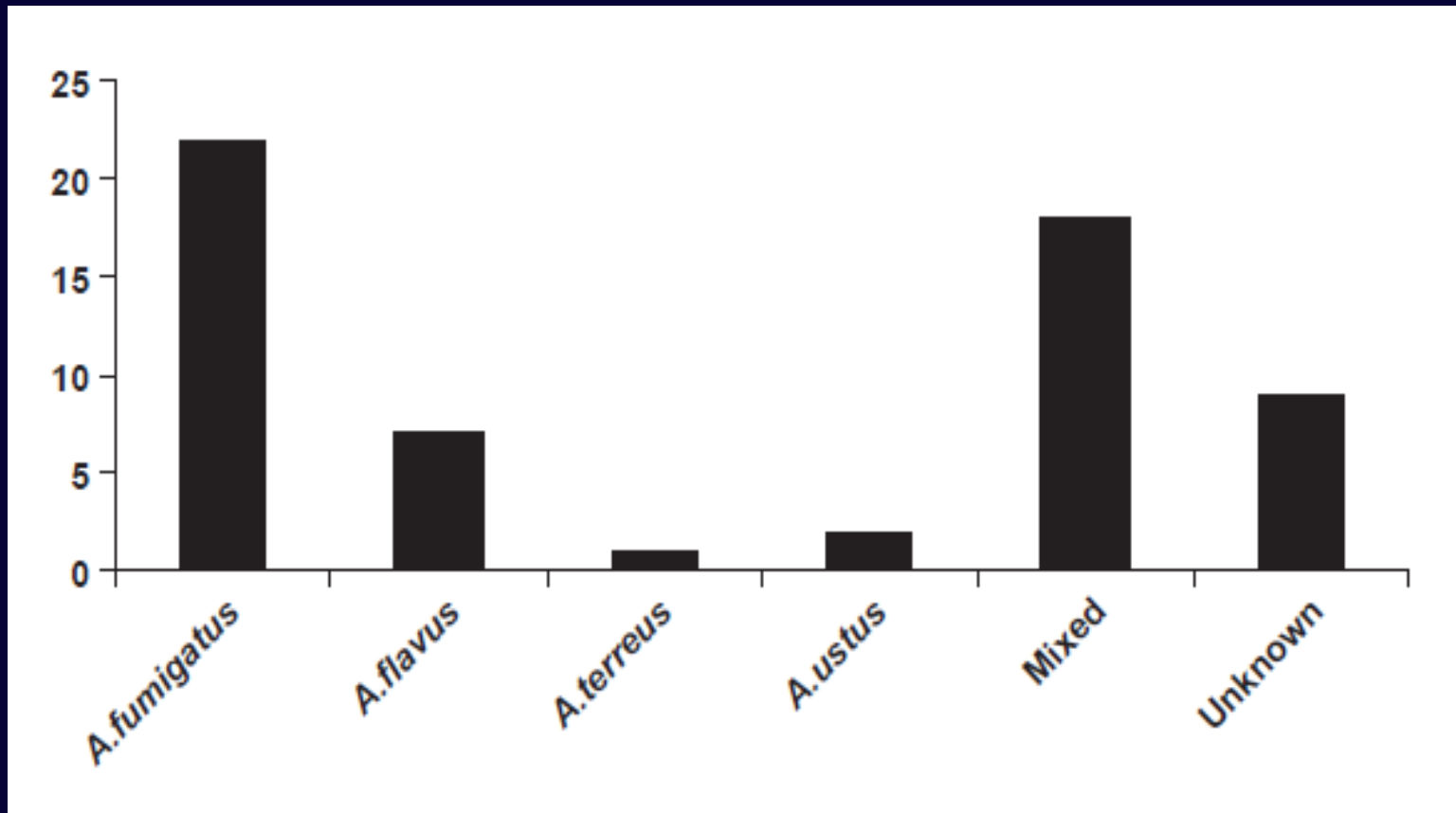
- *Aspergillus* spp. (by far most important)
- Zygomycetes
- Other fungi
- Miscellaneous

NOSOCOMIAL ASPERGILLOSIS IN OUTBREAK SETTINGS, 1970-2007



Adapted from Vonberg R-P, Gastmeier P. *J Hosp Infect* 2006;63:246-54

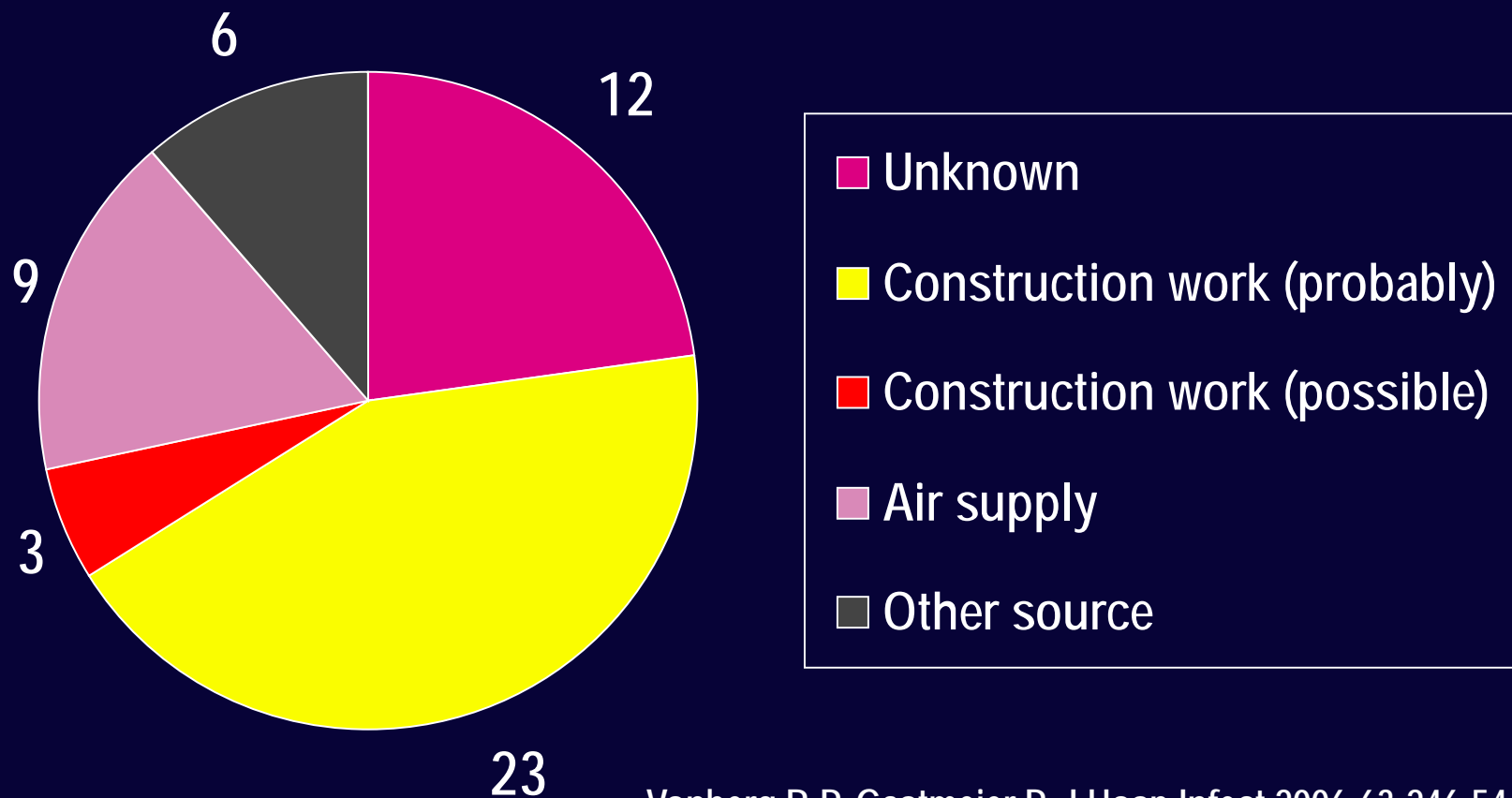
ASPERGILLUS SPECIES ASSOCIATE WITH OUTBREAKS



UNDERLYING CONDITIONS IN PATIENTS WITH NOSOCOMIAL ASPERGILLOSIS

| | No. of Patients | Mortality (%) |
|--|-----------------|---------------|
| Hematologic malignancy | 299 | 57.6 |
| Solid organ transplant | | 55.9 |
| ● Renal transplant | 36 | |
| ● Liver transplant | 8 | |
| Other immunocompromised | | 52.3 |
| ● High-dose steroid therapy | 15 | |
| ● Neonates | 5 | |
| ● Other malignancy | 4 | |
| ● Chronic lung disease | 2 | |
| ● ICU patients ("high-risk") | 2 | |
| ● No exact classification possible | 49 | |
| Patients without severe immunodeficiency | | 39.4 |
| ● Thoracic surgery | 25 | |
| ● Cataract surgery | 5 | |
| ● ICU patients ("low risk") | 5 | |
| ● Other surgery patients | 3 | |
| TOTAL | 458 | 55.0 |

NOSOCOMIAL ASPERGILLOSIS IN OUTBREAK SETTINGS



CDC/HICPAC RECOMMENDATIONS: GRADING OF RECOMMENDATIONS

- IA: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies
- IB: Strongly recommended for implementation and supported by some clinical or epidemiologic studies and by strong theoretical rationale.
- IC: Required for implementation, as mandated by federal or state regulation or standard.
- II: Suggested for implementation and supported by suggestive clinical or epidemiologic studies or by strong theoretical rationale.
- No recommendation; unresolved issue: Practice for which insufficient evidence or not consensus exists about efficacy

SURVEILLANCE¹

- Maintain a high index of suspicion for healthcare-associated pulmonary aspergillosis in severely immunocompromised patients (ANC <500/mm³ for 2 weeks or <100/mm³ for 1 week){IA}
- Surveillance cultures
 - Do NOT perform routine, periodic cultures of nasopharynx {IB}
 - Do NOT perform routine, periodic cultures of equipment or devices used for respiratory therapy, PFTs, or dust in rooms of HSCT recipients {IB}
 - NO recommendation for routine microbiologic air sampling before, during, or after facility construction or renovation {Unresolved}
- Perform routine surveillance of the ventilation status of PEs: room air exchanges, pressure relations, filtration efficacy {IB}

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

NEW CONSTRUCTION: PROTECTED ENVIRONMENT FOR HSCT PATIENTS¹

- Allogeneic HSCT recipients {IB, IC}
 - HEPA filtration of incoming air
 - Directed room airflow
 - Positive air pressure in patient's room in relation to corridor
 - Well-sealed room
 - High (≥ 12) air changes per hour
- Autologous HSCT and solid organ-transplant {unresolved}
 - No recommendation for constructing PE

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

EXISTING FACILITIES WITH HSCT UNITS: NO CASES OF HAI WITH *ASPERGILLUS*¹

- Placement of patients in PE
 - Place allogeneic HSCT recipient in PE that meets conditions outlined in previous slide {IB}
 - No recommendation regarding autologous recipient {unresolved}
- Maintain air-handling systems in PE according to recommendations {IB, IC}
- Develop a water-damage response plan {IB}
- Use proper dusting methods {IB}
- Do not use carpeting in hallways and rooms {IB}
- Avoid using upholstered furniture in rooms {II}

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

EXISTING FACILITIES WITH HSCT UNITS: NO CASES OF HAI WITH *ASPERGILLUS*¹

- Minimize length of time patients in PE are outside their rooms {II}
 - Have patient wear **N-95** when they leave PE during periods of construction or renovation in or around the healthcare facility {II}
 - No recommendation for specific type of respiratory protection (e.g., mask vs N-95) for patient who leaves PE when there is no construction {unresolved}
- Do not allow fresh or dried flowers or potted plants in patient-care areas for severely immunocompromised patients {II}

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

EXISTING FACILITIES WITH HSCT UNITS: CASE OF HAI WITH *ASPERGILLUS*¹

- Assess whether the infection is healthcare-associated or community-acquired
 - Obtain and use the following information: background rate of disease in facility; presence of concurrent or recent cases; length of patient's stay at, visit, of, or transfer from, other healthcare facilities or other locations within the facility, and period of time patient was exposed outside the healthcare facility after onset of immunosuppression and before onset of aspergillosis {II}
 - Determine if any ventilation deficiencies exist in the PEs {IB}

EXISTING FACILITIES WITH HSCT UNITS: CASE OF HAI WITH *ASPERGILLUS*¹

- If no evidence exists that the patient's aspergillosis is facility-acquired, continue routine maintenance to prevent aspergillosis {IB}
- If evidence of possible facility-acquired infection with *Aspergillus* exists, conduct an epidemiologic investigation and an environmental assessment to determine and eliminate the source of *Aspergillus* {IB} [if assistance is needed, contact the local or state health department]
- Use an antifungal biocide (e.g., copper-8-quinolinolate) that is registered with the EPA for decontamination of structural materials {IB}

CHEMOPROPHYLAXIS¹

- No recommendation can be made for routine administration of antifungal agents (e.g., intravenous amphotericin B){unresolved}
- No recommendation can be made for any specific strategy (e.g., deferral of hematopoietic stem-cell transplant for a particular length of time or routine prophylaxis with antifungal medications) to prevent recurrence of pulmonary aspergillosis in patients undergoing HSCT who have a history of pulmonary aspergillosis {unresolved}

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

CONSTRUCTION OR RENOVATION¹

- When planning construction, demolition, and renovation activities in and around the facility, assess whether patients at high-risk for aspergillosis are likely to be exposed to high ambient-air spore counts of *Aspergillus* spp., and if so develop a plan to prevent such exposure {IA}
- During construction, demolition, or renovation activities construct impermeable barriers between patient-care and construction areas to prevent dust from entering the patient-care areas {IB}
- Direct pedestrian traffic that come from construction areas away from patient-care areas to limit the opening and closing of doors or other barriers that might cause dust dispersion {IB}

¹Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003





CONSTRUCTION OR RENOVATION¹

- Establish a multidisciplinary team that includes infection-control staff to coordinate demolition, construction and renovation {IB, IC}
- Educate construction and healthcare staff in immunocompromised patient-care areas regarding airborne infection risks associated with construction and preventive measures {IB}
- Incorporate mandatory adherence agreements for infection control into construction contracts {IC}
- Establish and maintain surveillance for airborne environmental disease (e.g., aspergillosis) as appropriate during construction {IB}

¹Guideline for environmental infection control in health-care facilities, 2003

CONSTRUCTION OR RENOVATION¹

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
 - Before the project gets underway, perform an ICRA to define the scope of the project and need for barrier measures {IB, IC}
 - ◆ Determine if immunocompromised patients may be at risk for exposure and develop a contingency plan to prevent exposures
 - Implement infection-control measures for external demolition and construction {IB}
 - ◆ Determine if facility can operate on recirculated air; if feasible, seal off adjacent air intakes
 - ◆ If not feasible, check and replace low-efficiency filters as needed
 - ◆ Seal windows and reduce outside air intrusion

¹Guideline for environmental infection control in health-care facilities, 2003

CONSTRUCTION OR RENOVATION¹

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
 - Implement infection-control measure for internal construction {IB, IC}
 - ◆ Construct barriers to prevent dust from entering patient-care areas
 - ◆ Block and seal off return air vents (if needed)
 - ◆ Implement dust control measures; divert pedestrian traffic
 - ◆ Relocate patients adjacent to work zone (depending on their immune status)

¹Guideline for environmental infection control in health-care facilities, 2003



NOT AN EXIT
CONSTRUCTION SITE
DO NOT ENTER

DAVISEY

13
**CONSTRUCTION
AREA
DO NOT ENTER**

**CHECK WITH
SUPERINTENDENT
BEFORE ENTERING**



IT Room
←



CONSTRUCTION OR RENOVATION¹

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
 - Perform engineering and work-site related infection control measures as needed for internal construction and renovations
 - ◆ Ensure proper operation of the air-handling system
 - ◆ Create and maintain negative pressure in work zones
 - ◆ Monitor negative air flow inside of rigid barriers
 - ◆ Monitor barriers; repair gaps and breaks in barriers
 - ◆ Direct pedestrian traffic away from work zones
 - ◆ Provide designated travel routes for construction crew
 - ◆ Clean work zones daily
 - ◆ Clean and replace air filters

¹Guideline for environmental infection control in health-care facilities, 2003

CONSTRUCTION OR RENOVATION¹

- No recommendation is offered on routine microbiologic air sampling, before, during, or after construction {unresolved}
- If a case of healthcare-acquired aspergillus airborne fungal infection occurs during construction, implement appropriate measures {IB}
- If there is epidemiologic evidence of ongoing transmission of fungal disease, conduct an environmental assessment to determine and eliminate the source {IB}
- If air-supply systems to high-risk areas are not optimal use portable, industrial-grade HEPA filters on temporary basis {II}

UNC INTERVENTIONS TO PREVENT ASPERGILLUS IN HIGH-RISK PATIENTS

- UNC policies
 - Bone marrow transplant unit
 - Environmental services
 - Isolation precautions
 - Plant engineering and maintenance
- Other preventive interventions
 - Approval of construction and renovation projects
 - Construction rounds
- NC Health Department policies (developed by UNC)
 - Water damage

INFECTION CONTROL RISK ASSESSMENT (ICRA)

- ICRA is an multidisciplinary, organizational, documented process that after considering the facility's patient population and program:
 - Focuses on reduction of risk from infection
 - Acts through phases of facility planning, design, construction, renovation, facility maintenance and
 - Coordinates and weights knowledge about infection, infectious agents, and care environment permitting the organization to anticipate potential impact

STEP 1: IDENTIFY TYPE OF CONSTRUCTION PROJECT

| | |
|--------|---|
| TYPE A | <p>Inspection and Non-Invasive Activities. Includes, but is not limited to:</p> <ul style="list-style-type: none">▪ removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet▪ painting (but not sanding)▪ wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection. |
| TYPE B | <p>Small scale, short duration activities which create minimal dust Includes, but is not limited to:</p> <ul style="list-style-type: none">▪ installation of telephone and computer cabling▪ access to chase spaces▪ cutting of walls or ceiling where dust migration can be controlled. |

STEP 1: IDENTIFY TYPE OF CONSTRUCTION PROJECT

| | |
|---------------|---|
| TYPE C | <p>Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies</p> <p>Includes, but is not limited to:</p> <ul style="list-style-type: none">▪ sanding of walls for painting or wall covering▪ removal of floorcoverings, ceiling tiles and casework▪ new wall construction▪ minor duct work or electrical work above ceilings▪ major cabling activities▪ any activity which cannot be completed within a single workshift. |
| TYPE D | <p>Major demolition and construction projects</p> <p>Includes, but is not limited to:</p> <ul style="list-style-type: none">▪ activities which require consecutive work shifts▪ requires heavy demolition or removal of a complete cabling system▪ new construction. |

STEP 2: IDENTIFY PATIENT RISK

| Low Risk | Medium Risk | High Risk | Highest Risk |
|--|---|---|---|
| <ul style="list-style-type: none"> ▪ Office areas | <ul style="list-style-type: none"> ▪ Cardiology ▪ Echocardiography ▪ Endoscopy ▪ Nuclear Medicine ▪ Physical Therapy ▪ Radiology/MRI ▪ Respiratory Therapy | <ul style="list-style-type: none"> ▪ CCU ▪ Emergency Room ▪ Labor & Delivery ▪ Laboratories (specimen) ▪ Medical Units ▪ Newborn Nursery ▪ Outpatient Surgery ▪ Pediatrics ▪ Pharmacy ▪ Post Anesthesia Care Unit ▪ Surgical Units | <ul style="list-style-type: none"> ▪ Any area caring for immunocompromised patients ▪ Burn Unit ▪ Cardiac Cath Lab ▪ Central Sterile Supply ▪ Intensive Care Units ▪ Negative pressure isolation rooms ▪ Oncology ▪ Operating rooms including C-section rooms |

STEP 3: MATCH RISK GROUP WITH CONSTRUCTION TYPE

| Patient Risk Group | Construction Project Type | | | |
|--------------------|---------------------------|--------|--------|--------|
| | TYPE A | TYPE B | TYPE C | TYPE D |
| LOW Risk Group | I | II | III | III/IV |
| MEDIUM Risk Group | I | II | III | IV |
| HIGH Risk Group | I | II | III/IV | IV |
| HIGHEST Risk Group | III | III/IV | III/IV | IV |

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that **Class III** or **Class IV** control procedures are necessary.

INFECTION CONTROL BY CLASS

| | During Construction Project | Upon Completion of Project |
|----------|--|--|
| CLASS I | <ol style="list-style-type: none"> 1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection | <ol style="list-style-type: none"> 1. Clean work area upon completion of task. |
| CLASS II | <ol style="list-style-type: none"> 1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area 6. Remove or isolate HVAC system in areas where work is being performed. | <ol style="list-style-type: none"> 1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed. |

INFECTION CONTROL BY CLASS

During construction

After construction

CLASS III

1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.
3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
4. Contain construction waste before transport in tightly covered containers.
5. Cover transport receptacles or carts. Tape covering unless solid lid.

1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Department.
2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.
3. Vacuum work area with HEPA filtered vacuums.
4. Wet mop area with cleaner/disinfectant.
5. Upon completion, restore HVAC system where work was performed.

INFECTION CONTROL BY CLASS

During construction

1. Isolate HVAC system in area where work is being done to prevent contamination of duct system.
2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.
3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
4. Seal holes, pipes, conduits, and punctures.
5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

After construction

1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept.
2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction.
3. Contain construction waste before transport in tightly covered containers.
4. Cover transport receptacles or carts. Tape covering unless solid lid.
5. Vacuum work area with HEPA filtered vacuums.
6. Wet mop area with cleaner/disinfectant.
7. Upon completion, restore HVAC system where work was performed.

OTHER STEPS

4. Identify areas surrounding the project area, assess impact
5. Identify the specific sites of activity (e.g., patient rooms)
6. Identify issues related to: ventilation, plumbing, electrical in terms of possible outages
7. Identify containment measures using prior risk assessment
8. Consider possible water damage
9. Work hours: Can work be done during non-patient care hours?
10. Develop plans for the proper handwashing sinks
11. Develop plans for use of clean and soiled utility rooms
12. Communicate with project team: traffic flow, housekeeping, debris removal

SUMMARY

- Outbreaks of aspergillosis and other fungi continue to occur in US healthcare facilities
- Highly immunocompromised patients are at highest risk
- Most are related to construction and renovation
- Appropriate implementation of CDC/HICPAC guidelines can prevent healthcare-associated infection
- Use of ICRA is a logical method to plan for construction and renovation projects

A Systematized Approach for Remediating Water Problems in Buildings

- Floods
- Roof leaks
- Potable water leaks
- Sewage backup
- Steam leaks
- Ground water infiltration

Health Problems from Mold

Skin irritation – rash, redness, itching



Allergic responses – watery eyes, sneezing,
congestion, tiredness



Hypersensitivity diseases – Reactive airway
disease

Water Damage Checklist

- Inventory – all damaged areas, walls, floors, furniture (moisture meter)
- Ceiling tile – remove and dispose of all wet tiles within 24-48 hours (only exception small steam leak)
- Drywall – remove and replace within 24 hours – cut sheetrock at least 12" above moisture mark
- Wet lathe/plaster will leak minerals and form chalky surface, need to remove under controlled conditions after the surface has been allowed to dry.

Water Damage Checklist

- Block walls – scrub with a mild detergent followed by a rinse of the surface using a solution of $\frac{1}{4}$ to $\frac{1}{2}$ cup of bleach per gallon. Dry area. Controls include: negative air pressure, appropriate respiratory protection, excellent personal hygiene, handwashing and showering after work in the area
- Furniture upholstered – steam or drying → water air dry and monitor. If other water damage → discard
- Hardwood or intact laminate – appropriately clean

Water Damage Checklist

- Electrical – have checked by building inspector or electrician. Turn power off and discard wet electrical circuit breakers, fuses, switches, outlets, electrical motors, and light fixtures need to be opened, cleaned and air-dried by qualified person. (If in doubt → throw out)
- Particle board/pressed waterboard
 - If steam → air dry and monitor other water damage → discard

Water Damage Checklist

- Delaminated furniture/cabinets
 - If steam → air dry and monitor
 - If other water damage → discard
 - Fiberglass → discard and replace
 - Books and papers → nonvaluables discard, photo copy, freeze, Joy
 - Subflooring → must also be cleaned and dried

Water Damage Checklist

- Carpet – wet from floods, roof leaks, steam, potable and ground water
 - If wet less than 48 hours → remove all materials and extract as much water as possible per wet vacuums → shampoo with dilute surfactant → soak with ¼ to ½ cup bleach solution (do not use a biocide – people are sensitive and does not kill spores). Rinse and extract with clean water → or commercial steam cleaning may be used in lieu of bleach → dry carpet within 12-24 hours

Containment Tips

- Limit release of mold into air
- Always maintain negative air pressure
- Exhaust fans to outdoors, air makeup is available, block return air vents
- Barriers (airlock and tested)
- Limited polyethylene sheeting to floor, slit entry and cover flap
- HEPA units/change filter/used in well-sealed plastic bags

Personal Protective Equipment

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator
- Use professional judgment to determine prudent levels of PPE and containment.

Guidelines for Selecting Clean-up, Remediation and Containment

- Small – total surface area affected less than 10 square feet
- Medium – total surface area affected between 10 and 100 square feet
- Large – total surface area affected greater than 100 square feet or potential for increased occupant or Remediator Exposure during remediation estimated to be significant

Summary

- Acute and chronic health problems known to be associated with indoor air pollution
- Importance of managing moisture infiltration and indoor air pollution into health care buildings has become critical