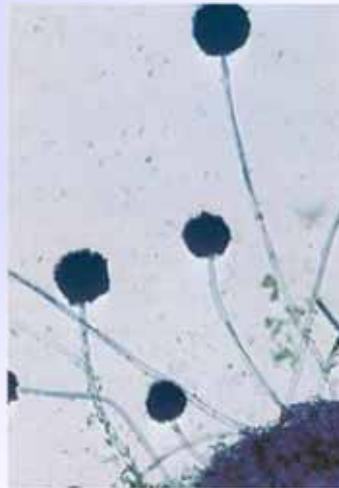
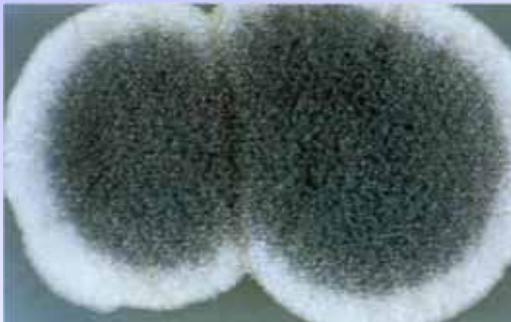


# *Renovation and Infection Control*

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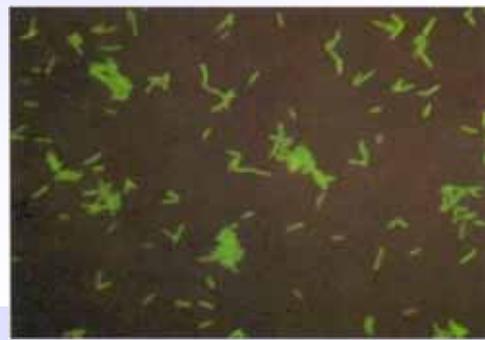
## *Construction-related nosocomial infections: Aspergillus sp*

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# *Construction-related nosocomial infections: Legionella sp*

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## *Source of microorganism*

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- Mould, dust, soil contaminated with fungal spore or bacteria
  - false ceilings, fibrous insulating material, roller-blind castings, fire-proofing material
    - fungal spores dispersed enters through open windows
    - windows not properly sealed

## *Source of microorganism*

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### ■ Plumbing system

- leaking water pipes causing damage to false ceiling
- dust and mould particles were dispersed
- soil contaminated with *Legionella* sp. entered water supply at time of installation of new pipes

## *Source of microorganism*

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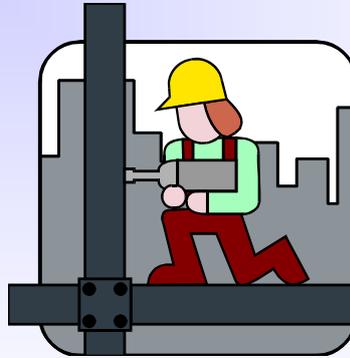
### ■ Ventilation system

- defective system allowing unfiltered air from construction zone to circulate into patient areas
  - vents not properly closed
  - incorrect air pressurization in patient care areas allowing air to move from dirty to clean areas
  - inadequate air exchange and exhaust
  - HEPA filters not properly maintained

## *Risk factors*

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- Exposure to construction and soil excavation



## *Risk factors*

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- Patient characteristics
  - underlying medical conditions
  - immunosuppressive conditions
    - GVH disease, prolonged neutropenia / granulocytopenia, prolonged use of antibiotics, steroid therapy
    - dialysis and mechanical ventilation, smoking, patient age, very young and very old
    - diabetes, surgery, neoplastic, pulmonary, renal or cardiac disease

## *Risk factors for infections with filamentous fungi*

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- Exposure to construction activities
- immunosuppressive conditions
- AIDS, congenital immunodeficiencies
- Dialysis, renal failure
- Diabetic ketoacidosis
- Mechanical ventilation
- Smoking
- Age of the patient - very young and very old

## *Risk factors for Legionnaires' disease*

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- Exposure to soil excavation during construction and malfunction of plumbing systems
- Immunosuppressive conditions
- Advanced age
- Chronic pulmonary disease
- Smoking
- Excessive use of alcohol
- Surgery
- Diabetes, neoplastic disease, renal failure, cardiac failure

## *Risk assessment*

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- Proactive approach
  - Minimise dust
  - Prevent dust infiltration into patient care areas adjacent to construction
- Attention to plumbing system when disruptions occur
- Infection control measures

## *Contract*

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- Preventive measures outlined clearly before start of construction or renovation project
- Maintenance of measures
- Clear responsibilities

## *General guidelines*

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- Minimise dust
- Prevent migration of duct particles into adjacent areas
  - plastic barrier from floor to ceiling + negative pressurization
  - *plastic barrier + high efficiency exhaust fan with HEPA filter*
  - plastic barrier + portable exhaust fan with side-draft hood

## *Pre-construction*

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- Consult infection control department
- Authority to stop construction?
- Identify essential services that may be disrupted
- ICN to identify patient population at risk and implement appropriate preventive measures
- Train contractors and workers
- Traffic patterns determined for construction workers

## *Construction*

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- Move immunosuppressed patients
- Seal windows, doors, air intake and exhaust vents in areas adjacent to construction area
- Dust barrier
- Walk-off mat
- Protective clothing
- ICN to visit construction site regularly with project manager

## *Post construction*

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- Construction zone thoroughly cleaned
- ICN to check area before patients are re-admitted
- Final walk-through inspection
- Evaluate preventive measures and review effectiveness for any problems and positive outcome

## *Personnel interactions*

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- Facility project manager, environmental services, medical and nursing staff
  - provide information on infection control concerns
  - education on importance of preventive measures
  - collaborate in making recommendations in cleaning
  - collaborate with staff to identify patients at risk

## *Personnel interactions*

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- Architects, engineers, contractors, subcontractors, suppliers
  - ICN should be aware of existing building and professional standards that address infection control issues
  - communicate with them
  - ensure preventive measures are initiated and followed through

## *Construction activity*

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- Type A: inspection, non-invasive
- Type B: small scale, short duration, minimal dust-generating activities
- Type C: activities that generate moderate to high levels of dust, require greater than one work shift to complete
- Type D: activities that generate high levels of dust, major demolition and construction activities requiring consecutive work shifts to complete

## *Population risk group*

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- Group 1: lowest risk
  - office areas, unoccupied wards, public areas
- Group 2: medium risk
  - other patient care areas unless stated in Group 3 or 4, outpatient clinics (except oncology & surgery), admission/discharge units
- Group 3: medium to high risk
  - EM, labour, day surgery, laboratories, paediatrics, general wards (not listed in Group 4), etc
- Group 4: highest risk
  - ICU, OT, oncology units and outpatient clinics, transplant units, wards and outpatient clinics for AIDS, dialysis units, endoscopy, CSSD, cardiac catheterization and angiography areas

# *Matrix*

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Risk group	Construction activity			
	Type A	Type B	Type C	Type D
Group 1	I	II	II	III/IV
Group 2	I	II	III	IV
Group 3	I	III	III/IV	IV
Group 4	III	III/IV	III/IV	IV

# *Guidelines*

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- Class I
  - minimise dust production
  - replace any displaced tiles
  - maintain as dry an environment as possible
  - report any water leaks

## *Guidelines*

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### ■ Class II

- prevent air-borne dust from dispersing
- use drop sheets to control dust
- seal windows and unused doors with duct tape
- water misting work surfaces while cutting
- seal air vents in construction/renovation area
- dust mat at entrance and exit of work site
- contain debris in covered containers or cover with moistened sheet before transporting for disposal

## *Guidelines*

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### ■ Class III

- maintain negative pressure within construction zone by using portable HEPA equipped filtration units or other methods
- ensure ventilation system is functioning properly and cleaned if contaminated by soil or dust after construction or renovation is over

## *Guidelines*

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- Class IV
  - construct anteroom
    - workers remove overalls each time they leave work site
    - change shoe covers
    - wet mop room daily

## *Standards & guidelines*

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- Health Technical Memorandum, UK
  - HTM 2025
- American Institute of Architects
  - AIA guidelines
- American Society of Heating, Refrigerating and Air Conditioning Engineers
  - ASHRAE standards

## *Air sampling*

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- OTS
  - new, major renovation to ventilation system
  - air sampling for bacteria count
- Immunosuppressed patients
  - *Aspergillus* surveillance

## *Conclusion*

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- Costs associated with containment and monitoring requirements
- Key to effective management of risk and cost
  - early and thorough planning

