

# The Newcastle upon Tyne Hospitals NHS Foundation Trust

## Microbiological Air Sampling of Operating Theatres

Effective: July 2009

Reviewed: July 2011

Next Review: July 2013

### 1. Background

1.1 This protocol has been put together to ensure that the operating theatre ventilation is optimal in order to prevent airborne microorganisms from entering surgical wounds.

In keeping with national guidance, it was necessary to review the indications and method of microbiological air sampling.

1.2 The areas covered are:

- Conventionally-ventilated operating theatres.
- Ultraclean-ventilated (UCV) operating theatres.

1.3 Airborne contaminants may enter an operating room via the following routes<sup>1</sup>:

- through the supply air
- shed by operating staff (skin fragments with bacteria)
- through surgical activities
- transferred from adjacent spaces

Dilution of airborne contaminants is ensured by a well functioning ventilation system.

1.4 The design of the operating theatre should seek to minimise the movement of air from less clean to cleaner areas. Overall ventilation (supply flow rates, air change rates etc) should give sufficient dilution of airborne bacterial contaminants as per HTM guidance<sup>1</sup>.

1.5 Microbiological air testing in a conventionally-ventilated theatre is a final check of supply of optimal quality-air to the operating theatre and the principles are applied for commissioning and monitoring post-maintenance (where this is indicated).

### 1.6 Microbiological sampling in conventional operating theatres<sup>1</sup>

An external company will be contracted to do air sampling by Estates.

The theatre should have had an “in-depth” clean and should be thoroughly clean and dust-free. The air handling unit should have been operating at normal flow rates (i.e. not on setback ventilation) continuously for at least 24 hours before sampling.

The supply air should be checked by closing all doors and leaving the operating room empty with the ventilation system running. An active air sampler mounted in the centre of the room approximately 1m above floor level should then be activated remotely to sample 1m<sup>3</sup> (1000 L) of air.

**Aerobic cultures on non-selective media should not exceed 10 bacterial and/or fungal colony forming units per cubic metre (CFU/m<sup>3</sup>).**

**The result may take 5 days to come back and will need to be discussed by Infection Control Doctor and Estates.** A satisfactory microbiological sampling result is required to enable a new or refurbished theatre to come into use.

## **2. Commissioning<sup>2</sup>**

2.1 Commissioning must occur before a new operating theatre is first used or after substantial modifications (that may affect airflow patterns) are made to an existing theatre.

2.2 Summary for commissioning of conventionally-ventilated theatres

Commissioning is a task for both the Estates Department and the Infection Control Team. Co-operation and co-ordination between them is important. Below is a summary of matters that should be addressed when commissioning conventionally-ventilated theatres.

- The theatre interior should be checked for obvious defects by both the Estates and users.
- The air distribution within the theatre and between rooms in the theatre suite should be checked by smoke tracing.
- The air handling unit supplying the theatre is properly constructed, finished and functioning.
- Where “setback” (reduction of ventilation rates when theatre is not in use) is in place, there are indications in theatre of its function and there are safeguards against setback operating (i.e. going back to normal ventilation rates), whilst the theatre is in use.
- The air change rates in theatre and preparation room are satisfactory.

- Microbiological air sampling results should be satisfactory.

## 2.3 Summary for commissioning ultraclean ventilated (UCV) theatres<sup>2</sup>

As for conventionally-ventilated theatres, new ultraclean ventilated theatres must be commissioned before being used for the first time or after substantial modifications. Commissioning is a task for both the Estates Department and the Infection Prevention and Control team. Co-operation and co-ordination between them is important. The following matters relevant to infection control should be addressed.

- The theatre interior should be checked for obvious defects.
- The airflow between a preparation room used for instrument layup and the theatre is satisfactory and the preparation room has an adequate air change rate as per HTM guidance.
- The air handling unit supplying the theatre is properly constructed, finished and functioning.
- The air velocities in the ultraclean zone are satisfactory, the terminal HEPA filter is effective and the ultraclean airflow can resist particle penetration from outside.
- The ultraclean zone resists ingress of air from outside, shown by smoke tests.
- There is little value in performing microbiological sampling in a new theatre supplied with ultraclean ventilation but if agreed locally, can still be done on a sample taken in the centre of the ultraclean zone.

## 3. **Monitoring<sup>2</sup>**

### 3.1 Conventionally-ventilated Theatres

#### 3.1.1 Routine monitoring

Provided that engineering parameters are satisfactory and regularly monitored, microbiological air sampling in conventionally-ventilated theatres need not be done on a routine basis.

Microbiological air sampling of empty, conventionally-ventilated theatres should be done either as part of an investigation into theatre-acquired infection with a possible airborne element or after any changes that may affect airflow supply rates or distribution patterns. This would include alterations to the fabric of the theatre or changes to the ductwork

distribution that may affect airflow to or within a theatre suite, but would not include routine filter changes.

Such sampling should be identical to that on initial commissioning of the theatres. Any of the above problems should be discussed with the Infection Prevention and Control Team (IPCT), who may have to consider cancellation of theatre list in discussion with theatre staff.

### 3.1.2 Sampling in a working theatre

May be indicated where use of theatre may have been possibly implicated in an increase in surgical wound infection. This should not be done as a routine exercise and would only occur following discussions with IPCT

## 3.2 UCV Theatres

### 3.2.1 Routine monitoring

This should be performed annually or following major modifications and consist of filter challenge tests, air velocity measurements, entrainment test and will be arranged by Estates. As stated previously, microbiological sampling is not required.

## 4. Action on air sampling results

Estates to forward all results to the on site Consultant Microbiologist for decision making.

Author: Consultant Microbiologist and Estates Maintenance Manager

## References

1. DH – Heating and ventilation systems, Health Technical Memorandum (HTM) 03-01: specialised ventilation for healthcare premises.
2. Hospital Infection Society : Guidance on the microbiological testing of operating theatres [www.his.org.uk/\\_db/\\_documents/OTIC-final.pdf](http://www.his.org.uk/_db/_documents/OTIC-final.pdf)  
HIS working party report

**THE NEWCASTLE UPON TYNE HOSPITALS NHS FOUNDATION TRUST**  
**IMPACT ASSESSMENT – SCREENING FORM A**

This form must be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

Policy Title:	Microbiological Air Sampling of Operating Theatres	Policy Author:	Dr M Narayanan
		Yes/No?	You must provide evidence to support your response:
1.	Does the policy/guidance affect one group less or more favourably than another on the basis of the following: (* denotes protected characteristics under the Equality Act 2010)		This policy applies equally to all irrespective of race, ethnicity, nationality, gender, culture, religion/belief, sexual orientation, age or disability
	• Race *	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender *	No	
	• Culture	No	
	• Religion or belief *	No	
	• Sexual orientation including lesbian, gay and bisexual people *	No	
	• Age *	No	
	• Disability – learning difficulties, physical disability, sensory impairment and mental health problems *	No	
	• Gender reassignment *	No	
	• Marriage and civil partnership *	No	
2.	Is there any evidence that some groups are affected differently?	No	
3.	If you have identified potential discrimination which can include associative discrimination i.e. direct discrimination against someone because they associate with another person who possesses a protected characteristic, are any exceptions valid, legal and/or justifiable?	N/A	
4(a).	Is the impact of the policy/guidance likely to be negative? (If “yes”, please answer sections 4(b) to 4(d)).	N/A	
4(b).	If so can the impact be avoided?	N/A	
4(c).	What alternatives are there to achieving the policy/guidance without the impact?	N/A	
4(d)	Can we reduce the impact by taking different action?	N/A	

<b>Comments:</b>	<b>Action Plan due (or Not Applicable): N/A</b>
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Name and Designation of Person responsible for completion of this form: Dr M Narayanan Consultant Microbiologist Date: 02/08/2011

Names & Designations of those involved in the impact assessment screening process: Dr M Narayanan Consultant Microbiologist

(If any reader of this procedural document identifies a potential discriminatory impact that has not been identified on this form, please refer to the Policy Author identified above, together with any suggestions for the actions required to avoid/reduce this impact.)

*For advice on answering the above questions please contact Frances Blackburn, Head of Nursing, Freeman/Walkergate, or, Christine Holland, Senior HR Manager. On completion this form must be forwarded electronically to Steven Stoker, Clinical Effectiveness Manager, (Ext. 24963) [steven.stoker@nuth.nhs.uk](mailto:steven.stoker@nuth.nhs.uk) together with the procedural document. If you have identified a potential discriminatory impact of this procedural document, please ensure that you arrange for a full consultation, with relevant stakeholders, to complete a Full Impact Assessment (Form B) and to develop an Action Plan to avoid/reduce this impact; both Form B and the Action Plan should also be sent electronically to Steven Stoker within six weeks of the completion of this form.*