1 Introduction

This policy has been put together to ensure that the operating theatre ventilation is optimal in order to prevent airborne micro-organisms from entering surgical wounds. In keeping with national guidance, it was necessary to review the indications and method of microbiological air sampling.

2 Scope

This policy covers the requirement for microbiological air sampling in a working theatre, commissioning of new theatres and where there has been substantial modifications to the ventilation system or fabric of the theatre. The areas covered include:

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

3 Aims

Airborne contaminants may enter an operating room via the following routes:

- 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.

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.

Microbial 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).
4 **Duties (Roles and responsibilities)**

Estates maintenance
Estates team will carry out annual PPMs. Where necessary they will liaise with IPCT for appropriate actions.

IPCT team
IPC nurses will liaise with clinical team where necessary on advice from Consultant Microbiologist and Estates where there are abnormal results.

Operating theatre leads

5 **Definitions**

Conventionally ventilated operating theatre has a supply of air to dilute airborne contamination by minimising transfer of airborne contaminants from less clean to cleaner areas, to control temperature, humidity of the space and to remove or dilute waste anaesthetic gases.

Ultra-clean ventilation system is a means of significantly increasing the dilution effect by providing a large volume of clean filtered air to the zone in which an operation is performed and sterile items are exposed. Air is discharged above the operating zone and, while not truly laminar, its downward displacement purges the clean zone of any contaminants and particles generated within it. The air flow in and around the clean zone also serves to prevent particles originating outside the zone from entering.

Ultra clean air is defined as that containing not more than 10 cfu/m$^3$.

6 **Microbiological sampling in conventional operating theatres**

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 1 m above floor level should then be activated remotely to sample 1 m$^3$ (10000 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$^3$).**

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.
6.1 Commissioning

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.

6.1.1 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

6.1.2 Summary for commissioning ultraclean ventilated (UCV) theatres

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.

### 6.2 Monitoring

#### 6.2.1 Conventionally-ventilated Theatres

**6.2.1.1 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.

**6.2.1.2 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.

#### 6.2.3 UCV Theatres

**6.2.3.1 Routine monitoring**
This should be performed annually of 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.

6.3 Action on air sampling results

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

7 Training

As applicable to estates and IPCT.

8 Equality and diversity

The Trust is committed to ensuring that, as far as reasonably practicable, the way we provide services to the public and the way we treat our staff reflects their individual needs and does not discriminate against individuals or groups on any grounds. This policy has been appropriately assessed.

9 Monitoring compliance with this policy

Estate assigned Engineer is responsible for audit checks and alert IPCT of exception reports that can be actioned upon

<table>
<thead>
<tr>
<th>Standard/Process/Issue</th>
<th>Monitoring and audit Method</th>
<th>By</th>
<th>Committee</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM</td>
<td>As implemented by Estates programme</td>
<td>Estates</td>
<td>IPCC</td>
<td>Yearly or as required</td>
</tr>
</tbody>
</table>

10 Consultation and review

Through Trust policy ratification process and IPCC

11 Implementation (including raising awareness)

This policy will be communicated to all Trust staff who undertake this procedure. The policy will be made available on the intranet.

12 References

- DH – Heating and ventilation systems, Health Technical Memorandum (HTM) 03-01: specialised ventilation for healthcare premises

**The Newcastle upon Tyne Hospitals NHS Foundation Trust**

**Equality Analysis Form A**

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

**PART 1**

1. **Assessment Date:** 26/5/16

2. **Name of policy / strategy / service:**
   - Microbiological Air Sampling of Operating Theatres Policy

3. **Name and designation of Author:**
   - M Narayanan, Consultant Microbiologist

4. **Names & designations of those involved in the impact analysis screening process:**
   - NA

5. **Is this a:**
   - Policy Y
   - Strategy
   - Service

   **Is this:**
   - New
   - Revised Y

   **Who is affected:**
   - NA
   - Employees
   - Service Users
   - Wider Community

6. **What are the main aims, objectives of the policy, strategy, or service and the intended outcomes?** (These can be cut and pasted from your policy)

   - Guidance for air sampling in operating theatres for commissioning and PPM.

7. **Does this policy, strategy, or service have any equality implications?**

   - Yes
   - No Y

   If No, state reasons and the information used to make this decision, please refer to paragraph 2.3 of the Equality Analysis Guidance before providing reasons:

   - Used by Estates and Infection Control for theatre maintenance and guidance purposes only
8. Summary of evidence related to protected characteristics

<table>
<thead>
<tr>
<th>Protected Characteristic</th>
<th>Evidence, i.e. What evidence do you have that the Trust is meeting the needs of people in various protected Groups</th>
<th>Does evidence/engagement highlight areas of direct or indirect discrimination? If yes describe steps to be taken to address (by whom, completion date and review date)</th>
<th>Does the evidence highlight any areas to advance opportunities or foster good relations. If yes what steps will be taken? (by whom, completion date and review date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race / Ethnic origin (including gypsies and travellers)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (male/ female)</td>
<td>NA</td>
<td></td>
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<tr>
<td>Religion and Belief</td>
<td>NA</td>
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<td></td>
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<tr>
<td>Sexual orientation including lesbian, gay and bisexual people</td>
<td>NA</td>
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</tr>
<tr>
<td>Age</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability – learning difficulties, physical disability, sensory impairment and mental health. Consider the needs of carers in this section</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender Re-assignment</td>
<td>NA</td>
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<tr>
<td>Marriage and Civil Partnership</td>
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<tr>
<td>Maternity / Pregnancy</td>
<td>NA</td>
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</tbody>
</table>

9. Are there any gaps in the evidence outlined above? If ‘yes’ how will these be rectified?

NA

10. Engagement has taken place with people who have protected characteristics and will continue through the Equality Delivery System and the Equality Diversity and Human Rights Group. Please note you may require further engagement in respect of any significant changes to policies, new developments and or changes to service delivery. In such circumstances please contact the Equality and Diversity Lead or the Involvement and Equalities Officer.

Do you require further engagement? Yes [ ] No [√]

11. Could the policy, strategy or service have a negative impact on human rights? (E.g. the right to respect for private and family life, the right to a fair hearing and the right to education?)

No
PART 2

Name: M Narayanan

Date of completion: 26/5/16

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