Original Article

Bacterial atmospheric contamination during routine dental activity

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Abstract

Routine dental procedures cause atmospheric bacterial contamination in the dental clinic and laboratory. This environmental hazard, quantified by the Air Microbial Index, was shown in our study to be directly related to aerosol creating instruments and ventilation.

Key words

Dental cross-contamination, atmospheric bacterial contamination, air microbial index

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Introduction

Increased atmospheric bacterial contamination during routine dental activity has been assumed and scientifically established for some time.[1, 2] Aerosol creating instruments are known to be the main cause, and recent attempts to quantify this environmental hazard have shown the seriousness of this potential cross-contamination.[3]

The level of air born bacterial pollution generated during routine activity is attributed to the following factors. [1-7]

1. Ventilation
2. Intra-oral aerosol creating instruments
   - Hand pieces
   - Ultra sonic scalers
   - Three-in-one syringe
   - Intra-oral polish
3. Laboratory polishing

The aim of this study was to determinate the Air Microbial Index (AMI) [4] during routine dental activity at the Dental Department, St. Luke's Hospital, G'Mangia, Malta.

Materials and methods

Locations selected to determine the AMI were:

1. The University Dental Clinic during a conservation session.
2. The Admissions and Local Anaesthesia Minor Oral Surgery (Screening) Clinic.
3. The Dental Hygiene Clinic.
4. The Dental Laboratory – 1 meter away from the polishing lathe.
5. The inter-connecting corridor - The plates were placed on top of metal shelves 2 meter high.

The AMI was measured in locations 1 to 3 by exposing Standard Plate Count Agar plates (Oxoid, UK) on a static work surface, which was marked, one meter from the patient's mouth on the dental chairs. Two plates were left open for the two times where most visitors are present. The plates were left open to the air for two hours on 10 separate days over a 5-week period between August and October 1999, making a total of 100 samples. On each occasion the plates were placed in the same marked position.

Table 1: *Qualitative evolution of the air in relation to static sampling (AMI method)*[4]

AMI	*Condition*
0-25	Good
26-50	Mediocre
51-75	Bad
Over 75	Very Bad

Table 2: *AMI from selected sites (n=100)*

Site	*Mean AMI (CFU/cm³)*
University Dental Clinic	218
Screening Clinic	98
Dental Hygiene Clinic	282
Dental Laboratory	100
Corridor	185

Table 3: Air-dispersed Mean AMI (1 hour)[3]

Before Dental Activity	51
During Dental Activity	166
1 hour After Dental Activity	57

One plate was subsequently incubated at 37°C in a CO_2 incubator (5 to 7% CO_2) for 48 hours. The other plate was incubated for the same time in anaerobic atmosphere using an anaerobic jar (Oxoid, UK). The numbers of colony forming units per cubic meter, CFU/cm³, were counted using a colony counter fitted with a magnifying glass and presented as AMI.

Results and discussion

The results obtained were defined from a hygienic point of view for the hospital environment using the index employed by Pizzura *et al* (Table 1).[4]

Our results, Table 2, show "very bad" bacterial contamination levels at all sites.

Except for the bacterial contamination in the inter-connecting corridor, these counts were as expected corresponding to levels reported in the literature. Legnani[3] reported that during dental activity, because of the aerosol contamination produced, the air in the majority of their samples (81%) were very bad. By way of direct comparison the values of Legnani, for an exposure of 1 hour, as opposed to our 2-hour exposure are reproduced in Table 3.

It has been reported that the AMI values return to pre-treatment levels quite rapidly, however the majority of these levels fall within the mediocre band. A small percentage (13%) fell within the very bad hygiene levels at the beginning of treatment. It was further pointed out that aerosol produced contamination is fairly homogenous even at some distance from the patients mouth.[3]

The differences in the level of air borne bacterial contamination recorded from different sites in our study are accounted for hereunder.

The highest level was in the Oral Hygiene Clinic, 282 CFU/cm³, where patients with inflammatory periodontal conditions are treated with ultra sonic aerosol producing instruments; the ventilation in this clinic is mediocre.

The second highest levels were recorded in the University Dental Clinic, 218 CFU/cm³, where patients were undergoing conservation treatment involving aerosol producing hand pieces.

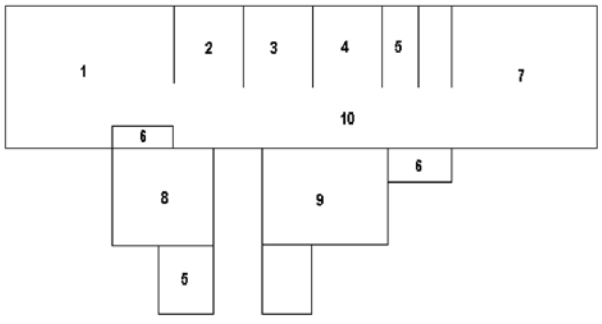
In line with expectations for clinical areas, the Admission and Local Anaesthesia Clinic recorded the lowest levels (98 CFU/cm³). Here virtually no aerosol producing instruments are used and the clinic well ventilated.

The results from the Dental Laboratory, 100 CFU/cm³, cannot be compared with other studies since none were available when the study was conducted. However given the good ventilation and given that the only source of airborne bacteria is polishing with contaminated pumice it was felt that the levels recorded were high[6,7]. A further contribution can be attributed to the high ambient levels recorded in the inter-connecting corridor, 185 CFU/cm³. The latter can only be accounted for by the lack of ventilation. Plan A shows a schematic diagram of the Dental Department at St. Luke's Hospital.

Plan A

This study formed part of a wider investigation into cross-contamination, in which a number of bacteria were isolated from dental appliances Table IV. These and other contaminants would be present as air pollutants.

Plan A: *The Dental Department St Luke's Hospital*



1 University Dental Clinic
2 Conservation Room
3 Consultation Room 1
4 Consultation Room 2
5 Office
6 Store
7 Dental Laboratory
8 Screening Clinic
9 Dental Hygiene Room
10 Inter-Connecting Corridor

Conclusions

Cross contamination by air borne bacteria occurs as a result of routine dental activity where hand pieces are in operation.

Provision of good ventilation is an important preventive measure.

As far as possible aerosol related dental treatment likely to increase atmospheric contamination should be delayed in patients with active oral inflammatory conditions and pre-operative antiseptic mouth rinses prescribed.

The commonest identifiable health hazard reported for members of the dental team and patients are reported conjunctivitis and respiratory disorders[2, 4]. However communicable disease also poses a health hazard for the dental team.

The recommended infection control protocol, including the use of eye protection for members of the dental team and patients should be adhered to.[4, 10]

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