Additional precautions for tuberculosis and a self assessment checklist

Tuberculosis – additional precautions for infection control

Active pulmonary tuberculosis appears now to be increasing. The prevalence of the disease in various countries in 1994 is set out in Table 1.

The principles of infection control set out in the Infection Control Summaries, are the foundation of infection control and should always be observed. However, the additional precautions described in this summary are needed to prevent the transmission of pulmonary tuberculosis in the clinical, dental environment and to protect dental clinicians and members of the dental team.

The mycobacterium responsible for tuberculosis, Mycobacterium tuberculosis, is transmitted in airborne droplets, originating from persons with active pulmonary or laryngeal tuberculosis. Coughing, in particular, produces substantial quantities of infected droplets and on occasions, infected sputum, which if inhaled by others readily facilitates the transmission of tuberculosis. Other mycobacteria, Mycobacterium avium-intracellulare and Mycobacterium kansaii are also important causes of similar pulmonary diseases in humans.

*M. tuberculosis* is a particularly potent pathogen and only small numbers of these mycobacteria, when inhaled, are required for the transmission and establishment of the pulmonary form of the disease. The lungs are a highly susceptible site for establishment of tuberculosis.

In addition to pulmonary tuberculosis other forms of tuberculosis occur; for example intestinal tuberculosis, transmitted by *M. tuberculosis* in infected milk, and tuberculosis of bones and joints. While non-pulmonary tuberculosis is serious, it is considerably less contagious than pulmonary tuberculosis. Immunosuppression, associated either with age or with another infection, often viral, increases susceptibility to tuberculosis.

Aerosols generated during dental treatment provide a vehicle for the transmission of tuberculosis and a

<table>
<thead>
<tr>
<th>Country</th>
<th>Prevalence per 100,000 pop.</th>
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<tbody>
<tr>
<td>Australia</td>
<td>5.6</td>
</tr>
<tr>
<td>United States</td>
<td>9.8</td>
</tr>
<tr>
<td>England and Wales</td>
<td>17.2</td>
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<tr>
<td>India</td>
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<tr>
<td>China</td>
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<td>Philippines</td>
<td>94.7</td>
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This is the sixth, and last, in our series on infection control. The series has proved to be very popular having been translated into at least five languages and reproduced in dental journals around the world. Here, Dr Woods describes the additional precautions required for treating patients with active tuberculosis, a disease once again on the increase worldwide. In addition, to round off the series, we provide a comprehensive checklist for dental practice.
susceptible new host can readily contract pulmonary tuberculosis by this route. Prevention of transmission of tuberculosis employs measures to prevent inhalation of infected airborne material, usually infected droplets exhaled or coughed from diseased lungs.

Survival of M. tuberculosis outside the body is short, while the thermal death point of the organism is 60°C for 15–20 minutes; it can readily be killed by heat disinfection (boiling water) or steam pressure sterilisation (autoclaving). Use of crockery, cutlery and bed linen used by those with tuberculosis is not considered a risk as tuberculosis bacilli are killed by normal machine dish-washing and laundering procedures which employ hot water and a detergent. Soiled waste and linen should be handled in the usual way described in universal or general precautions.

**Clinical features**

The essential clinical features of pulmonary tuberculosis are:

- fatigue, weight loss, fever, night sweats;
- productive cough (pulmonary infiltrates on chest radiograph);
- in most cases positive tuberculin skin test reaction;
- acid fast bacilli on sputum smear;
- sputum culture positive for M. tuberculosis

**Conditions predisposing persons to tuberculosis**

Crowded urban living conditions, homelessness, drug abuse and poor health care favour the spread of tuberculosis.

Immunosuppression occurs with viral infections, and is particularly associated with the human immunodeficiency virus (HIV) with or without the development of the acquired immune deficiency syndrome (AIDS). Infection with HIV has emerged as a very important risk factor for developing tuberculosis.

**Additional precautions for dental treatment of patients with active tuberculosis**

- Universal or general procedures for infection control should always be observed, however additional infection control procedures must also be observed when treating patients with active tuberculosis.
- Dental treatment for those with active tuberculosis should be restricted to non-elective procedures. Only urgent and absolutely necessary procedures should be undertaken, for instance treatment of acute facial and oral infections, acute pulpitis, trauma and bleeding. These procedures should be kept as simple as possible.
- Treatment should be carried out in a surgery equipped with effective air evacuation to the outside of the building, and with high volume suction to minimise any aerosol arising from the use of turbine burs. Where possible treatment of those with active tuberculosis is best undertaken in an appropriately equipped institution.
• Portable suction units should not be used as they recirculate air contaminated with *M. tuberculosis*.
• Rubber dam may be used to minimise contaminated aerosol however, if coughing occurs rubber dam should not be used.
• Long sleeved gowns should be worn as they provide good protection for clinicians from contamination and can be autoclaved or discarded after use. Gloves should be cuffed and the cuff drawn over the cuffs of the gown. Eye protection and caps or other suitable hair protection should be worn.
• After treatment all instruments should be collected, cleaned and prepared for sterilisation. The preferred method for sterilisation is by steam under pressure (autoclave).
• Immediately following treatment and instrument collection, cleaning and preparation for sterilisation, outer garments should be collected, bagged and autoclaved, or if disposable, destroyed.
• From commencement of treatment until the conclusion of treatment and cleaning of the surgery or treatment room clinical staff should not leave the treatment area.
• Disinfection of environmental surfaces and equipment should be performed in the usual way with an agent which is effective against *M. tuberculosis (Infection Control Summary No. 4).*
• Infectious or contaminated waste should be managed in accordance with the guidelines already published. Where waste management is regulated by a government authority these regulations should be observed.
• In addition to the special or additional precautions set out, universal or general precautions already described in this series of *Infection Control Summaries*, should be employed.

• Before treating patients with active pulmonary tuberculosis, dentists and their clinical assistants should be aware of their own tuberculosis immune status.
• Dentists and clinical staff providing treatment for active tuberculosis patients should have established tuberculosis immunity.

**Model ventilation for infection control**

A minimum of six total air changes per hour (including at least two outside air changes per hour) is required, plus good air circulation within the room to dilute and to remove tuberculosis bacilli from the dental clinical area.

The direction of the air flow should be into the clinical area from the building (by creating negative pressure) to minimise the opportunity for spread of tuberculosis bacilli to the non-clinical areas of the health care facility. The air direction can be monitored with flutter strips.

Air from the room should be exhausted to the outside of the building and directed away from air intake vents or windows. To maintain airflow direction doors to the clinical areas should be kept closed from the commencement of treatment until after treatment is complete.

**Particulate masks for treating sputum positive persons**

Those involved in the treatment of persons with active pulmonary tuberculosis should wear a particulate filter mask which provides a face-seal leakage of less than 10 per cent, and greater than 95 per cent efficiency in filtering one micron particles.

If a patient being treated needs to leave the room for any reason during treatment, he or she should wear a particulate filter mask while outside the clinical area.

**Infection Control Checklist – Infection control self assessment**

Dentistry is a predominantly clinical discipline and wherever clinical dentistry is practised there is potential for transmission of infection from patient to patient, from clinician to patient, or from patient to clinician. The process and procedures for control of cross infection aims at creating a barrier to prevent transmission of infection and to make clinical dentistry safe from the threat of being a source of transmission of infection.

A list of factors to be considered when assessing the effectiveness of infection control measures in dental practice, is set out. This checklist has been developed by modification of the pre-infection control audit conducted in South Australia under the auspices of The Australian Medical and Australian Dental Associations (AMADA).

The pre-audit checklist sets out the principal factors to be considered when the normal AMADA infection control audit and assessment is made. Practitioners are given the checklist some time prior to the audit to assist them to make their own assessment of their infection control practise and to correct their infection control procedures.

This checklist has been developed from the AMADA checklists and has been amended to be suitable for wide application in varying conditions and circumstances of practice. Not all the factors listed will apply to any one practice, a selection of factors should be considered, consistent with the practice treatment profile. The checklist is intended to be a guide and is based on current infection control practice in Australia. Some factors listed may not be in agreement with established practice elsewhere. Where differences exist alternative procedures which have been shown to be effective and meet local requirements or are included in national guidelines for infection control, are acceptable.
Infection Control Checklist

Factors for consideration in infection control audit

1. Environment
   1.1. A clean environment
   1.2. Clinical area is uncluttered and can readily be cleaned
   1.3. Detergent is used for environmental surface cleaning
   1.4. Work surfaces are non-porous to permit efficient cleaning
   1.5. Floor suitable for dental clinical practice
   1.6. Maintenance programme for air-conditioners
   1.7. Reasonable separation of compressor air inlet from suction exhaust
   1.8. Anti-retraction values on all liquid (water) lines at terminal end of line
   1.9. Oxygen and nitrous oxide equipment cleaned after use, masks and tubing protected from contamination

2. Hand Washing Facilities
   2.1. Separate hand washing and instrument decontamination sinks
   2.2. Hygiene taps of suitable design to prevent cross infection in hand washing sink
   2.3. Availability of hot and cold running water
   2.4. Tap filters or accelerators cleaned regularly (monthly)
   2.5. Plain soap available for hand washing
   2.6. Antimicrobial hand washing agent for washing hands prior to gloving for invasive procedures
   2.7. Single use towels to dry hands

3. Waste Disposal
   3.1. Medical waste (sharps, containers of body fluid, recognisable human tissue) not placed in general domestic waste
   3.2. Appropriate disposal of sharps in approved containers
   3.3. Sharps containers located to minimise risk to patients and to staff (out of reach of children and close to the point of use)
   3.4. Sharps containers processed correctly when full, where possible being delivered to a recognised disposal or reprocessing facility
   3.5. Correct disposal of chemical waste where appropriate in accordance with governmental regulations

4. Linen And Laundry
   4.1. Outer clothing changed as appropriate
   4.2. Heavily soiled linen (including outer clothing and drapes) treated as contaminated and transported in properly marked leak-proof bags
   4.3. Non-sterile linen (including outer clothing) to be laundered separately from any domestic laundry using hot water and a suitable detergent
   4.4. Sterile linen to be laundered before being packed and sterilised

5. Personal Protective Equipment
   5.1. Sterile, single use gloves available for invasive (surgical) procedures
   5.2. Non-sterile, single use gloves available for contact with saliva, blood, wounds, mucus membrane and other body fluids or excrement
   5.3. Disposable gloves discarded after each patient
   5.4. Availability of utility gloves for cleaning including instrument cleaning
   5.5. Availability of protective eye wear and masks or face shields for procedures where there is a risk of aerosols or blood splatter
   5.6. Protection of patients with proper eye wear during dental procedures
   5.7. Protective apparel (gowns, aprons etc.) worn for procedures that are likely to cause splashing of blood, saliva or other body fluid splatter
   5.8. Cleaning and maintenance of reusable protective apparel
6. Pathology Services

6.1 Specimens and samples (including exudate, blood or saliva samples), sealed and labelled according to postal or courier regulations or requirements

6.2 Specimens stored suitably prior to transport

7. Medication Administration

7.1 Sterile injecting equipment used for medication administered by injection

7.2 Single use needles and syringes discarded and if necessary, destroyed after use

7.3 Reusable needles and syringes cleaned and sterilised after use using either steam pressure (autoclave) or dry heat (oven) and stored to maintain in sterile condition until use. Chemical solutions should not be used for sterilisation of injection equipment.

7.4 Sharps, and contaminated needles which are uncapped, should not be passed hand to hand

7.5 Used needles should never be recapped unless using a mechanical device or a single handed technique

7.6 Medication including drugs should be taken from a single use or dose container, for instance a single dose carpule, cartridge, vial or ampoule

7.7 Medications including drugs should not be used after their expiry date

7.8 Bulk solutions for irrigation should be appropriately dispensed, sterile bulk solutions dispensed (used for instance during surgery) using a sterile technique

8. Surgical Procedure

8.1 Availability of sterile drapes and surgery tray or table covers

8.2 Availability of sterile surgery instruments

8.3 Availability of sterile outer apparel, surgery gowns with sleeves and cuffs

8.4 Supply of correct size sterile surgery gloves

8.5 Appropriate eye protection, masks and hair protection (caps) available

8.6 Where appropriate availability of sterile surgery handpieces and burs and sterile water, or other sterile solution for irrigation

8.7 Provision of suitable suction which can be cleaned and disinfected, and suction tubes and sucker attachments which can be cleaned and sterilised

8.8 Provision of surgeon’s waste bag

9. Equipment/Instrument Cleaning And Disposal

9.1 All single use items discarded at the point of use and not reprocessed

9.2 Contaminated (or dirty) items separated from clean items

9.3 Designated cleaning areas with adequate bench space for an appropriate flow pattern to avoid recontamination of equipment or instruments being reprocessed

9.4 Protective attire including gloves worn when reprocessing instruments or equipment

9.5 Where appropriate, items of equipment or instruments to be dismantled prior to cleaning

9.6 Use of a suitable detergent for cleaning

9.7 Cleaning techniques should minimise splashing

9.8 Items of equipment or instruments cleaned to remove all visible soiling, rinsed, dried and stored either for packing and sterilising or until needed

9.9 Steel wool and abrasive powders or materials not used

9.10 After cleaning, equipment and instruments inspected for cleanliness

9.11 Equipment tested after cleaning to ensure proper function

9.12 Enzyme cleaners not used as an alternative to mechanical cleaning

10. Dental Instruments and Equipment

10.1 All handpieces cleaned, lubricated and sterilised after use in accordance with manufacturers’ instructions

10.2 Impressions and prosthetic items rinsed under running water, detergent applied and washed again

10.3 All materials transported to laboratories, cleaned and disinfected for transportation

10.4 Instruments and equipment, for instance handpieces, sterilised and packed before being sent for repair or maintenance
10.5 □ Pumice dispensed in units and disposable liners used for polishing shields
10.6 □ Prosthetic laboratory brushes and mops cleaned, and boiled or autoclaved after each use
10.7 □ High speed handpiece and air/water syringes run to discharge water and air for 30 seconds after use for each patient
10.8 □ Air/water syringe tips – single use or sterilised after use
10.9 □ Availability of sterile surgical instrument packs, drapes and instrument covers, and surgical suction units
10.10 □ Availability of appropriate sterile outer apparel for surgery or other invasive procedures as required
10.11 □ Appropriate air exhaust systems in place

11. Ultrasonic Cleaners

11.1 □ Awareness of risks associated with submersion of any part of the body during operation of the ultrasonic cleaner
11.2 □ Equipment rinsed of blood and other visible soiling before immersion
11.3 □ Only detergents approved by the manufacturer used
11.4 □ Lids closed during operation
11.5 □ After processing, instruments rinsed in clean, hot water and dried
11.6 □ Maintenance:
   • solution changed daily or more frequently if needed
   • efficacy test – foil test or approved alternative
   • performed daily and result recorded

12. External Instrument Processing

12.1 □ Arrangements for external processing of instruments with an accredited facility capable of providing correctly packed and sterilised instruments and equipment as required

13. Steam Pressure Sterilisers (autoclaves) – Factors for consideration

13.1 □ Operator manual available close to steriliser
13.2 □ Steriliser without drying cycle
   • used for processing unwrapped items (and small, single wrapped instruments) only
   • dry storage of sterilised items
   • provision for re-sterilisation if items used for invasive procedures
   • for small wrapped items residual steriliser heat may be used to dry packs after opening door slightly
13.3 □ Steriliser with drying cycle
   • used for processing wrapped or unwrapped items
   • items should be removed dry from steriliser after completion of drying cycle which should be completed with door closed
   • correct storage for sterilised packages
13.4 □ Packaging of instruments for sterilisation
   • correct steam-penetrable materials used
   • textile wraps laundered prior to reuse
   • felt tip pen or stamp to date and identify package contents
   • correct sealing of sterilising bags and laminated pouches
   • integrity of package checked prior to use
13.5 □ Documented evidence of monitoring and maintenance programme
   • annual calibration of gauges
   • biological tests performed weekly, also on installation, after maintenance and when investigating abnormalities observed with mechanical and chemical monitoring
   • appropriate chemical indicators for each load
   • provision to monitor each sterilising cycle (time, temperature and pressure)
   • cleaning schedules and cleaning recorded

14. Dry Heat Sterilisers (ovens)

14.1 □ Operator manual available near steriliser
14.2 □ Packaging instruments
   • correct packaging material used
   • felt tip pen or stamp to date and identify package contents
   • correct sealing of sterilising bags and laminated pouches
   • integrity of package checked prior to use
14.3 Documented evidence of monitoring and maintenance programme
   • annual calibration of gauges
   • biological tests used weekly, also on installation, after maintenance and when investigating abnormalities
   • observed with mechanical and chemical monitoring
   • appropriate chemical indicators for each load
   • provision to monitor each sterilising cycle (time and temperature)
   • cleaning schedules and cleaning recorded

15. Thermal Disinfection (hot water boilers)
15.1 Items correctly cleaned prior to immersion
15.2 Items boiled for correct time (5 minutes) time recorded
15.3 No item or instrument added during thermal disinfection cycle time
15.4 Cleaning schedule and cleaning recorded

16. Chemical Disinfection
16.1 Usage should only be for appropriate instruments and equipment based on nature of contamination
16.2 Availability of suitable and appropriate personal protective equipment (including gauntlet length nitrile gloves and 
vapour extraction if glutaraldehyde is used)
16.3 Storage of chemical disinfectant in sealed containers
16.4 Instruments properly cleaned, rinsed and dried prior to immersion in disinfecting chemical solution
16.5 Manufacturer's instructions observed for proper use of disinfecting chemical (dilution, preparation, time for 
disinfection and disposal)
16.6 Correct immersion time
16.7 Thorough rinsing after disinfection to remove all traces of chemical disinfectant
16.8 Correct disposal of chemical (where local regulations apply they should be observed)

17. Instrument and Equipment Storage
17.1 Correct maintenance of storage areas
17.2 Storage for clean, but unwrapped items
17.3 Storage of sterile, wrapped items
17.4 Storage of prepared, wrapped and sterilised trays or instrument packs
17.5 Expendable, single use supplies stored and dispensed appropriately
17.6 Stocks of stored instruments consistent with practice usage and practice profile of activity

18. Practitioners and Staff
18.1 Courses completed or available, which include infection control procedures for dental practice
18.2 Assessment of clinical staff’s knowledge and competence in infection control including instrument preparation 
and sterilising procedures
18.3 Availability of infection control information, for instance manuals, books, journal articles and video tapes

19. Documentation
19.1 Written infection control policy
19.2 Infection control procedure manual
19.3 Immunisation policy
19.4 Maintenance of staff immunisation records, including immune status
19.5 Information for management of sharps injury
19.6 Policy for management of blood and other body fluid exposure
19.7 Records of courses undertaken by staff
19.8 Regular review of policies and procedures
Acknowledgement

Additional precautions for infection control for tuberculosis and the Infection Control Checklist were prepared with assistance of Dr Elizabeth Coates (South Australia Dental Service, Adelaide)

References


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