

## Disinfection Methods of Extracted Human Teeth

Nikita V Lolayekar, Vidya Bhat S, Sham S Bhat

### ABSTRACT

Extracted human teeth are routinely used for educational purposes in dental institutions. In recent years infection control guidelines have been revised due to the possibility of cross-contamination from these extracted teeth. This study was done to determine the efficacy of some commonly used methods for disinfection/sterilization of extracted human teeth.

**KEY WORDS :** Extracted Teeth, Disinfection, Sterilization

### Contact Author

*Dr. Nikita V Lolayekar*

E-mail : [nikita2882@yahoo.co.in](mailto:nikita2882@yahoo.co.in)

*J Oral Health Comm Dent 2007;1(2):27-29*

Extracted teeth are routinely used in dentistry to learn technical and preclinical skills before entering clinics and treating patients. Even though some endodontic procedures can be taught conceptually using manufactured instructional materials such as artificial plastic blocks and teeth on manikins and models, there are instances when you cannot substitute extracted teeth i.e. for examination, preparation or research.

Extracted human teeth are also used in vitro laboratory dentin bonding research, before clinical trials ultimately decide their clinical effectiveness.(1)

Therefore, in recent years infection control guidelines in dental institutions have been revised due to the possibility of cross-contamination from extracted teeth. Directives by the American Dental Association and the Centre for Disease Control (2003) call for thorough removal of any organisms capable of transmitting disease from non-disposable items used in patient care; including those materials used in simulated care that may have come in contact with blood or saliva and both these body fluids are associated with teeth that are routinely used by us.(1) The Centre for Disease Control has recommended the decontamination of extracted teeth for use in the dental education setting, to minimize the risk of transmission of blood-borne pathogens.(2)

### Hazards of Cross Contamination(3)

The spread of aerosols generated during dental procedures has been well documented.

- Stevens (1963) found that bacterial colonies grew on plates placed in the area of the dentists' nose and mouth while performing dental procedures with an air turbine handpiece.

- Belting *et al* (1964) obtained cultures of mycobacterium tuberculosis on media placed at various distances from active tuberculosis patients' mouths while the dentist operated the air rotor handpiece in their oral cavities without cutting tooth structure. The water-off method produced almost twice as many colonies as the water-on method. The highest concentration of bacteria was found in front of the mouth of the patient, no matter which method was used.
- Larato *et al* (1966) found that during a 1.5 to 5 min cavity excavation, organism counts found in the operatory increased by 2,200% and the type of organisms also increased.
- Miller and Mick (1978) reported that 42% of one dental class converted to tuberculin positive between their freshman and senior years. The death rate of practicing dentists in the U.S due to respiratory illness was 113% of the general population between 1968 and 1972.
- Council on Dental Materials *et al*, 1988 said that these airborne microorganisms may cause infectious diseases such as the common cold, pneumonia, tuberculosis, herpes, hepatitis B and AIDS.

Although the hazards noted in the previous studies pertain to in vivo conditions, an investigator preparing an extracted tooth for test purposes maybe exposed to the same potential health hazards. This is particularly true when the investigator feels it necessary to use freshly extracted teeth to simulate in vivo conditions.

Human teeth are therefore to be treated as a potential source of blood-borne pathogens according to U.S. OSHA (Department of Labor, 1991).(3)

Several chemicals have been tried for disinfection/sterilization of extracted human teeth with varying success. At present, there is no specific recommendation for sterilization of extracted human teeth used in dental technique course.(1) Also, while there has been no report of transmission of diseases with extracted teeth, sterilization of teeth used in the teaching laboratory should be a concern.(4)

### Aims of the study

To determine efficacy of commonly used methods of disinfection/sterilization of extracted human teeth.

### Materials & Methods

Evaluation of efficacy of commonly used methods of disinfection/ sterilization of extracted human teeth:

80 freshly extracted human teeth were obtained and stored in sterile saline till tested. The teeth included were intact, non-carious and extracted due to periodontal disease or for orthodontic purpose. The teeth were randomly divided into one of the following 8 groups consisting of 10 teeth in each group.

- Group 1: 10% Formalin
- Group 2: 3% Hydrogen Peroxide
- Group 3: 5.25% Sodium Hypochlorite
- Group 4: 2% Glutaraldehyde
- Group 5: 0.1% Thymol in distilled water
- Group 6: Boiled in water for 20 minutes
- Group 7: Autoclaved at 121°C, 15lbs psi x 30 minutes
- Group 8: Control, in which teeth were immersed in normal saline.

All teeth were immersed in separate bottles containing 10 ml of the disinfectant for 7 days at 25°C.

Following the assigned treatment procedures, teeth from each group were placed individually in separate test tubes containing 10ml of tryptic soy broth at 37°C for 48 hours. Evidence of growth was observed after 2 days. No visible growth in the broth was considered effective disinfection/ sterilization.

**Table 1: Comparison of different methods used and teeth disinfected/sterilized**

Type of treatment done	Duration	No. of teeth studied	No. of teeth disinfected/sterilized
10% Formalin	7 days	10	10
3% Hydrogen Peroxide	7 days	10	7
5.25% Sodium Hypochlorite	7 days	10	10
2% Glutaraldehyde	7 days	10	2
0.1% Thymol in distilled water	7 days	10	0
Boiled in water	20 minutes	10	6
Autoclaved (121°C, 15lbs psi)	30 minutes	10	10
Normal saline	7 days	10	0

## Results

### Discussion

Since extracted human teeth may harbor potential pathogens, disinfection/ sterilization of extracted human teeth in the teaching laboratory is important for educators and students. Further, bacteria can remain viable within the root canal of tooth for extended period of time.

Difficulties do exist in the use of extracted human teeth because:

- They are grossly contaminated
- Difficult to sterilize because of their structure and
- Maybe damaged or altered by the sterilization procedures.(1)

But we have to “handle teeth with care” because many blood borne pathogens maybe present in pulp, radicular and periradicular tissue of extracted human teeth. Furthermore if lab preparation is done without a liquid coolant, there is greater probability of exposure to pathogenic organism in the lab area. Certainly then, the risk exits for the spread of contagion, both, through aerosol and accidental puncture wounds that might occur with dental instruments during handling. (1)

The difference in effectiveness of the methods tested could also be due to:

- Poor penetration of agents into the pulp space
- Inactivation of disinfectants by the organic substances present in the teeth.(1)

Although in our study 10% Formalin, 5.25% Sodium Hypochlorite and autoclaving were able to sterilize all the teeth, each method does have its drawbacks:

- Formalin is hazardous, irritant and a potential carcinogen.(1) But when used its recommended the container holding the teeth should be opened only under a fume hood and the teeth should be rinsed prior to their use. Impervious gloves and goggles should be used to prevent skin and eye exposure.(4)
- It has been reported that sodium hypochlorite may increase enamel porosity by deproteinization and alter dentin structure, by removing or modifying the proteic matrix, which could invalidate the use of teeth stored in this solution.(5)
- With regards to autoclaving, there is concern about its use for sterilization of extracted teeth with amalgam restorations as it may release mercury vapors in the air through autoclave exhaust and residual mercury contamination of the autoclave.(1) It is also possible that the thermal cycling may cause teeth with amalgam restorations to fracture due to their differences in co-efficient of thermal expansion.(4)

### Conclusion

Dental students and dental investigators who use extracted teeth for learning and research purposes are thus exposed to

**Table 2: Infection control guidelines for use of extracted teeth in dental educational settings(6)**

- Extracted teeth used for the education of dental health care workers should be considered infective and classified as clinical specimens because they contain blood.
- All persons who collect, transport or manipulate extracted teeth should handle them with the same precautions as a specimen for biopsy.
- Before extracted teeth are manipulated in dental educational exercises, the teeth first would be cleaned of adherent patient material by scrubbing with detergent and water or by using an ultrasonic cleaner.
- Teeth should then be stored, immersed in a fresh solution of sodium hypochlorite (household bleach 1:10 with tap water) or any liquid chemical germicide for clinical specimen fixation. [However a study by Tata and White demonstrated it to be a poor disinfectant for this purpose].(4)
- Persons handling extracted teeth should wear gloves. Gloves should be disposed off properly and hands washed after completion of work activities. Additional personal protective equipment e.g. face shield or surgical mask and protective eyewear should be worn if mucous membrane contact with debris or spatter is anticipated when the specimen is handled, cleaned or manipulated.
- Work surfaces and equipment should be cleaned and decontaminated with an appropriate liquid chemical germicide after completion of work activities.

potentially harmful organisms and need to follow infection control guidelines whenever extracted teeth are handled.(3) Also, because preclinical educational exercises simulate clinical experiences, students enrolled in dental educational programs should adhere to standard precautions in both preclinical and clinical settings.(6)

In this study we found 10% Formalin, 5.25% Sodium Hypochlorite and autoclaving were the most effective; but previous studies recommend formalin and autoclaving because they are simple, cheap and suitable for routine use in preclinical courses, exercises and research purposes. Further, both treatments can effectively destroy all kinds of microorganisms, including viruses. They also do not alter the “feel” and cutting characteristics of the teeth which were not assessed in our study but will be done at a later stage. This observation is supported by earlier studies on functional characteristics of sterilized human teeth.(1)

So keeping all the above mentioned facts in mind, extracted human teeth must be handled with utmost care!

## Acknowledgements

**Dr. Chaitanya Shanbhag**, Post Graduate student, Department of Periodontics, Yenepoya Dental College Hospital, Mangalore.

## THE AUTHORS

### Dr. Nikita V Lolayekar

Post Graduate Student  
Department of Pedodontics and Preventive Dentistry  
Yenepoya Dental College, Nithyananda Nagar P.O.,  
Mangalore  
E-mail: nikita2882@yahoo.co.in

### Dr. Vidya Bhat S

MDS  
Professor  
Department of Prosthodontics  
Yenepoya Dental College  
Mangalore

### Dr. Sham S Bhat

MDS  
Professor and Head  
Department of Pedodontics and Preventive Dentistry  
Yenepoya Dental College, Nithyananda Nagar P.O.,  
Mangalore. 575018  
Phone no. : 09448356562  
E-mail: bhatsham@indiatimes.com

## References

1. Kumar M, Sequeira PS, Peter S, Bhat GK. Sterilisation of Extracted Human Teeth for Educational Use. Indian Journal of Medical Microbiology 2005;23(4):256-258.
2. White JM, Goodis HE, Marshall SJ, Marshall GW. Sterilisation of Teeth by Gamma Radiation. J Dent Res 1994;73(9):1560-1567.
3. DeWald JP. The use of extracted teeth for in vitro bonding studies: A review of infection control considerations. Dent Mater 1997;13:74-81.
4. Dominici JT, Eleazer PD, Clark JS, Staat RH, Scheetz JP. Disinfection/ Sterilization of Extracted Teeth for Dental Student Use. J Dent Educ 2001;65:1278-1280.
5. Moura JS, Rodrigues LKA, Del Bel Cury AA, Lima EMCX, Garcia RMCR. Influence of storage solution on enamel demineralization submitted to pH cycling. J Appl Oral Sci 2004;12(3):205-208.
6. CDC. Guidelines for Infection Control in Dental Health-Care Settings – 2003. MMWR 2003;52(RR17);1-61. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5217a1.htm>