Extracted Teeth and Research (3/08)


The authors conducted a study to test the null hypothesis that when storing extracted teeth the storage medium and sterilization method have no effect on composite-to-dentin bond strengths. The authors collected 170 bovine incisors, cleaned them and placed them randomly into one of six storage media at 37°C for 60 days: distilled water (dH2O), 0.9% sodium chloride, 0.5% chloramine-T, 5.25% sodium hypochlorite (NaClO), 2% glutaraldehyde and 10% formalin. They used an autoclave to sterilize a subset of 10 specimens from every sample, while they stored another subset of 10 specimens from every sample (except for the 10% formalin sample) in 10% formalin for 14 days. The authors then embedded the specimens in epoxy and ground flat the facial surface to expose middle-depth dentin, which they polished to 600 grit. They used a dental adhesive to apply composite to the exposed dentin. The authors tested the composite-to-dentin shear bond strength 24 hours after bonding. They analyzed the data using global analysis of variance and, when appropriate, multiple post hoc tests ($P=0.05$). Storage in NaClO resulted in significantly lower bond strength than that of the other treatment specimens. Sterilization with the autoclave negatively affected the bond strength of specimens stored initially in dH2O or 10% formalin, while sterilization with formalin alone had no significant effect on bond strengths. Storing bovine teeth in 5.25% NaClO may negatively affect composite-to-dentin bond strengths. Immersion in 10% formalin might be the best option for storage and sterilization of bovine teeth that are to be used in dental bonding studies in vitro.

DECS Comment: The USAF Guidelines for Infection Control in Dentistry address disposal of extracted teeth as regulated medical waste and use in educational settings. The guidance is based on recommendations from the Centers for Disease Control and Prevention (CDC). It is important to note that the CDC does not make recommendations for the use of extracted teeth during research activities. In fact, the 2003 CDC guidelines state: “However, whether autoclave sterilization of extracted teeth affects dentinal structure to the point that the chemical and microchemical relationship between dental materials and the dentin would be affected for research purposes on dental materials is unknown.”

Formalin is not a sterilizing agent, as stated in this article. Formalin is a disinfectant. Before use in educational settings, the recommendation is to heat sterilize teeth that do not contain amalgam. If teeth containing amalgam must be used for training purposes, the CDC recommends immersion for two weeks in 10% formalin to achieve disinfection of both the internal and external tooth surfaces because these teeth cannot be safely autoclaved due to the potential mercury vaporization. Formalin is a hazardous material identified as a potential carcinogen and should not be used to routinely disinfect amalgam-free teeth. When using formalin, the manufacturer MSDS should be reviewed for occupational safety and health concerns and to ensure compliance with OSHA recommendations.

A review of the literature of the use of extracted teeth for in vitro bonding studies found that most research has focused on heat sterilizing the extracted teeth or disinfecting them with formalin. While formalin does adequately disinfect teeth, the effects on dentin bond strengths have been controversial and formalin was not recommended in the past when using teeth for research. The authors concluded that autoclaving amalgam-free teeth was suitable to prevent cross-contamination without adversely affecting dentin bond strengths.

While the results of the present study support the use of formalin, researchers should be reminded that formalin is not a sterilant and therefore the extracted teeth still pose a possible risk for cross contamination and standard precautions should be used (e.g., wearing appropriate personal protective equipment) when handling extracted teeth. Continued research is needed to determine the best method for treating teeth before research activities.

References