# Guest Editorial

## Are current infection control practices justified?

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Ten years ago, the acronym AIDS (acquired immunodeficiency syndrome) was not known by the general public and had barely entered the medical vocabulary. However, within a decade AIDS has influenced dramatically public policies, societal behavior, and health care practices. In dentistry, the late 1980s and early 1990s have been witness to ethical dilemmas, media scrutiny, the specter of government controls, anxious patients, and concerned staff. A most visible consequence of the AIDS era has been policies and procedures pertaining to the prevention of infectious disease transmission. In most instances these policies have been promoted and accepted with minimal concern as to their efficacy. It appears appropriate that, after a decade of experience with AIDS, there be an assessment of the justification for currently recommended dental infection control practices.

### Dentistry and disease transmission

Infection control methods are instituted in dentistry presumably because of the assumption that dental treatment spreads disease. Otherwise, sterilization, disinfection, immunization, and the wearing of gloves and masks have no validity. In reality, the ability of dental treatment to transmit disease is a reflection of the pathogenicity of the microorganisms involved in dentistry.

The common oral bacterial and fungal microbes do cause the major dental diseases, and—when the host environment permits—they may produce endogenous opportunistic diseases, such as dental abscesses, actinomycosis, candidiasis, and infective endocarditis.[1] Apart from herpes simplex, all viruses are transient members of the oral flora.[2] The normal oral microorganisms are of low pathogenicity and unlikely to cause infection of surgical wounds, intact skin, or intact mucous membranes.[3] If this were not so, intraoral invasive procedures would be impractical, and common social activities, such as speaking, kissing, and eating out, would be hazardous.

It is these common oral microbes that contaminate dentists' hands, instruments, and working environment. The pathogenicity of these organisms is so low that hands and instruments contaminated by the organisms would be unlikely transmitters of disease, even if these potential vectors were not cleaned between patients. In substantiation of this seemingly heretical statement is that fact that not one case of dental equipment–mediated cross infection has been confirmed in the literature.[4] Therefore, it appears that dental procedures that involve only the usual oral microbiologic flora have a minimal justification for infection control techniques.

The majority of dentists do perform invasive surgical procedures; thus dentistry involves exposure to bloodborne microorganisms, such as human immunodeficiency virus (HIV) and hepatitis B virus (HBV). These pathogens are not part of the normal oral microbiologic flora and are usually only present after a bloodletting process. Nevertheless, these viruses, especially HIV, have promoted the current interest in disease transmission by dental treatment.

The proven routes of transmission of HIV are via blood and seminal fluid and in utero.[5] In North Amer-

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ica, HIV is transmitted mainly by homosexual activity and intravenous drug abuse. There is no evidence that AIDS or HIV transmission is breaking out of the major risk groups, or that other routes of transmission remain unidentified.[5] Despite this, dental practice continues to be portrayed by some health officials and the media as a high-risk activity for AIDS acquisition. A probable reason for this is a statement by the Centers for Disease Control (CDC) that a dental procedure *may* have transmitted HIV.[6] Despite intensive investigations, the route of transmission—if it did occur—remains unknown.

In September 1992 the definitive report on the CDC's investigation of this case was published by the US General Accounting Office.[7] The report stated that *(1)* the CDC could not identify how HIV was transmitted to five dental patients; *(2)* transmission most likely occurred through accidental, direct contact with the dentist's blood; and *(3)* the case failed to identify medical procedures that are riskier than others in terms of HIV transmission.[7]

It is contended that had it been possible to delay all publicity on this "dental transmission" until the release of the above report, needless debate, hysteria, and the creation of ineffective policies would have been avoided.

During the 10 to 20 years when HIV may have been present in North America, millions of treatments have been performed with minimal infection control, and there is today scant evidence of HIV transmission in dentistry either to or from staff or via instruments. According to the CDC,[8] there is only one instance in which transmission of HIV from an infected health care worker to patients has been reported; the route of transmission, however, remains unknown. While it is true that a theoretical potential for dental spread of HIV exists, history and epidemiology would suggest that the real risk is infinitesimal.

Since the early 1970s there have been 20 published reports of outbreaks of HBV infection associated with treatment by an HBV-infected health care worker.[9] The risk factors associated with these transmissions included hepatitis B e antigen in the serum of health care workers (the e antigen implies increased infectivity), invasive surgical procedures, and potential contamination of surgical wounds via cuts, abrasions, or needlestick-type injuries from the operator's ungloved hands.[9] According to the CDC,[10] these are the only high-risk activities associated with HBV transmission in a health care setting. There is no confirmed documentation that HBV has been transmitted in dentistry via inappropriately disinfected or sterilized instruments.[4] The spread of hepatitis B either from or to dental personnel is now of historical interest, because it is most appropriately avoided by vaccination of clinical dental staff.[11]

This brief review of the bloodborne pathogens indicates that, even without current infection control policies, the risk of HIV transmission via the normal practice of dentistry is infinitesimal and the spread of HBV is most effectively prevented by immunization.

**Sterilization and disinfection**

The cleaning, disinfecting, and sterilization of equipment and instruments are long-established requisites of dental practice. Nevertheless they have recently been associated with much needless confusion and controversy.

Sterilization is a finite physical state defined as a process that destroys or removes all forms of life with particular reference to *all* microorganisms.[12] It either exists or does not; there are no degrees of sterilization. In dentistry, sterilization is accomplished by steam under pressure (autoclave); chemical vapor under pressure (chemiclave); dry heat oven; glass bead or salt sterilizer; or chemical solutions (rarely).

Dinsinfection is a process that kills most disease-producing microorganisms but rarely destroys all bacterial spores.[12] Unlike sterilization, disinfection is a comparative physical phenomenon recognized as occurring at three levels:

1. High-level disinfection kills tubercle bacilli, fungi, lipid viruses, nonlipid viruses, vegetative bacteria, and most spores.
2. Intermediate-level disinfection kills tubercle bacilli, fungi, lipid viruses, nonlipid viruses, vegetative bacteria, and some spores.
3. Low-level disinfection kills fungi, lipid viruses, and most vegetative bacteria. This level does not destroy spores or nonlipid viruses, and sometimes may not destroy tubercle bacilli.

The level of a disinfectant is an indicator of its ability to destroy most, some, or no spores. It is noteworthy that the traditional method of immersing instruments in boiling water for 5 to 10 minutes produces high-level disinfection,[13] which although not sterilization is very close to it. Human immunodeficiency virus is a lipid virus and will be destroyed by low-level disinfectants, whereas HBV, a nonlipid virus, requires at least an intermediate-level disinfectant.

The categories of disinfectants, although simple, have created confusion among users because of the competitive variety of available products. Examination of the manufacturer's information sheets on the disinfectant or of the label on the solution container permits easy classification of the product:

1. If the phrase "sterilant/disinfectant and sporicidal" or another combination of these words is present, the product may be used as a chemical sterilizing solution (for up to 6 to 10 hours), or as a high-level disinfectant if diluted according to the manufacturer's instructions.
2. The term "hospital disinfectant and tuberculocidal" indicates an intermediate-level disinfectant.
3. The designation "hospital disinfection" with no mention of tuberculocidal activity implies a low-level disinfectant.

Unnecessary confusion surrounds the issue of which instruments should be sterilized and which need only be disinfected. The resolution of the dilemma is simple if the principles articulated by Spaulding[14] in 1968 are followed. Instruments and devices are placed into the following categories:

1. Critical items are those that enter into sterile tissue or the vascular supply. They *must* be sterilized, because their action creates portals of entry through which pathogenic microbes on the item could enter and colonize tissues.
2. Semicritical items are those that contact intact mucous membranes or nonintact skin. They should be subject to high-level or, at a minimum, intermediate-level disinfection, because intact oral mucosa and saliva are efficient physical and chemical barriers, respectively, to pathogenic invasion.
3. Noncritical items are those that contact intact skin but not mucous membranes. They need only be subjected to low-level disinfectants, because intact skin is the best human barrier to microbial invasion.

Such a classification permits dental staff to decide which instrument belongs to which category and deal with it appropriately. The category into which the instrument is placed may vary from time to time depending on its specific use. This system does not preclude semicritical and noncritical items from being sterilized—sometimes sterilization may be less time consuming. It does allow some flexibility, because the decision to sterilize or disinfect is dependent on the instrument's use, which, ultimately, is a reflection of the treatment being performed. However, the classification does demand that sterilizers be effective; this requires that a regular system of biologic monitoring be instituted.

If handpieces are deemed to be critical items by the operator, they must, according to Spaulding's[14] classification, be sterilized. This is unlikely to be the situation during restorative dentistry, especially that performed under rubber dam. An essential requisite for sterilization is that the instrument be visibly clean and free of all obvious debris. At present, this cannot be accomplished readily to the inside of a handpiece; therefore handpiece sterilization should not be considered an infallible process. If the handpiece is not sterilized, it *must* be disinfected. This will take between 3 and 30 minutes, depending on the chemical used.[15] It may be faster to heat sterilize the handpiece, although this is physically damaging to its internal components. The absence of any controlled clinical studies linking handpieces to infectious disease transmission suggests that Spaulding's[14] criteria may safely and effectively be applied to handpieces and similar devices.

### Gloves and masks

Contrary to popular belief, there are no controlled studies that demonstrate that the wearing of gloves will prevent the spread of either HIV or HBV during dental treament. (When such transmissions were reported, the attending dentists were actively infected with the appropriate virus.) In spite of a paucity of scientific information justifying glove use, some operators may wear gloves as a matter of personal preference. Under such circumstances it would be sensible and cost effective to limit their use to invasive procedures involving the escape of free-flowing blood.

Similarly, there are no controlled studies to show that masks prevent the spread of viral diseases in dental practice. Indeed, although the CDC recommends face masks, it is unable to prove that face masks are effective against any biologic agent.

### Conclusions and recommendations

It is not surprising that current infection control programs have concentrated on HIV and, to a lesser extent, HBV. However, more than a decade of experience has demonstrated that the risk of HIV transmission in dentistry is insignificant, while HBV spread is readily prevented by immunization. Therefore, it remains justified to have an infection control program in dentistry that is cognizant of the relatively low pathogenicity of the common oral microbiologic

flora. Such a program recognizes the necessity of handwashing, the sterilization of surgical instruments, and a clean operatory. It does not warrant the excessive regulations and complexities accompanying many of today's infection control programs for which there would appear to be minimal scientific, historical, or epidemiologic justification.

The following recommendations are offered for a simplified but effective infection control program:

1. Handwashing before and after all intraoral procedures
2. Hepatitis B vaccination of all clinical dental personnel
3. Sterilization of all invasive instruments and devices
4. At least intermediate-level disinfection of all other intraoral instruments
5. Use of gloves to be considered unnecessary or minimally necessary when noninvasive procedures are performed; as moderately necessary when fresh wounds are present on the operator's fingers or when open lesions exist on the patient's oral mucosa; and as a reasonable necessity when invasive surgical and periodontal procedures are performed with the exposure of free-flowing blood
6. Use of masks, nonprescription eyeglasses, and gowns to be considered as providing physical protection from projectile debris, such as amalgam and acrylic resin
7. Cleaning of the clinical environment between patients, with the removal of visible blood and similar debris

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