Subchapter 7. General Industry Safety OrdersGroup 16. Control of Hazardous SubstancesArticle 109. Hazardous Substances and Processes

- Market Availability. The engineering control is not required if it is not available in the marketplace.

- In the United States, an estimated 9 million persons work in health-care professions, including approximately 168,000 dentists, 112,000 registered dental hygienists, 218,000 dental assistants (*3*), and 53,000 dental laboratory techn
- Dental patients and DHCP can be exposed to pathogenic microorganisms including cytomegalovirus (CMV), HBV, HCV, herpes simplex virus types 1 and 2, HIV, *Mycobacterium tuberculosis*, staphylococci, streptococci, and other viruses and bacteria that colonize or infect the oral cavity and respiratory tract. These organisms can be transmitted in dental settings through 1) direct contact with blood, oral fluids, or other patient materials; 2) indirect contact with contaminated objects (e.g., instruments, equipment, or environmental surfaces); 3) contact of conjunctival, nasal, or oral mucosa with droplets (e.g., spatter) containing microorganisms generated from an infected person and propelled a short distance (e.g., by coughing, sneezing, or talking); and 4) inhalation of airborne microorganisms that can remain suspended in the air for long periods (*5*).

- **Aerosol:** particles of respirable size (<10 µm) generated by both humans and environmental sources that can remain viable and airborne for extended periods in the indoor environment; commonly generated in dentistry during use of handpieces, ultrasonic scalers, and air/water syringes.

Air abrasion: the application of a mixture of small abrasive particles by air blast to prepare a cavity in a tooth or remove deposits from teeth
Bacterial count: a method of estimating the number of bacteria per unit sample. The term also refers to the estimated number of bacteria per unit sample, usually expressed as colony-forming units (CFUs) per square centimeter (cm2) per milliliter (ml).
Bloodborne Pathogens Standard: a standard developed, promulgated, and enforced by the Occupational Safety and Health Administration (OSHA) directing employers to protect employees from occupational exposure to blood and other potentially infectious material.
NIOSH: The National Institute for Occupational Safety and Health is the Federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. The Institute is part of the Centers for Disease Control and Prevention.
OPIM (Other Potentially Infectious Materials): an OSHA term that refers to (1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Barry Hammarback was born in Lewistown, Montana in 1951. He grew up in Northern Minnesota, Alaska and Oregon and graduated from South Eugene High School, in Eugene Oregon in 1970. While there he was elected president of the Student Body, received the outstanding Junior, and outstanding Senior Awards. He was a member of the National Honor Society, Band, Debate and Student government.
Barry's work history includes work for Mobil Oil in Brisbane Australia where he worked with appropriations and purchasing. He was employed by the Law Firm of Gavic and Associates, and then formed his own law firm in 1980. He is currently the President and Senior Partner of Hammarback, Murray & Jacobson S.C. He works in the field of trial practice, and has tried lawsuits in 14 states. His specialty is litigation involving the dairy industry. He also is President and CEO of MRLB International, Inc., which manufactures the DentaPure® line of dental unit waterline purification products, and has been since 2000.

Minimization of work surface contamination

2.a. To reflect changes in technology that eliminate or reduce exposure to
SearchTerm5SearchTerm5**bloodborne**SearchTerm7SearchTerm7 pathogens; and

D) All procedures involving blood or OPIM shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.

c. Safety Performance. The engineering control is not required if the employer can demonstrate by means of objective product evaluation criteria that the engineering control is not more effective in preventing exposure incidents than the alternative used by the employer.

TABLE 1

DISEASES KNOWN TO BE SPREAD BY DROPLETS OR AEROSOLS.

DISEASE	METHOD OF TRANSMISSION
Pneumonic Plague	Patient to patient without the usual insect vector (flea); apparently by inhalation of the causative bacteria
Tuberculosis	Droplet nuclei expelled from the patient by coughing; once considered an occupational disease for dentists
Influenza	Apparently associated with coughing but may require direct contact with the patient
Legionnaires' Disease	Aerosolization of *Legionella pneumophila* has been associated with air conditioning systems and hot tub spas
Severe Acute Respiratory Syndrome	Spread by direct contact and aerosolized droplets

Bio-Medical Consultants
4256 Heyer Ave
Castro Valley, CA 94546
Contact: David M. Harris, PhD
Phone: 510-583-7574
E-mail: bmcinc@attbi.com

- A true aerosol or droplet nuclei may be present in the air of the operatory for up to 30 minutes after a procedure.[13] This means that after a dental procedure, if the operator removes a protective barrier such as a face mask to talk to a patient when a procedure is completed, the potential for contact with airborne contaminated material remains. Also, there is a potential for an airborne contaminant to enter the ventilation system and spread to areas of the facility where barrier protection is not used.
- The ADA and CDC have recommended that all blood-contaminated aerosols and splatter should be minimized.[29] Occupational Safety and Health Administration regulations state that "all procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of the these substances."[37] In the guidelines for infection control in dental health-care settings that was published recently by the CDC, all of these recommendations were retained.
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There are currently no specific OSHA Standards or Directives for dentistry. However, exposure to numerous biological, chemical, environmental, physical, and psychological workplace hazards that may apply to dentistry are addressed in specific standards for general industry. This page provides links to those standards as well as references related to OSHA enforcement policy such as directives and interpretation letters. Note: Some states have OSHA-

approved State Plans and have adopted their own standards and enforcement policies.

The potential routes for the spread of infection in a dental office are direct contact with body fluids of an infected patient, contact with environmental surfaces or instruments that have been contaminated by the patient and contact with infectious particles from the patient that have become airborne.[1] There is a long history of infections that have been transmitted by an airborne route. Even before the discovery of specific infectious agents such as bacteria and viruses, the potential of infection by the airborne route was recognized. In historical reports of the bubonic plague—the "black plague"—the pneumonic form of the disease was recognized as the most deadly. Historical accounts have noted that the pneumonic form of the plague, characterized by severe coughing, has been spread from patients who had the pneumonic form of plague to those who surrounded the patient but were not necessarily in direct contact. Apparently, because the bacteria that cause plague (*Yersinia pestis)* were inhaled, the pneumonic form of the disease was reported to progress more rapidly than other forms of plague, and historical reports indicate that it was almost universally fatal.[2]

There are more recent examples of the spread of disease by an airborne route. In one published report, a number of people were exposed to tuberculosis, or TB, while on a commercial airline flight. A patient with active TB boarded an airplane in Chicago en route to Honolulu. During the flight, the patient coughed repeatedly, aerosolizing the tubercle bacillus, which then entered the airplane's ventilation system and subsequently spread to other parts of the airplane cabin. After it was confirmed that the patient had active TB, it was determined that 15 of the 55 passengers in the cabin who were tested had been exposed to TB, as confirmed by a positive tuberculin test. Passengers seated within two rows of the source patient had a higher probability of a positive skin test than did those seated elsewhere in the cabin.[3]

> The smaller particles of an aerosol have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting infections.

- Another published example occurred in a medical office where the measles virus was spread through the ventilation system to multiple people. The source patient was a 12-year-old boy who was coughing. Of the seven people who had secondary cases of measles that were associated with him, three were never in the same room with the source patient and one entered the office an hour after he had left.[4]

More common is the apparent spread of cold and influenza viruses by airborne routes. However, the actual documentation of an airborne route for transmission of cold and influenza viruses is difficult to verify. Because cold and flu viruses can be transmitted by contact, contaminated objects and an airborne route, in a flu outbreak it often is difficult to know the exact route by which the virus is transferred.

SARS recently has been reported in China, Canada and other countries. This severe flulike illness appears to be caused by a new form of coronavirus, a family of viruses usually associated with the common cold. The exact mechanisms by which SARS is spread remains uncertain, but it is clear that the primary method is through aerosolized droplets produced by coughing or other means. In a Hong Kong apartment complex outbreak, it appeared that the disease may have been spread through ventilation systems by airborne viruses that were independent of larger droplets.[5] The Centers for Disease Control and Prevention, or CDC, and the ADA have recommended that aerosol-producing procedures should be avoided in patients with active SARS. The ADA has pointed out that it is unlikely that any dental treatment will be performed on a patient with active SARS, owing to the fact that these patients are extremely ill and should not undergo any elective procedures.[6,7]

Back to the 2005 Survey Results Index Page
Previous Survey Result
High-speed Handpieces

Star has the largest market share (41%), followed by Midwest (36%), Kavo (19%), and A-dec/W&H (3%). The most prevalent models are the Star 430 SWL (34%), Midwest Tradition (21%), Kavo 635B (11%), and Midwest XGT (7%). Providers appreciated the small head and the lubrication-free aspect of the Star 430 SWL. The Kavo 635B received mostly positive comments. The Midwest XGT received many positive comments and some negative comments on its bulkiness. The Midwest Tradition is an older model than the Midwest XGT and that may explain the lower Consumer Satisfaction Score. The consumer satisfaction scores were Kavo 635 B (+1.14), Midwest XGT (+1.00), Star 430 SWL (+0.85), and Midwest Tradition (+0.75).