Face Mask Efficacy (11/05)

Checchi L, Montevecchi M, Moreschi A, Graziosi F, Taddei P, Violante FS. Efficacy of three face masks in preventing inhalation of airborne contaminants in dental practice. J Am Dent Assoc 2005;136:87782.

The authors of this article assessed the relative filtering efficacy of two currently used surgical face masks (one a molded mask, the other a tie-on mask) and a certified personal particulate respirator, all made by a single manufacturer. The authors sprayed bicarbonate particulate against a porcelain surface (representing the patient's mouth) and collected it via a mannequin head (representing the dentist's head) placed 40 centimeters away and a tube with two airflow rates (0.5 cubic meters per hour and 9 m^3/hour). They calculated the dry residue weight. They performed three separate runs for each mask and three runs with no mask at the two airflow rates with and without aerosol. With no mask (control), the authors recorded significant weight gains at both airflow rates with and without vaporization. With vaporization, the three masks were associated with different dry residue weights ($P < .03$ with the Kruskal-Wallis test at both flow rates), the respirator providing the lowest amount. The respirator provided an efficiency of 94 to 96 percent, compared with 90 to 92 percent and 85 to 86 percent for the molded and tie-on surgical masks, respectively. **These data provide independent evidence that a certified personal respirator can be more effective than high quality surgical masks in dental settings.**

DIS Comment: Face masks protect against microorganisms generated by the wearer and also protect dental health-care personnel (DHCP) from large-particle droplet spatter that might contain bloodborne pathogens or other infectious microorganisms. Surgical face masks are composed of synthetic materials that have the ability to filter out at least 95% of small particles that directly contact the mask. For routine dental procedures surgical face masks are acceptable to protect the mucous membranes of the nose and mouth from direct contact with droplets of saliva or other potentially infectious materials. However they only provide partial protection against small aerosol particles such as those of tuberculosis (TB) or severe acute respiratory syndrome (SARS). When airborne infection isolation precautions (expanded or transmission-based) are necessary, such as with TB patients, a National Institute for Occupational Safety and Health (NIOSH)-certified particulate-filter respirator (e.g., N95, N99, or N100) should be used. Available data indicate infectious droplet nuclei measure 15 m; therefore, respirators used in health-care settings should be able to efficiently filter the smallest particles in this range.

Most surgical masks are not NIOSH-certified as respirators, do not protect the user adequately from exposure to TB, and do not satisfy OSHA requirements for respiratory protection. However, certain surgical masks (i.e., surgical N95 respirator) do meet the requirements and are certified by NIOSH as respirators. The level of protection a respirator provides is determined by the efficiency of the filter material for incoming air and how well the face piece fits or seals to the face (e.g., qualitatively or quantitatively tested in a reliable way to obtain a face-seal leakage of <10% and to fit the different facial sizes and characteristics of health-care personnel). Because respirators are not used frequently in dental settings they are usually not part of the normal personal protective equipment needed in dental offices. Its important to remember that when respirators (e.g., N95, N99, or N100) are used while treating patients with diseases requiring airborne-transmission precautions (e.g., TB), they should only be used in the context of a complete respiratory protection program. This program should include training and fit testing to ensure an adequate seal between the edges of the respirator and the wearers face. In USAF Medical Treatment Facilities Bioenvironmental Engineering is usually the point of contact for the respiratory protection program.