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# Handbook of Occupational Hazards and Controls for Dental Workers

Government of Alberta

## *Credits*

This document has been developed by the Government of Alberta and derived as a profession-specific summary of information contained in the five volumes of Best Practices in Occupational Health and Safety in the Health Care Industry. Full text of these documents can be found at http://www.employment.alberta.ca/SFW/6311.html

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# Occupational Health and Safety Hazards and Controls for Dental Workers

## Introduction

As part of the Alberta Healthcare Initiative, a series of Best Practice documents were produced by Alberta Employment and Immigration – Workplace Health and Safety to better acquaint healthcare workers with workplace hazards and appropriate control measures. Five documents have been produced; each developed with the input of a multidisciplinary stakeholder group. The documents are available on the Alberta Employment and Immigration website http://www.employment.alberta.ca/SFW/6311.html as follows:

*Overview of Best Practices in Occupational Health and Safety in the Healthcare Industry Vol. 1*
*http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp009.pdf*

*Best Practices for the Assessments and Control of Biological Hazards* Vol. 2
http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp010.pdf

*Best Practices for the Assessments and Control of Chemical Hazards*, Vol. 3
http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp011.pdf

*Best Practices for the Assessments and Control of Physical Hazards*, Vol. 4

*Best Practices for the Assessments and Control of Psychological Hazards*, Vol. 5

In an effort to focus the hazard assessment and control information for specific healthcare professions, a series of short summaries of relevant information have been produced using excerpts from the five best practice documents. Readers are directed to the original documents for more details and more comprehensive information. *Please note that hyperlinks are provided to reference documents for the convenience of the reader. These links are functional at the time of first availability of this document but, due to the changing nature of web information, may not be functional at a later date. The Government of Alberta does not assume responsibility for updating hyperlinks.*

This document focuses on hazards and controls in dental offices and clinics.

## Hazard Assessment Process

Dental workers may be exposed to a variety of workplace hazards in the course of performing their functions. The type and degree of exposure is dependent upon the type of services, the type of patients or clients, and the specific tasks performed. A key component of a health and safety program is to identify and assess hazards and determine appropriate controls. A systematic approach to hazard assessment includes the following steps:

1. List all work-related tasks and activities.
2. Identify potential biological, chemical, physical and psychological hazards associated with each task.
3. Assess the risk of the hazard by considering the severity of consequences of exposure, the probability that the exposure will occur and the frequency the task is done.
4. Identify the controls that will eliminate or reduce the risk. The hierarchy of controls should be followed. This means that engineering controls are the most effective, followed by administrative controls (such as training and rules), followed by personal protective equipment (PPE).
5. Implement the controls for each hazard.
6. Communicate the hazard assessments and required controls to all workers who perform the tasks.
7. Evaluate the controls periodically to ensure they are effective.

## Potential Hazards and Recommended Controls

The following charts summarize potential hazards for dental workers and recommended controls to reduce the risk of exposure to the hazards.

## Biological Hazards and Controls

In this section the most commonly encountered biological hazards for dental workers and methods to control them are presented. Employers should carefully evaluate the potential for exposure to biohazardous materials in all tasks and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the most frequently encountered biological hazards for dental personnel.

**Note:** The following chart provides basic information about control strategies for commonly occurring biological hazards. Administrative controls include Routine Practices that are to be used as a minimum and Additional Precautions as warranted based on the risk assessment. Worker education and good communication processes are also critical administrative controls. Any PPE selected must be based upon the risk assessment of the task and the environment in which it is used. All legislation related to the selection and use of controls must be followed.

| Potential Hazards | Summary of Major Control Strategies | | |
|---|---|---|---|
| | **Engineering** | **Administrative** | **PPE** |
| **Exposure to biological agents in blood and saliva of patients through contact with blood and saliva or through contact with contaminated needle or sharp instruments (including orthodontics wires)** | Equipment to minimize formation of aerosols (rubber dams, high-speed evacuation, etc.). Obtain medical history of patients. Engineered needle stick prevention devices. Availability of sharps containers for disposal. Proper disinfection of instruments and decontamination of environmental surfaces, lab supplies and materials. Vaccines. | Compliance with all infection prevention and control practices. No recapping of needles (even if multiple injections in same patient). Safe work procedures to minimize formation of aerosols where possible (proper patient positioning, etc.). Proper disposal of waste materials. Immunization program. Worker education. | Use of gloves, eye and face protection when splashes or splatters are possible. Gowns or uniforms that should be changed daily or when contaminated. |
| **Exposure to respiratory infectious disease through droplet transmission, including splatters from body fluids** | Medical history of patients. Vaccines. | Compliance with all infection prevention and control practices. Immunization program. Worker | Use of gloves, eye and face protection when splashes or splatters are |

| | | | |
|---|---|---|---|
| **and projectiles while using high=speed devices.** | | education. | possible. Gowns or uniforms that should be changed daily or when contaminated. |
| **Exposure to respiratory infectious disease through airborne transmission** | Medical history of patients. Vaccines. | Good housekeeping practices. Compliance with all infection prevention and control practices. Immunization program. Worker education. | PPE based on the risk assessment may include gloves, respiratory protection, eye protection and other protective clothing. |
| **Exposure to environmental biological contaminants from ventilation systems, water or food** | Maintenance of ventilation systems. Early spill clean-up. Preventive maintenance of ventilation systems and water supply systems with regular testing to ensure proper functioning. Early detection and remediation of mould. | Infection prevention and control practices related to building maintenance and food preparation. Protocols for construction and renovation projects that reduce contamination. Worker education. | Use of proper PPE when cleaning contaminated environmental surfaces, including gloves, respiratory protection, and eye protection. |

## Notes about controls for biological hazards

Exposure to biological hazards may occur for any dental workers in contact with patients. Controls include any mechanisms to reduce the potential for exposure to infectious agents and the immunization of all dental workers against infectious diseases to which they may be exposed.

### *Engineering Controls*

In the hierarchy of controls, the highest level of control is directed at the source. From an occupational health perspective, the highest level of control may be immunization of workers who may come in direct contact with infected patients. Good engineering controls such as proper design and maintenance of facilities, room design, the use of needleless systems and engineered needle stick prevention devices, and effective biological waste containment also contribute to minimizing the transmission of infectious agents. Engineering controls, once designed and implemented, are not under the control of the worker, but are directed at the source of the hazard.

## *Safe Needle Devices*

Safe needle devices have built-in engineering features that assist in preventing injuries during and after use of the device. Examples of safe needle devices that have built-in engineering features include:

- Needleless connectors for IV delivery systems
- Protected needle IV connectors
- Needles that retract into a syringe or vacuum tube holder
- Hinged or sliding shields attached to syringes
- Self-blunting phlebotomy and winged steel needles
- Blunt tip suture needles
- Retractable finger/heel-stick lancets

While some engineered safe needle devices have been available for some time, new engineered safe needle devices continue to be introduced for the healthcare industry. Sharps disposal containers assist in protecting dental workers from injuries when handling and transporting waste sharps. The CSA standard *Z316.6-07 Evaluation of Single-use and Reusable Medical Sharps Containers for Biohazardous and Cytotoxic Waste* should be consulted when selecting sharps containers.

## *Decontamination[1] of facilities and materials*

Decontamination is a term used to describe procedures that remove contamination by killing microorganisms, rendering the items safe for disposal or use. Sterilization refers to the complete destruction or removal of all microorganisms by chemical or physical means, usually to provide sterile items for use. All contaminated materials must be decontaminated before disposal or cleaning for reuse. The choice of method is determined by the nature of the material to be treated. Disinfection refers to the destruction of specific types of organisms but not all spores, usually by chemical means. Disinfection is a means of decontamination. Surfaces must be decontaminated after any spill of potentially infectious materials and at the end of the working day. Work areas, treatment rooms, and pieces of equipment may also require decontamination (i.e., prior to servicing, maintenance, between patients, transfer to other settings or reassignment).

[1] This section was modified from Laboratory Safety: CSMLS Guidelines, sixth edition; Gene Shematek & Wayne Wood; Canadian Society for Medical Laboratory Science; 2006.

### *Local exhaust ventilation*

Local exhaust ventilation removes contaminants at the source where the contaminant originates and can be very effective at controlling exposure. The components of a local exhaust system include a hood into which contaminated air flows, ducting for air to pass through, a fan to move the air, and an exhaust. For biological hazards, local exhaust ventilation is used in some dental instruments that create aerosols and is widely used as suction to remove saliva and particles from patients during procedures. Examples of local exhaust ventilation include capture devices on some dental and surgical equipment.

### *General ventilation*

General ventilation systems serving buildings must be maintained regularly and inspected for conditions that could adversely affect air quality provided to work spaces. Accumulations of water that could stagnate in humidification systems or drip trays may become sources of potential biological contamination of air handling systems that need regular monitoring and inspection.

Biohazardous organisms may be carried through general ventilation systems, potentially distributing them to other workspaces in a facility. Ultraviolet germicidal irradiation units, and or HEPA filtration media incorporated into air handling systems may be warranted for special circumstances.

Mould growth in the indoor environment can be affected by relative humidity levels, which is a function of some general ventilation systems. High relative humidity levels may contribute to an increase in the growth of some moulds and lead to condensation developing on surfaces. Control of indoor relative humidity levels is an important factor in preventing mould growth.

## *Administrative Controls*

The next level of controls includes administrative controls. Because it is not always possible to eliminate or control the hazard at the source, administrative controls are frequently used for biological hazards in healthcare. Administrative controls focus on ensuring that the appropriate prevention steps are taken, that all proper work procedures are documented, that dental personnel are trained to use the proper procedures, and that their use is enforced. Administrative controls include policies and procedures that establish expectations of performance, codes of practice, staff placement, required orientation and training, work schedules, and occupational health programs in which baseline immune status is recorded and immunizations are provided.

A comprehensive management system considers the continuum of infection prevention and control efforts across all sites and operations. It includes attention to patient as well as worker safety. A comprehensive system should include the following components:

- ☐ A process that ensures comprehensive hazard assessments are conducted for all sites and tasks and appropriate controls are identified
- ☐ An infection prevention and control plan with clear designation of roles and responsibilities
- ☐ Consistent standards for the cleaning, disinfection and sterilization of equipment, procedures, and policies including Routine Practices, Additional Precautions, hand hygiene policies and facilities, patient risk assessments, communication protocols, decontamination of equipment and clothing and dedicated clothing
- ☐ Hands free or no touch techniques for the passing of instruments
- ☐ Outbreak prevention and management
- ☐ Required orientation and ongoing education
- ☐ Biomedical waste handling procedures and policies
- ☐ Supporting systems that include
    - Adequate housekeeping and waste management services
    - Appropriate processes for cleaning, decontamination, disinfection and sterilization of patient care equipment
    - Purchasing processes to include consideration of safety factors
- ☐ A comprehensive surveillance and monitoring plan
- ☐ Record keeping and regular reporting of outcomes

### *Routine practices and additional precautions*

Procedural controls may include procedures that relate to the use of Routine Practices and Additional Precautions as directed, baseline health assessments and periodic screening of workers, and hazard identification and control processes. Awareness of the infectious disease status of patients is another good control, though this is not always possible for dental workers. All work procedures should include the consideration and control of the risk of exposure to workers. Routine Practices and Additional Precautions (where required) greatly assist in reducing the transmission of infectious agents from both known and unknown patient sources by treating all contacts as potential risks.

**Infection Prevention and Control Definitions:**

- **Routine Practices** include a recommended pattern of behaviours to form the foundation of limiting the transmission of microorganisms in all health care settings and is generally accepted care for all clients. Elements of Routine Practices are: hand hygiene: risk assessment related to client symptoms, care and service delivery, including screening for infectious diseases; risk reduction strategies through the use of PPE, cleaning environment, laundry, disinfection and sterilization of equipment , waste management, safe sharps handling, client placement and healthy workplace practices; and education of healthcare providers, clients and families, and visitors.
- **Additional precautions** are practices used to prevent transmission of infectious agents that are spread by direct or indirect contact with the client or client's environment that are necessary in addition to Routine Practices for certain pathogens or clinical presentations. These precautions include Contact Precautions, Droplet Precautions, and Airborne Precautions that are based on the method of transmission.

For more information: http://www.health.alberta.ca/documents/IPC-MRSA-Standards-2008.pdf

Routine Practices include being attentive to all routes of transmission. Awareness of routes of transmission has led to the development of a variety of transmission-route specific strategies. Most of these are well documented in infection prevention and control plans. In particular, hand hygiene is identified as the single most important administrative strategy in infection prevention and control. Other strategies include additional precautions designed to address infections transmitted through the "airborne" route, those transmitted through "droplets" and those transmitted through "contact". It should be noted that though some infection prevention and control plans appear to provide sharp demarcations as to what size of particle is transmitted by which route (particularly by airborne and droplet); it is highly likely that there is a continuum of particle sizes produced at any time and the determination of transmission route is more a probability than a certainty. For this reason, one must be careful in defining control strategies based solely on particle sizes.

In some circumstances, identification of the specific organism responsible for the infection may take considerable time, during which patient dental work may be required. In these cases, it is prudent to apply the most stringent precautions until evidence indicates that less are required. In cases where the transmission route or organism has not yet been identified, it is prudent to assume all routes of transmission may be possible, as this would drive the highest level of precautions available and appropriate. Once more information is known about the organism, precautions can be revised to take that knowledge into account.

Administrative controls related to the prevention of exposure to biological hazards include the development and implementation of infection prevention and control guidelines, including equipment decontamination and safe work procedures.

Surfaces must be decontaminated after any spill of potentially infectious materials. Specific written protocols must be developed and followed for each decontamination process. Dental personnel must be trained in all decontamination procedures specific to their activities and should know the factors influencing the effectiveness of the treatment procedure.

### *Chemical Disinfectants*

Chemical disinfectants are used to decontaminate surfaces, reservoirs of infectious material, and to clean up spills of infectious material. The choice of chemical disinfectant must be made carefully based on:

- Types of organisms, suspected or known
- Items or surfaces to be decontaminated
- Hazards posed to the worker by the disinfectant
- Cost of disinfectant
- Corrosiveness of disinfectant
- Shelf life and required dilution of disinfectant
- Material which inactivates the disinfectant

In many cases, the choice of disinfectant for specific uses may be standardized in the organization and made after evaluation by IPC and OHS professionals.

Considerations in the use of chemical disinfectants

- Choose the disinfectant carefully. More than one may be required. Keep in mind the items to be disinfected, and the properties and limitations of the various available disinfectants. If more than one disinfectant is required, ensure that those selected are chemically compatible.
- Follow the manufacturer's directions for making the proper dilutions of the disinfectants.
- The effective life of disinfectants can vary depending on the formulations and the conditions of usage. Follow the manufacturer's directions.
- The effective exposure time that the disinfectant must be in contact with the contaminant will also vary with conditions of usage. Often overnight exposure may be recommended to ensure effective decontamination.
- Understand the health and safety hazards that may be posed by a particular disinfectant and ensure appropriate precautions are taken. Wear disposable gloves when using any disinfectants. Wear other personal protective equipment or clothing as necessary, depending upon the disinfectants. Consult Material Safety Data Sheets for details.

- Workers with particular sensitivities to specific disinfectants should avoid using those disinfectants.
- Perform tests of the disinfectants to ensure effective disinfection.

### *Spill response procedures*

The efficient and effective control of a biological spill requires that all staff members are trained in and have practiced the established spill response techniques. The materials and supplies that are necessary for spill clean-up and decontamination must be readily available to ensure timely spill response. Written spill response procedures should outline spill response actions and roles. The actual procedure used will vary with the size of the spill and the location of spill (including materials, equipment or environmental surfaces affected). All spill responses should be documented as incidents.

A biological spill kit should contain:

- Biological liquid solidifying agent
- Disinfectant - small quantities, made fresh daily if phenolics or hypochlorites (such as bleach)
- Forceps for picking up broken glass
- Paper towels, swabs, disposable and heavy-duty gloves
- Metal or polypropylene (autoclavable) dust pan
- Heavy-duty polyethylene bags
- High efficiency particulate respirators, shoe covers or rubber boots and full protective clothing if large spills may occur

### *Training*

Training in biological hazards and controls should be provided to all dental workers. Each dental worker must understand the employer's IPC and OHS programs as they relate to his or her job duties. For newly hired dental workers, all relevant IPC and OHS policies and procedures must be provided before they start work. To ensure that dental workers understand and apply this information to their jobs, specific training should also be provided to address job-specific biological hazards. Periodic refresher training to reinforce policies and procedures and introduce any new practices will benefit all dental workers. Competency assessments should be provided for all training, and training records should be maintained.

### *Dental worker immunization and health surveillance*

An immunization policy and program is a proactive mechanism to reduce risk of communicable diseases for dental workers. Each dental provider should have an immunization and health surveillance program in place that is appropriate to the size and type of workplace. Immunization and health surveillance programs should include:

- Education about vaccine-preventable diseases
- Risk assessment to determine the need for immunization or surveillance based on potential exposure
- Administration of immunizations (or referral for immunizations, as appropriate)
- Documentation and follow-up of any baseline health assessments, communicable disease status and immunizations

Ideally, the immunization and surveillance programs should provide easy, authorized access to dental worker immune status records for follow up of exposure incidents and outbreaks. In some cases, immunizations or baseline testing may be required prior to commencement of work.

### *Post-exposure follow-up management*

Post-exposure management includes management of dental workers exposed to, colonized by, or infected with microorganisms; an outbreak management process for exposures and/or dental workers who are symptomatic or colonized with infectious disease; and access by Occupational Health professionals to utilize medical assessment and diagnostic services for timely follow-up for dental worker exposures.

## *Personal Protective Equipment (PPE)*

Personal protective equipment such as gloves, respiratory protection and eye protection should be used based on the risk assessment. PPE is often used in conjunction with other controls (engineering and administrative) to provide additional protection to workers. The primary types of PPE are designed to protect the worker from infectious disease by breaking the chain of infection at the "portal of entry or exit" of the microorganisms. This means that all PPE is designed to reduce exposure via specific routes of transmission. Gloves, gowns and other protective clothing reduce exposure through the dermal (skin) contact route and help contain the microorganisms to the work environment.

### *Gloves*

Gloves are the most common type of PPE used for dental tasks. Gloves are made from a variety of materials including latex, nitrile, neoprene, copolymer, and polyethylene and are available in various levels of thickness. When dealing with infectious materials, gloves must be waterproof. Most patient care activities require non-sterile gloves, whereas any invasive procedure should be performed using sterile surgical gloves. Latex gloves should be avoided due to the risk of latex allergy unless there is a demonstrated safety requirement for latex to be used. The Canadian General Standards Board (CGSB) certifies medical gloves, which is a key factor in selecting gloves for use in healthcare. The choice of gloves must often balance the needs for protection and dexterity. While thicker gloves (or double gloves) may appear to provide greater protection, it may make tasks more difficult and

increase the exposure risk. In Recommendations for Canadian Health Care and Public Service Settings[2], it is noted that the *"Selection of the best glove for a given task should be based on a risk analysis of the type of setting, type of procedure, likelihood of exposure to blood or fluid capable of transmitting bloodborne pathogens, length of use, amount of stress on the glove, presence of latex allergy, fit, comfort, cost, length of cuffs, thickness, flexibility, and elasticity."*

**Safe Practices for Glove Use[3]**

- Wear medical gloves when there is a risk of contact with blood, body fluids or substances, mucous membranes, open wounds or skin lesions.
- Wear gloves that are certified by the CGSB.
- Wear gloves when handling items contaminated with blood, body fluids, secretions or excretions.
- Wear gloves if you have any cuts or lesions on your hands or if you have dermatitis affecting your hands.
- Avoid latex gloves and powdered gloves to reduce sensitization or allergic reactions.
- Ensure that the gloves fit properly.
- Inspect gloves for holes or tears, discarding any damaged gloves.
- Put gloves on just before beginning the task, and remove them promptly when finished and before touching any environmental surfaces.
- Work from "clean to dirty" (touching clean sites or surfaces before dirty or contaminated ones).
- Do not touch your face or adjust PPE with contaminated gloves and avoid touching uncontaminated items such as light switches, telephones, etc. while wearing gloves.
- Change gloves when they become soiled, during lengthy procedures, and between patients.
- Remove gloves carefully according to the IPC guidelines and dispose of them properly.
- Wash hands before using and after removing gloves.
- Never reuse or wash single-use disposable gloves.

[2] *Recommendations for Canadian Health Care and Public Service Settings*; found at http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s3/index.html

[3] Modified from information provided in Preventing the Transmission of Blood Borne Pathogens in Health Care and Public Service Settings. Found at http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s3/index.html (See Supplement)

PPE is required when there is the potential for exposure of the face to splashes or sprays of infectious material. The selection of eyewear depends upon the tasks being conducted. Types of eye protection include safety glasses, goggles, visors, face shields and table mounted barrier shields. Regular prescription eyewear and contact lenses are not considered effective as PPE. Safety eyewear should fit the wearer, be clean and well maintained and stored. If necessary, goggles may be fitted with prescription lenses or worn over glasses. Face shields should cover the forehead, extend below the chin, and wrap around the side of the face. Masks protect the mucous membranes of the nose and mouth from exposure to large droplets that may contain infectious materials. Masks are commonly used to contain droplets at the source (for example, the dental worker or patient with a cough). Masks should fully cover the nose and mouth and fit snugly. Masks worn by patients reduce exposure through droplet containment at the source, and respirators worn by health care workers reduce exposure to the respiratory system.

*The Difference between a Surgical or Procedure Mask and a Respirator*

| Surgical or Procedural Masks | Respirators (i.e. NIOSH approved N95) |
|---|---|
| • Surgical Masks are <u>not</u> designed to seal tightly against the dental worker's face or certified to prevent inhalation of small droplets/particles.<br>• When the dental worker inhales, contaminated small droplets can pass through gaps between the face and surgical mask. | • A fit-tested NIOSH approved respirator provides a proper seal at the dental workers face, forcing inhaled air to be pulled through the filter material and not through gaps between the face and the respirator. |
| • Surgical masks provide a physical barrier for protection from splashes of large droplets of blood or body fluids.<br>• Surgical masks are used for several purposes including:<br>o Prevention of accidental contamination of patients wounds with pathogens normally present in mucus or saliva<br>o Placed on sick patients to limit spread of infectious respiratory secretions to others<br>o Protection from splashes or sprays of blood or body fluid<br>o Assist to keep dental workers contaminated hands from contacting their own mucous membranes | • Respirators are designed to reduce dental worker's exposure to airborne contaminants.<br>• Fit tested NIOSH approved respirators are used when required, based on hazard assessment. |

*Adapted from OSHA (2007) *Guidelines on Preparing Workplaces for an Influenza Pandemic*

## Chemical Hazards and Controls

This section will provide a brief overview of selected chemicals that dental workers may come into contact with. **Note that this list is not extensive or all-inclusive.** In the control column, E, A and P are used to designate Engineering, Administrative and PPE controls. These controls are briefly summarized and the reader should link to the references provided for additional information. The proper choice of control measures must be based on a risk assessment for the specific tasks being performed. Safe work practices are administrative controls necessary for working with all harmful substances and educating workers in the practices is vital. Safe work procedures should be designed to:

- Limit the worker's exposure time
- Reduce contact with the substance through any route of exposure to the worker
- Ensure safe disposal of substances and disposable equipment that comes into contact with harmful substances
- Ensure safe handling and decontamination of reusable equipment
- Require the use of all designated controls.

Worker education is critical for safely handling harmful substances.

**General Resources – Chemical Hazards**
For more information about specific chemical hazards, consult the following resources:
NIOSH Pocket Guide to Chemical Hazards (http://www.cdc.gov/niosh/npg/).
CCOHS Cheminfo (http://ccinfoweb.ccohs.ca/).
Alberta Workplace Health and Safety Bulletins (http://employment.alberta.ca/SFW/136.html ).

The following charts, taken from Volume 3 – Best Practices for the Assessment and Control of Chemical Hazards in Healthcare, summarize important information about some of the chemical hazards that may be encountered by dental personnel.

*Chemicals used for cleaning and disinfection*

| Chemical (category or group) | Common Uses and Examples | Exposure and Health Effects Information | Controls | For more information: |
|---|---|---|---|---|
| These are examples of chemicals, uses, health effects and controls. For each chemical used in the workplace, specific information MUST be consulted to determine controls based on what the product is used for, how it is used and the environment it is used in. This may be found on MSDSs, information provided by the manufacturer or supplier, or other sources. Individual reactions to chemicals must also be considered in determining appropriate controls. | | | | |
| **Alcohol hand sanitizers** | Hand hygiene when water is not available and hands are not visibly soiled | May cause skin dryness. Product is flammable. | **A**- Appropriate storage of product (away from ignition sources and incompatible products). Provision of hand cream to soothe hand dryness. | http://www.ottawa.ca/residents/health/emergencies/pandemic/hand/faq_gel_en.html<br><br>http://employment.alberta.ca/documents/WHS/WHS-PUB_fex002.pdf<br><br>http://www.municipalaffairs.alberta.ca/documents/ss/STANDATA/fire/fcb/97fcb026.pdf |
| **Detergents** | Cleaning a variety of surfaces | Possible eye, skin, and respiratory irritants. Some products may cause allergic dermatitis or contain sensitizers such as nickel or limonene. May react with other products to create hazardous products. | **E**- Substitution with less harmful product. Properly designed and maintained ventilation systems. Automatic diluting machines.<br>**A**- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. WHMIS program and maintenance of MSDSs. Worker education. Accommodation for sensitized workers or those with health issues,<br>**P**- Gloves and eye protection. | http://www.hercenter.org/hazmat/cleaningchems.cfm<br><br>http://www.museo.unimo.it/ov/fdrEdete.htm |
| **Low Level Disinfectants** | Chlorine compounds, alcohols, quaternary ammonium salts, iodophors, phenolic | Most are eye, skin, and respiratory irritants, particularly when concentrated. Some products may produce sensitization. Toxic effects depending on | **E-** Substitution with less harmful product. Properly designed and maintained ventilation systems. Automatic diluting machines. Closed systems.<br>**A-** Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. | http://ehs.virginia.edu/biosafety/bio.disinfection.html<br><br>http://www.cdc.gov/niosh/topics/chemical.html<br><br>http://cms.h2e- |

| | | | | |
|---|---|---|---|---|
| | compounds, hydrogen peroxide used widely for disinfection; usually prepared and used in low concentrations. | nature of chemical. May react with other products to create hazardous products. | WHMIS program and maintenance of MSDSs. Worker education. Accommodation for sensitized workers or those with health issues.<br>**P**- Gloves and eye protection. | online.org/ee/hazmat/hazmatconcern/steril/<br><br>http://www.mtpinnacle.com/pdfs/disinfectant-selection-guidelines.pdf |
| **Glutaraldehyde** | High level disinfection of medical devices. May also be used in tissue processing | Contact allergen, may cause occupational asthma and respiratory and skin sensitization. Ceiling Limit OEL exists. Strong skin and respiratory irritant. May react with other products to create hazardous products. | **E**- Substitution with less harmful product. Properly designed and maintained ventilation systems. Local exhaust ventilation. Enclosed processes.<br>**A-** Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures including spill procedures. WHMIS program and maintenance of MSDSs. Worker education. Routine exposure monitoring. Accommodation for sensitized workers or those with health issues,<br>**P-** Gloves, eye protection, face protection, and chemical-resistant protective clothing. Respirators for use in the event of spills. Respirators if engineering controls are insufficient. | http://www.osha.gov/Publications/3258-08N-2006-English.html<br><br>http://www.osha.gov/SLTC/etools/hospital/hazards/glutaraldehyde/glut.html<br><br>http://www.cdc.gov/niosh/docs/2001-115/<br><br>http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi. |
| **Hydrogen Peroxide** | Sterilization of medical devices and surfaces | Skin, eye and respiratory irritant. Oxidizer. May react with other products to create hazardous products. Fire hazard. | **E**- Substitution with less harmful product. Properly designed and maintained ventilation systems. May require local exhaust ventilation. Enclosed processes.<br>**A-** Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. WHMIS program and maintenance of MSDSs. Worker education. Accommodation for workers who are sensitized or may have health issues.<br>**P**- Gloves, eye protection and chemical-resistant protective clothing. Respiratory | http://www.cdc.gov/niosh/npg/npgd0335.html |

| | | | | |
|---|---|---|---|---|
| | | | protection based on risk assessment. | |
| **Ortho-phthalaldehyde (OPA)** | High level disinfection of medical devices. Replaces glutaraldehyde containing disinfectants. | Eye and respiratory irritant and skin sensitizer. May cause skin discoloration. May react with other products to create hazardous products. | **E**- Properly designed and maintained ventilation systems. May require local exhaust ventilation. Enclosed processes.<br>**A**- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures including disposal and spill procedures, and keeping soaking containers closed at all times. WHMIS program and maintenance of MSDSs. Worker education. Control access to work area. Exposure monitoring. Accommodation for sensitized workers or those with health issues,<br>**P-** Gloves, eye protection, face shield and chemical-resistant protective clothing. | http://www.mtpinnacle.com/pdfs/Cydex.pdf<br><br>http://www.aspjj.com/us/supports/material-safety-data-sheets<br><br>http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi |

*Chemicals used in treatment*

| Chemical | Common Uses; Examples | Exposure and Health Effects Information | Controls | For more information: |
|---|---|---|---|---|
| These are examples of chemicals, uses, health effects and controls. For each chemical used in the workplace, specific information MUST be consulted to determine controls based on what the product is used for, how it is used and the environment it is used in. This may be found on MSDSs, information provided by the manufacturer or supplier, or other sources. Individual reactions to chemicals must also be considered in determining appropriate controls. | | | | |
| **Anaesthetic gases**[4] | Used to induce anaesthesia by inhalation in operating | Exposure is primarily through inhalation. Neurological and reproductive effects. | **E-** Substitution with less harmful products. Properly designed and maintained ventilation systems. Scavenging systems to control fugitive | http://www.ccohs.ca/oshanswers/chemicals/waste_anesthetic.html |

[4],[23] Information from linked sources plus Essential of Modern Hospital Safety, Volume 3, William Charney, ed. 1994, CRC Press, ISBN 1-56670-083-3.

| | | | | |
|---|---|---|---|---|
| | theatres and dental offices; may off-gas in recovery rooms and ICUs | Central nervous system depressant. | emissions. Properly designed patient masks and induction systems to reduce emissions.<br>**A-** Safe work procedures. Preventative maintenance on equipment and systems. Routine exposure monitoring. Worker education.<br>**P –** Respiratory protection based on hazard assessment. | |

*Other chemicals and substances*

| Chemical | Common Uses; Examples | Exposure and Health Effects Information | Controls | For more information: |
|---|---|---|---|---|
| These are examples of chemicals, uses, health effects and controls. For each chemical used in the workplace, specific information MUST be consulted to determine controls based on what the product is used for, how it is used and the environment it is used in. This may be found on MSDSs, information provided by the manufacturer or supplier, or other sources. Individual reactions to chemicals must also be considered in determining appropriate controls. | | | | |
| **Compressed gases** | Commonly used for patient treatment i.e. oxygen, nitrous oxide. Also commonly used in maintenance activities. Liquid nitrogen is used for tissue preservation and cryo-treatment (e.g. wart removal) | Asphyxiation, anaesthetic effects. Toxicity is dependant on chemical products. Other hazards include explosions, fire hazards, flying projectiles, and release of gas. Cryogenic gases may also cause skin damage through freezing. | **E-** Substitution with less harmful product. Adequate ventilation. Proper storage of cylinders.<br>**A**- Appropriate store of products to decrease exposure and minimize fire and explosion hazards. Safe work procedures including transportation. WHMIS program and maintenance of MSDSs. Worker education. Good housekeeping.<br>**P**- PPE based on hazard assessment. | http://www.ccohs.ca/oshanswers/chemicals/compressed/compress.html<br><br>http://www.ccohs.ca/oshanswers/prevention/comp_gas.html<br><br>http://www.chem.ubc.ca/safety/safety_manual/hazard_chem_gases.shtml |
| **Latex** | Used in gloves, medical | Exposure can produce irritant contact | **E**- Substitution with less harmful product. Properly designed and maintained | http://www.worksafebc.com/publications/health_and_safety/by_topic/as |

| | | | | |
|---|---|---|---|---|
| | devices, some respirators, elastic bands, balloons, etc. | dermatitis, allergic contact dermatitis, and allergic responses including immediate hypersensitivity and shock. | ventilation systems.<br>**A**- Purchasing controls to limit latex containing materials from entering facility. Safe work procedures. Education of workers in the nature of the hazard, hand washing after glove removal, proper glove donning and removal. Work reassignment for workers with latex allergies to areas where latex is not present. As per hazard assessment. | sets/pdf/latex_allergies.pdf<br><br>http://www.ccohs.ca/oshanswers/diseases/latex.html?print |
| **Mercury** | Metallic mercury may be found in thermometers, pressure gauges (manometers), other medical devices and dental fillings, etc. | Exposure is through inhalation of vapours, ingestion and skin absorption. Skin sensitizer. Corrosive as liquid. Target effects to the nervous system, kidneys, cardiovascular and eyes. | **E**- Elimination of mercury containing equipment. Substitution with less harmful product. Enclosed mercury sources. Mechanical amalgamators to ensure no physical contact. Properly designed and maintained ventilation systems. Local exhaust ventilation may be required.<br>**A**- Safe work procedures including spill procedures. Education of workers in the nature of the hazard. Purchasing controls to restrict mercury containing materials from entering facility. Monitoring of the work environment following a spill. Good hygiene practices. Appropriate storage of products to decrease exposure.<br>**P**- Protective clothing, gloves, eye and face protection, and respiratory protection based on hazard assessment. | http://employment.alberta.ca/documents/WHS/WHS-PUB_ch003.pdf<br><br>http://www.cdc.gov/niosh/npg/npgd0383.html<br><br>http://www.mtpinnacle.com/pdfs/MERCURY-USE-%20HOSPITALS-AND-CLINICS.pdf |
| **Methyl methacrylate** | Surgical and dental prosthesis | Eye, skin and mucous membrane irritant. Central nervous system and cardiac effects. Skin sensitizer. | **E**- Substitution with less harmful product. Properly designed and maintained ventilation systems. Enclosed mixing devices. Local exhaust ventilation.<br>**A**- Safe work procedures. Good hygiene practices. Education of workers in the nature of the hazard. WHMIS program and maintenance of MSDSs. Medical monitoring of workers. | http://www.cdc.gov/niosh/npg/npgd0426.html<br><br>http://www.cdc.gov/niosh/hcwold5b.html<br><br>http://www.cdc.gov/niosh/npg/npgd0426.html |

| | | | | |
|---|---|---|---|---|
| | | | **P**- Gloves, eye protection and face shields. Respirators based on hazard assessment. | |
| **Various metals (e.g. beryllium, chromium, cobalt and nickel)** | Used for castings of bridge framework | Lung irritants and disease | **E**- Substitution with less harmful product. Properly designed and maintained ventilation systems. Enclosed mixing devices. Local exhaust ventilation.<br>**A**- Safe work procedures. Good hygiene practices. Education of workers in the nature of the hazard. WHMIS program and maintenance of MSDSs. Medical monitoring of workers.<br>**P**- Gloves, eye protection and face shields. Respirators based on hazard assessment. | http://www.cdc.gov/niosh/npg/npgd0426.html<br><br>http://www.cdc.gov/niosh/hcwold5b.html<br><br>http://www.cdc.gov/niosh/npg/npgd0426.html |
| **Silica** | Mixing porcelain powders; grinding or polishing dried porcelain; investment and divestment of castings | Silicosis, other lung diseases | **E** – Local exhaust ventilation. Dust collection systems. Substitution to eliminate crystalline silica. HEPA vacuums.<br>**A -** Safe work procedures. Good hygiene practices. Good housekeeping, including wet mopping. Education of workers in the nature of the hazard. WHMIS program and maintenance of MSDSs. Medical monitoring of workers.<br>P-Respirators | http://www.mda-myanmar.org/journals/Myanmar-Dental-Journal-2008.pdf |
| **Personal care products, scents and fragrances** | A wide range of products including personal care items such as shampoos, soaps, perfumes, creams, deodorants, etc. Also contained in, cleaning products. | May cause a variety of mild to severe symptoms. Allergic, asthmatic and sensitive workers may experience reactions. | **E**- Elimination of scented products. Substitution with less harmful products. Properly designed and maintained ventilation systems.<br>**A-** Development, implementation and enforcement of scent-free policies. Signage in work areas where affected workers work. Worker education. | http://www.ccohs.ca/oshanswers/hsprograms/scent_free.html |

In this section the chemical exposure hazards most commonly encountered by dental personnel and methods to control them are presented. Employers should carefully evaluate the potential for exposure to chemical hazards in all dental tasks and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the most frequently encountered chemical hazards encountered by dental personnel.

**Note:**
The following charts taken from Volume 3 – Best Practices for the Assessment and Control of Chemical Hazards in Healthcare provide basic information about control strategies for commonly occurring chemical hazards related to dental tasks. The selection of controls must be based on a risk assessment of the tasks and environment. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls must be followed

| Potential Chemical Hazards | Summary of Major Control Strategies | | |
|---|---|---|---|
| | **Engineering** | **Administrative** | **PPE** |
| **Exposure to methyl methacrylate used as a filler** | Substitution with less harmful product. Maintain adequate general ventilation. Enclosed mixing devices. Local exhaust ventilation. | Develop safe work procedures. Maintain good hygiene practices. Educate workers in the nature of the hazard. Medical monitoring of workers. | Gloves, eye protection and face shields. Respirators based on risk assessment |
| **Exposure to various metals or silica** | Substitution with less harmful product. Maintain adequate general ventilation. Enclosed mixing devices. Local exhaust ventilation. HEPA vacuums. | Develop safe work procedures. Maintain good hygiene practices. Wet mopping where silica is present. Educate workers in the nature of the hazard. Medical monitoring of workers. | Gloves, eye protection and face shields. Respirators based on risk assessment |
| **Exposure to mercury when handling mercury-containing amalgams** | Elimination of mercury containing amalgams. Substitution with less harmful product. Maintain adequate general ventilation. Local exhaust ventilation when removing old amalgams. | Safe work procedures. Educate workers in the nature of the hazard. Monitor work environment following a spill. Ensure good hygiene practices. Store products appropriately to decrease exposure. | Protective clothing, gloves, eye and eye protection, and respiratory protection. |

| | | | |
|---|---|---|---|
| **Exposure to latex from contact with latex gloves or components of medical devices** | Substitution with less harmful product. Maintain adequate general ventilation. | Purchasing controls to limit latex containing materials from entering facility. Educate workers in the nature of the hazard, hand washing after glove removal, proper glove donning and removal. Periodic screening of workers. | |
| **Exposure to a variety of disinfecting and cleaning agents in routine cleaning activities related to patient care** | Maintain adequate general ventilation. Automatic diluting machines. | Purchase in ready to use concentrations to minimize handling. Worker education. Safe work procedures. WHMIS program and maintenance of MSDSs. | Gloves and eye protection. |
| **Exposure to scented products that may induce sensitization** | Elimination of scented products. Substitution with less harmful products. Maintain adequate general ventilation. | Develop scent-free policies. Educate worker in the nature of the hazard. Post signage in work areas where affected workers work. | |

## Notes about controls for chemical hazards

### *Engineering Controls*

Many engineering controls are available for controlling the hazard at the source and along the path of transmission. For chemical hazards, common engineering controls include:

- Elimination
- Substitution
- Local exhaust ventilation
- General ventilation (only appropriate for non-toxic chemicals)
- Isolation/enclosed processes
- Proper chemical storage
- Facility design

For dental personnel, chemical exposures may be limited by ensuring the facilities well designed, have effective ventilation, have automated equipment that reduces manual handling of chemicals, adequate storage for any chemicals used and have easily cleanable surfaces.

### *Elimination*

Elimination of a hazardous chemical from the dental workplace is always desirable but not always possible. For example, working with chemicals is required when working with amalgams and other dental prostheses, anaesthetic gases must be used for surgeries, disinfectants are required when biological hazards are present, cleaning solutions are necessary to maintain hygienic conditions, and reagents are required for dental materials.

### *Substitution*

Some chemicals used in the dental environment are chosen based on tradition or cost. In recent years, efforts have been made to find less hazardous alternatives to some of the chemicals commonly used. When substituting a chemical for one that is currently in use, it is critical to ensure that the new chemical does not have properties that may make it more toxic or more flammable, etc.

Some examples of substitution of chemical hazards in healthcare:

- Replacing mercury-containing devices (manometers, thermometers) with non-mercury containing alternatives.
- Using dental alloys that do not contain beryllium
- Using accelerated hydrogen peroxide-based disinfectants instead of glutaraldehyde.
- Using hydrogen peroxide-based cleaners rather than chlorine- based cleaners.

### *Local Exhaust Ventilation*

The most common engineering control used in healthcare to minimize exposure to chemicals in the air is local exhaust ventilation (LEV). LEV captures contaminants at the point where they are released or generated and mechanically removes them before workers can inhale them.

Examples of uses of local exhaust ventilation in healthcare:

- Scavenging systems are used to ensure that workers are not exposed to elevated levels of waste anaesthetic gases.
- Dedicated local exhaust is used over instruments soaking in glutaraldehyde.
- Methyl methacrylate is handled with local exhaust ventilation by dental technicians.
- Suction is used when removing old fillings.

### *Administrative Controls*

#### *Policies and procedures, training*

As administrative controls, policies and procedures should be in place to ensure that there are safe work procedures for storing and using chemicals and discarding chemical wastes appropriately. Dental workers may come into contact with a number of chemicals through exposure to chemicals that may be present in dental materials and disinfection procedures. Workplace Hazardous Materials Information System (WHMIS) training should be provided to all dental personnel. In addition, emergency call lines that provide expertise and advice regarding toxic chemicals should be made available.

#### *WHMIS Program*

A WHMIS program is an administrative control to reduce the risk of exposure to chemicals in the workplace and is a legal requirement for all employers who use controlled products in Alberta. To be effective, a WHMIS program must be relevant to the workplace, presenting information and training specific to the chemicals that are used in the workplace. The components of WHMIS include having current Material Safety Data Sheets for all products in the workplace, ensuring all products are appropriately labelled and ensuring that all workers are instructed on how to use the chemicals safely.

#### *Exposure follow-up – emergency response equipment*

Two types of exposure follow-up are considered as administrative controls. The first is the provision of appropriate emergency response equipment to reduce the impact of the exposure. The second is the medical follow-up for workers who have had a chemical exposure. In the first case, emergency response equipment for dental workers usually refers to emergency eyewashes that can provide sufficient water to dilute the contaminant before it can cause extensive damage. Wherever chemical exposure could pose a hazard to eyes and skin, emergency wash devices are required. Appropriate signage that is easily visible must be provided to indicate where the eyewashes are kept.

#### *Medical follow-up of the exposed worker*

A worker who has had a chemical exposure may require medical follow-up. Guidelines are available to provide information on the treatment and monitoring of workers with exposure to specific chemicals.

#### *Health Surveillance and Medical Monitoring in the Workplace*

Health surveillance encompasses two types of individual health assessments. The pre-placement assessment considers the worker's personal health status as it relates to potential workplace exposures. It is useful to identify if workers have any allergies or sensitivities to products that they may need to work with. Another form of health surveillance is the on-going biological monitoring of

workers who are exposed to certain chemicals in the workplace. In some cases, dental employers establish medical surveillance programs to monitor potential exposures to hazardous materials.

### *Chemical Waste Handling and Disposal*

Chemical wastes must be addressed with a good chemical waste management system. Municipal and or Provincial codes address appropriate disposal requirements and aim to reduce contamination, possible injuries, illness or reactions related to chemical exposures.

### *Additional considerations for reducing risk of exposure*

It is prudent to be aware of the need for modification of the work environment, conditions or required PPE for workers who may be medically vulnerable to the effects of some substances. Higher risk workers may include pregnant workers, workers with allergies or those who are sensitized to certain chemicals. Some common approaches to accommodate these workers include temporary reassignment to areas or tasks where the exposure potential is eliminated; work scheduling to reduce the amount of exposure, and changes to the PPE to accommodate limitations.

## *Personal Protective Equipment*

Personal protective equipment (PPE) is considered the lowest level of protection in the hierarchy of controls. This reflects the reliance on proper selection, fit, use and maintenance of the equipment by the organization and individual dental workers. PPE is often used in conjunction with other controls (engineering and administrative) to provide additional protection to workers. PPE is designed to protect the worker from exposure to chemicals by blocking access to the route of entry into the body. Gloves, aprons and other protective clothing reduce exposure through the dermal (skin) contact route. Eye and face protection reduce exposure through skin and mucous membrane contact. Respirators reduce exposure to the respiratory system.

### *Gloves*

The most frequently used PPE by dental workers to prevent exposure to chemicals is gloves. When choosing gloves, the following must be considered:

- The nature and concentration of the chemicals
- The amount of time the gloves will be exposed to the chemical
- Dexterity required to perform the task
- Extent of protection needed (to wrist or higher)
- Decontamination and disposal requirements

Rules for glove use for chemicals[5,6]

- Wear the appropriate gloves for the task when needed; for reusable gloves, follow the manufacturer's guidelines for care, decontamination and maintenance. Choose gloves resistant to holes and tears.
- Ensure gloves fit properly and are of the appropriate thickness to offer protection; ensure adequate supplies of gloves in appropriate sizes.
- Avoid using latex gloves (due to latex allergies).
- Do not use worn or defective gloves.
- Wash hands once gloves have been removed.
- Disposable gloves must be discarded once removed. Do not save for future use.
- Dispose of used gloves into the proper container. Have separate disposal locations for gloves contaminated with chemicals which pose a toxic hazard if mixed.
- Non-disposable/reusable gloves must be washed and dried, as needed, and then inspected for tears and holes prior to reuse.
- Remove gloves before touching personal items, such as phones, computers, pens and one's skin.
- Do not wear gloves into and out of areas. If gloves are needed to transport anything, wear one glove to handle the transported item. The free hand is then used to touch door knobs, elevator buttons, etc.
- Do not eat, drink, or smoke while wearing gloves. Gloves must be removed and hands washed before eating, drinking, or smoking.
- If for any reason a glove fails, and chemicals come into contact with skin, remove the gloves, wash hands thoroughly and obtain first aid or seek medical attention as appropriate.

### *Eye and Face Protection*

For most dental workers who use chemicals, goggles or face shields are necessary. In most cases, goggles are considered re-usable. All reusable PPE must be properly decontaminated and maintained. Selection of protective eyewear should take into account:

- Level of protection required.
- Comfort of the wearer.
- Secure fit that does not interfere with vision or movement.

[5] OSH Answers- Chemical Protective Clothing – Gloves; http://www.ccohs.ca/oshanswers/prevention/ppe/gloves.html

[6] Glove Use in Laboratories; University of Florida Chemical Hygiene Plan; http://www.ehs.ufl.edu/Lab/CHP/gloves.htm

- Ease of cleaning and disinfection.
- Durability.
- Compatibility with prescription glasses and other PPE that must be worn at the same time (e.g. respirators)

### *Respirators*

According to the Alberta Occupational Health and Safety Code 2009[7], there is a duty to provide and use respiratory protective equipment (RPE) when a hazard assessment indicates that a worker may be exposed to airborne contaminants or exposed to an oxygen deficient environment. Employers are required to use engineering and administrative controls before using RPE (respecting the hierarchy of controls). Respirators may be required to protect dental workers from exposure to chemicals by inhalation.

**Respiratory Protective Equipment (RPE)**

Employers must determine the degree of danger presented by respiratory hazards and whether workers need to wear RPE if workers are, or may be exposed to, an airborne harmful substance. The employer must consider the nature and the exposure circumstances of the harmful material. If a hazard assessment identifies the need for RPE, the specific legislated requirements are outlined in the *OHS Code, Part 18.*

Some of the requirements include:

**Training**

• Employers must ensure that all workers receive appropriate education, instruction or training with respect to hazards that they may be exposed to and procedures and controls used to reduce exposure.

**Code of Practice**

• If respiratory equipment is used at a work site, an employer must prepare a written code of practice governing the selection, maintenance and use of the RPE.

**Approval of Equipment**

• Employers must ensure that RPE required at a work site is approved by NIOSH or another standards setting and equipment testing organization, or combination of organizations, approved by a Director of Occupational Hygiene.

**Effective Face Seal**

• Employers must ensure that RPE that depends on an effective facial seal for its safe use is correctly fitted in accordance with CSA standard Z94.4-02 or a method approved by a Director of Occupational Hygiene.

*OHS Act,* Section 33 and OHS Code, Part 18

[7] Alberta OHS Code 2009, Part 18 – Personal Protective Equipment

## *Protective Clothing*

Chemical protective clothing is available as gowns, aprons, uniforms, coveralls, and foot covers. The choice of protective clothing relies on an accurate hazard assessment. Should protective clothing become contaminated with a chemical or damaged, the clothing must be removed and handled according to organizational procedures (disposal or proper decontamination). Residual chemicals such as acids on clothing may continue to present an exposure hazard. Workers must not wear clothing that is contaminated with chemicals home, as this may pose a danger to themselves and others.

**Worker Decontamination**

If a worker is contaminated by a harmful substance at the worksite, the employer must ensure that only those items that have been properly decontaminated or cleaned are taken from the worksite

## Physical Hazards and Controls

There are many potential physical hazards to which dental personnel may be exposed. The nature of the work may pose ergonomic hazards, the potential for slips, trips and falls, exposure to environmental conditions, hazards related to the storage and use of compressed gas cylinders, cuts, and electrical hazards.

In this section the physical hazards most commonly encountered by dental workers and methods to control them are presented. Employers should carefully evaluate the potential for exposure to hazards for all dental tasks and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments.

**Note:**
The following chart provides basic information about control strategies for commonly occurring physical hazards in dental work. The selection of controls must be based on a risk assessment of the tasks and environment. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls must be followed.

| Potential Physical Hazards | Summary of Major Control Strategies | | |
|---|---|---|---|
| | **Engineering** | **Administrative** | **PPE** |
| **Ergonomic hazards associated with computer use or workstation design** | Ergonomically designed workstations, chairs and equipment. Incorporate adjustable workstation to accommodate shared use by employees of various sizes. | Adjustment of workstation and chair to fit user. Worker education regarding ergonomic hazards and control strategies. Self assessment tools to assist workers in identifying and controlling risk factors. Safe work procedures. Early reporting of signs and symptoms of ergonomic concerns. Stretches and micro-breaks. Purchasing standards for ergonomically designed computer workstations, chairs and equipment. Ergonomic assessments. Maintenance of | |

| | | | |
|---|---|---|---|
| | | workstations, chairs and equipment. | |
| **Ergonomic hazards associated with awkward sustained postures and repetition/duration.** | Ergonomically designed workstation, chairs, instruments and equipment. Use automatic and ultrasonic instruments and tools whenever possible. Use of indirect vision when treating maxillary teeth. Consider a non-traditional stool such as a saddle chair (improve posture and mobility). Minimize glare through the use of appropriate lighting and window coverings. | Adjust the workstation to the patient and the worker each time. Schedule patients in an effort to reduce risk factors. Worker education regarding ergonomic hazards and control strategies. Safe work procedures. Early reporting of signs and symptoms of ergonomic concerns. Stretches and micro-breaks. Alternate working position frequently. Keep frequently used instruments in easy reach. Purchasing standards for ergonomically designed workstations, chairs, instruments and equipment. Maintenance of equipment. | |
| **Exposure to ionizing radiation when taking dental X-rays** | Workplace design to provide distance between worker and source. Appropriate shielding materials (permanent where possible). Interlock systems. Equipment design to minimize scatter. Positioning devices for patients. Audible signals on machines when exposure is ended. Replacement of older dental X-ray equipment with newer equipment with additional safety features. | Worker education. Safe work procedures reduce exposure time (procedures requiring fewer workers in area, etc.). Scheduling. Radiation safety program. Exposure monitoring. | Lead gloves, aprons, etc. as required. |
| **Exposure to laser beams during dental procedures** | Ensure area has no reflective surfaces. Local exhaust ventilation. Fail-safe systems. Lock/key access for activation | Radiation safety program. Worker education. Safe work procedures (including placing laser in standby mode when not in use, single-operator activation, activate laser only when tip is under direct observation by surgeon, etc.). Restricted work area. Laser safety | Gloves, gowns, and eye protection based on specific parameters of laser in use (wavelength, pulse versus continuous, wattage, laser class/type) |

| | | | |
|---|---|---|---|
| | | program. | |
| **Exposure to UV-A radiation when curing resin-based materials** | Equipment maintenance. Area design. Blue light filters. | Worker education. Safe work procedures including review and attention to equipment manufacturer's guidelines. | Eye protection with UV filters. |
| **Falling hazards associated with slips, trips and falls** | Install slip resistant flooring. Design stairwells according to accepted safety standards. Ensure adequate lighting. | Perform regular maintenance on flooring, stairwells, hallways, handrails, etc. Inspect ladders prior to use. Worker education. Implement a spill cleanup program that includes prompt spill cleanup, use of warning signs, etc. Maintain good housekeeping practices and minimize clutter and tripping hazards. | Appropriate footwear with gripping soles and good support. |
| **Cuts from sharp instruments, including medical instruments and scissors** | Avoid use of sharps when not required. Replace sharps with Safety Engineered Medical Devices. Proper storage of sharps. | Worker education. Safe work procedures. | Gloves |
| **Exposure to cryogenic agents in cryosurgical procedures** | Substitution ($CO_2$ instead of $N_2O$) where possible). Proper storage of containers, including exhaust ventilation, scavenging systems, storage away from moisture, ignition sources and flammable materials. Use of proper lifting and transfer devices (hand truck or cart). Containers with pressure relief valves. Equipment maintenance. Restricted access. | Worker education. Safe work practices. Spill and exposure emergency response equipment and procedures. Oxygen depletion monitoring (depending upon hazard assessment). | Face shields, goggles, insulated gloves, and protective clothing as required based on hazard assessment. Earplugs if venting gases. |
| **Burns from handling recently heat-sterilized equipment** | Work process design to manage equipment turnover. | Safe work procedures. Rotation of supplies. | Heat-resistant gloves. |
| **Fire, projectiles, or physical injury if compressed gas cylinders used for a variety of procedures and maintenance activities are damaged,** | Install protective valve caps when cylinder is not in use if the cylinder is equipped with a means of attaching caps. | Safe work procedures that includes use, care, maintenance, storage and transport. Worker training. | PPE based on hazard assessment and type of compressed gas. Protective footwear for |

| | | | |
|---|---|---|---|
| **dropped or mishandled** | Secure and restrain cylinders. | | impact hazard when handling large cylinders. |
| **Electrical hazards arising from use of electrical cords and appliances** | Ground fault circuit interrupters when used close to water sources. | Safe work procedures that include use of electrical cords, power bars and appliances that includes facility approval requirements. Worker training. | |

## Notes about controls for physical hazards

### *Engineering Controls*

#### *Ergonomic hazards*

One of the most commonly encountered physical hazards for dental personnel is the use of awkward body positions that includes prolonged positions with bent or twisted necks, and repetitive and monotonous movements. Engineering controls workplace design to reduce awkward positions as much as possible and ergonomically designed furniture and equipment.

For a task assessment, consideration should be given to the risks associated with the tasks. These may include

- Static positions that may be required
- Duration of task
- Awkward postures for dental personnel
- Tasks requiring extended reach, bent or twisted necks, or abducted arms
- Repetitive motions

#### *Radiation*

Shielding is a critical engineering control for controlling exposure to external ionizing radiation hazards. It relies on providing a specific barrier material that absorbs, stops or attenuates the radiation. The use of shielding requires a careful consideration of the type of radiation, the required thickness of the shielding material, the location of the workers, and the potential for leakage or scatter.

Other engineering controls include design considerations, interlock systems and equipment selection and maintenance. For both ionizing and non-ionizing radiation, design considerations are important as engineering controls to prevent exposures. For ionizing radiation, permanent shielding should be provided in areas where there is frequent need for shielding. Mazes and other traffic area

designs are used to reduce exposure by providing barriers and reducing traffic. The placement of equipment can greatly reduce awkward movement for workers.

For lasers, engineering controls include ensuring the area has no reflective surfaces, the provision of fail-safe system and lock/key access for activation as well as interlock systems

Interlock systems are mechanical systems that prevent the operation of the equipment or some facet of the equipment until an action or other system is engaged or completed. Interlock systems are used extensively in radiation equipment to ensure that the equipment cannot be accidentally activated.

The choice and the maintenance of equipment are critical engineering controls. Equipment design that includes advanced safety features (such as audible/visible signals when the equipment is operating, interlock or key/lock systems, permanent shielding, etc.) should be considered whenever possible. Equipment calibration and maintenance will ensure the equipment performs optimally and reduces the potential for accidental worker exposure.

### *Trips, Slips and falls*

In order to prevent slips, trips and falls, adequate lighting should be available. Cords and other tripping hazards should not be in the path of traffic. Non-slip flooring should be provided. The following are common engineering controls used to reduce the risk of slips, trips and falls in patient care areas:

- Designing treatment areas and equipment layout to minimize cords and to accommodate equipment without creating tripping hazards
- Designing treatment areas with adequate space to accommodate portable equipment without creating tripping hazards
- Providing adequate storage space to minimize the storage of equipment in hallways
- Keeping hallways clear of obstructions
- Using cord covers over electrical cords, as necessary
- Utilizing non-slippery surfaces on the whole steps or at least on the leading edges
- Performing regular maintenance to keep stairs in good repair. Ensure nothing is sticking out of surfaces on the stairs, handrails or banisters (e.g. nails or splinters).
- Maintaining lighting levels
- Using angular lighting and colour contrast to improve depth perception

### *Cuts*

The most effective controls to reduce cuts are engineering controls. Common engineering controls include

- Substitution of medical sharps with safety engineered medical devices (SEMDs)
- Substitution of a sharp instrument with a less sharp alternative (e.g. engineered sharps injury prevention devices)
- Safety cutters as bag and box openers
- Proper storage and disposal of sharps
- Transfer trays and magnetic drapes in during dental surgery

### *Temperature Extremes*

Cryogenic liquids are liquefied gases that are maintained in a liquid state by keeping them at very low temperatures and maintaining them under pressure. Major hazards associated with cryogenic agents are the rapid expansion of the gases resulting in increased concentration of the gas in surrounding air, and burns from contact with the cryogenic agent or material or equipment that contains it. The increased concentration of gases may cause asphyxiation if the gases displace oxygen or the gases themselves may be toxic. In addition, under some circumstances, cryogenic agents can be flammable or can be explosive when expanding rapidly.

Exposure of tissues to cryogenic materials or frozen surfaces can cause severe burns (frostbite) or cause tissue to become stuck to metal that is cooled by cryogenic agents.

Substitution with a less hazardous freezing agent would be the engineering control of choice if possible. Other engineering controls include local exhaust ventilation where cryogens are stored and used (the type depending upon the hazard assessment), effective general ventilation to dilute any vapours, design of storage area to ensure proper segregation of chemicals, use of proper and well-maintained storage vessels, restricted access to storage areas, proper calibration and maintenance of equipment, pressure release valves, and alarm systems.

Heat-related burns may occur during flash sterilization or through contact with hot surfaces, fire, or steam. Engineering controls are aimed at reducing contact with hot surfaces or steam. These include effective workplace design (that limits traffic in hot areas, reduces proximity to hot surfaces, provides sufficient space to work and move around hot equipment, etc.), shielding, process changes, local exhaust ventilation for the removal of steam, interlock systems that prevent opening autoclaves or sterilizers until a cooler temperature is reached, mechanical devices (tongs, etc.) for manipulating hot items, temperature and pressure relief valves, and reducing hot water temperatures.

## *Pressure*

Compressed gas cylinders are designed to safely hold their contents during regular use and the demands expected to be placed on them. Regulators, fittings and delivery systems must likewise meet manufacturers' requirements. Cylinders should be stored away from any heat sources or combustible material; they should be stored upright and not be able to move freely or fall.

Protective valve caps are an engineering control to protect the valve head from damage when the cylinder is not in use. If the cylinder has a valve cap, the cap should always be placed on cylinders when the cylinder is not expected to be used for a period of time, such as for a work shift. All cylinders must be restrained from tipping by means of racks, chains, strap or other suitable means.

## *Electrical Hazards*

Insulation protects workers from contact with electricity. All equipment, wiring and cords must be maintained and used in a manner that keeps electrical insulation intact.

Electric appliances and equipment are protected from overloading by means of electric overloading devices such as fuses or circuit breakers. Although these devices will stop the flow of current when too much current flows through them, they are intended to protect equipment but not workers. All overloading devices must be of sufficient ratings. Replacing fuses or circuit breakers with overloading devices that trip at a higher current than specified is a dangerous practice as is replacing overloading devices with a conductor. Ground fault circuit interrupters (GFCIs) are safety devices that will interrupt the flow of current by monitoring the flow of current to and from the device. GFCIs are important engineering controls that should be used in wet environments and to power tools and equipment outdoors.

Another important engineering control is grounding. Grounding of electrical equipment refers to creating an electrical path to earth (ground). Grounding provides some protection to equipment operators if there is a fault in the equipment or insulation that energizes the equipment housing; electricity would flow to ground rather than through the worker. Grounding for equipment that is plugged into electrical receptacles can be identified by the third prong on the electrical plug. Similarly electrical cords commonly have a third prong on the plug end. The third prong that facilitates grounding must not be removed or defeated. The housings of all equipment should be suitably grounded. Some electrical cords for tools or other equipment do not have a third grounding prong. This equipment is double insulated, meaning that it has been designed with additional insulating considerations to prevent the housing of the device from becoming energized. Such a device will be labelled with the term "double insulated" or with a symbol comprised of a square box within another square box.

### *Administrative Controls*

#### *Ergonomic hazards*

Controls that focus on how work is performed and organized are administrative controls. Administrative controls include policies, procedures, work practices, rules, training, and work scheduling, including:

- Establish ergonomic purchasing standards for tools and equipment.
- Conduct user trials to test new equipment and tools with input from workers.
- Maintain equipment and tools to optimize their operation.
- Provide training programs to educate workers regarding biomechanical risk factors, signs and symptoms and safe work practices, (including proper lifting methods and proper use of lifting devices).
- Provide self assessment tools to identify and control biomechanical hazards.
- Design break schedules to reduce biomechanical hazards.
- Encourage monitoring and early reporting of the signs and symptoms of MSIs.

#### *Radiation*

Administrative controls include policies and procedures and on-going assessment of possible exposures to radiation. The policies and procedures are designed to ensure that workers are informed about the hazards of both ionizing and non-ionizing radiation and are trained in the safe work procedures necessary to prevent exposure. Some administrative controls include having a radiation safety program, a laser safety program, safe work practices, monitoring exposures, and proper disposal practices. Minimize contact with body substances from patients receiving treatment with radionuclides.

#### *Trips, Slips and falls*

Administrative controls to prevent slips, trips and falls include:

- Education of workers and enforcement of the use of proper footwear
- Timely clean-up of any spills
- Eliminate the use of extension cords that may pose tripping hazards
- Keep walkways free of clutter

#### *Cuts*

Administrative controls widely used to reduce the potential for cuts include

- Educating workers
- Following safe work procedures (including no-touch instrument passing)

- Keeping sharp edges away from the body
- Using tools correctly
- Engaging all machine guards
- Choosing appropriate tools
- Restricting access to work areas
- Providing signs and warnings in hazardous areas, and
- Safely disposing of all sharps, including broken glass

### *Temperature Extremes*

For cryogenic hazards, administrative controls include worker education about the nature of the hazard and how to work safely with cryogenic agents, safe work practices (including insertion of materials so that boiling and splashing can be avoided, avoiding touching the skin with any part of the equipment, purchasing appropriate vials for freezing and thawing, etc.), and emergency response procedures for spills or exposures. To reduce the risk of burns, administrative controls include worker education, established safe work practices, assessment of work area to identify potential sources of burns, and equipment maintenance programs.

### *Pressure*

Compressed gas cylinders must be handled, maintained and stored carefully to prevent cylinders from falling or a gas release. Proper transportation of cylinders must also be considered whether it be by vehicle or within a work area by use of a hand cart or other means. A safe work procedure should be developed for the use, transport, storage and maintenance of compressed gas cylinders in the workplace. Some key compressed gas safe work practices are detailed below:

**What are basic safe practices when working with compressed gases?**[8]

- Read the MSDSs and labels for all of the materials you work with.
- Know all of the hazards (fire/explosion, health, chemical reactivity, corrosivity, pressure) of the materials you work with.
- Know which of the materials you work with are compressed gases and check the label, not the cylinder colour, to identify the gas.
- Store compressed gas cylinders in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources. Ensure that the storage temperature does not exceed 52$^{o}$C (125$^{o}$F).

[8] CCOHS; *OSH Answers – How Do I Work Safely with Compressed Gasses?; July 8, 2008;* http://www.ccohs.ca/oshanswers/prevention/comp_gas.html

- Store, handle and use compressed gas cylinders securely fastened in place in the upright position. Never roll, drag, or drop cylinders or permit them to strike each other.
- Move cylinders in handcarts or other devices designed for moving cylinders.
- Leave the cylinder valve protection cap in place until the cylinder is secured and ready for use.
- Discharge compressed gases safely using devices, such as pressure regulators, approved for the particular gas.
- Never force connections or use homemade adaptors.
- Ensure that equipment is compatible with cylinder pressure and contents.
- Carefully check all cylinder-to-equipment connections before use and periodically during use, to be sure they are tight, clean, in good condition and not leaking.
- Carefully open all valves, slowly, pointed away from you and others, using the proper tools.
- Close all valves when cylinders are not in use.
- Never tamper with safety devices in cylinders, valves or equipment.
- Do not allow flames to contact cylinders and do not strike an electric arc on cylinders.
- Always use cylinders in cool well-ventilated areas.
- Handle "empty" cylinders safely: leave a slight positive pressure in them, close cylinder valves, disassemble equipment properly, replace cylinder valve protection caps, mark cylinders "empty" and store them separately from full cylinders.
- Wear the proper personal protective equipment for each of the jobs you do.
- Know how to handle emergencies such as fires, leaks or personal injury.
- Follow the health and safety rules that apply to your job.

## *Electrical Hazards*

A major component of an electrical safety program is worker training. Extension cords are used in many applications for temporarily supplying power. Considerations to follow when using extension cords include:

- Protect cords from damage; do not allow vehicles to drive over cords.
- Never keep an extension cord plugged in when it is not in use.
- Do not use a damaged extension cord.
- Extension cords and most appliances have polarized plugs (one blade wider than the other). These plugs are designed to prevent electric shock by properly aligning circuit conductors. Never file or cut the plug blades or grounding pin of an extension cord.
- Do not plug one extension cord into another. Use a single cord of sufficient length.

Hazard assessments should guide the development of work procedures to assess and control electrical hazards.

### *Personal Protective Equipment Controls*

#### *Ergonomic hazards*

The most important personal protective equipment to control ergonomic hazards is appropriate footwear with gripping soles and good support.

#### *Radiation*

Depending upon the nature of the radiation and the specific tasks the worker is performing, a range of PPE may be used as additional controls (to engineering and administrative controls) to reduce exposures. Examples include protective eyewear used when working with lasers, UV, infrared or ionizing radiation that is specifically made to reduce exposure to each type of radiation. Protective clothing is also used when working with various forms of radiation. For ionizing radiation, protective clothing (commonly called lead aprons) includes shielding materials. All ionizing radiation protective clothing must be uniquely identified and inspected annually with an x-ray machine for any cracks or holes in the shielding material. These inspections results must be recorded and saved. Clothing also protects against exposure to UV rays. Gloves protect workers from contamination with radioactive material and must be worn when there is the potential for contamination.

#### *Trips, Slips and falls*

The use of appropriate footwear by dental personnel is essential to prevent trips, slips and falls. Workers should be required to wear flat shoes with non-slip soles that offer good support. (To prevent chemical exposure in the event of a spill, footwear should cover the entire foot and be of non-porous material.)

#### *Cuts*

Eye protection is important if there is any possibility that fragments of glass or other sharps may enter the eyes, and footwear must protect the wearer from accidental exposure to sharps. Gloves are usually required as PPE to protect workers from cuts. The selection of gloves depends on the nature of task. Cut-resistant gloves are available that are made from a variety of materials including Kevlar, Dyneema, HexArmor, stainless steel and wire mesh.

#### *Temperature Extremes*

PPE to protect workers from cryogenic hazards include non-porous and non-woven protective clothing, full foot protection, insulated gloves, safety glasses or a face shield (based on nature of the task). PPE is often used to prevent burns. Insulated gloves, protective clothing, foot protection, and eye/face protection should be chosen based on the hazard assessment.

## Psychological Hazards and Controls

Each dental facility should systematically conduct hazard assessments for the work environment and tasks performed by dental personnel and identify if and where the potential exists for psychological hazards. In this section, examples are provided of psychological hazards that may be encountered in any healthcare setting, and possible control measures will be suggested. Employers should carefully evaluate the potential for exposure to hazards in all areas and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the some of the reported psychological hazards in healthcare settings.

**Note:**
The following chart provides basic information about control strategies for commonly occurring psychological hazards. The selection of controls should be based on a risk assessment of the tasks and environment. Worker tolerance to stressors varies considerably. Most controls listed here relate to organizational controls, with some mention of personal controls that may be useful in controlling risk. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls should be followed.

| Potential Psychological Hazards or Effects of Workplace Stressors | Summary of Major Control Strategies | | |
|---|---|---|---|
| | **Engineering** | **Administrative** | **Personal** |
| **Depression, anxiety, sleep disorders, other mental illness as a response to excessive workplace stressors** | | Worker education about the signs and symptoms of depression, anxiety, sleep disorders, other mental illness. Elimination of workplace risk factors for depression, anxiety, sleep disorders, other mental illness. Provision of support services and programs. Benefit plans provision. Effective return to work programs. | Programs to maintain or build resilience or coping skills. Development of support system. Communication with family physician. |
| **Substance abuse as a response to excessive workplace stressors** | | Worker involvement in substance abuse policy and procedures development. Worker education about | Increase awareness of substance abuse signs and symptoms. |

| | | | |
|---|---|---|---|
| | | substance abuse. Training workers and supervisors to recognize the signs of substance abuse. Procedures to limit individual access to narcotics. . Provision of counselling services and return to work plans. | Communication with counsellors. Report to family physician. Participate in treatment programs and return to work programs. |
| **Stress related to work-life conflict** | | Management policies and procedures that support work-life balance (e.g. voluntary reduced hours, voluntary part-time work, phased in retirement, telecommuting, job sharing, paid and unpaid leaves, dependent care initiatives, etc.). Work designed to address workload and work demands issues. Reliance on paid and unpaid overtime is reduced. Supportive management culture. Work-life balance policies are communicated to workers. The use and impact of work-life balance policies is measured. | Time log used to track time. Work-life balance programs are utilized. Work activities are isolated from home time. Time is effectively managed. Days off are protected. Appropriate sleep habits. Social support system is in place. |
| **Abuse by clients or members of the public** | Isolation areas for agitated clients. Furniture arrangement to prevent workers entrapment. Lockable washrooms for workers separate from client or visitors. Controlled access. Grating or bars on street level windows. Bright lighting in parking lots. Alarm systems and panic buttons. Video surveillance. | Management policies and procedures related to no tolerance of violence or abuse. Worker education in violence awareness, avoidance and de-escalation procedures. Well-trained security guards. Escort services to parking lots. Liaison and response protocols with local police. Policies related to control of keys. Working alone policies. Reporting procedures for incidents and near misses. Use of nametags. | Ability to request support. Use of counselling services. |
| **Abuse by co-workers** | Alarm systems and panic buttons. Video surveillance. | Management policies and procedures related to no tolerance of violence or abuse. Worker education in violence awareness, avoidance and de-escalation procedures. Well-trained security guards. Escort services to parking lots. Working alone policies. Reporting and investigation procedures | Assertiveness training. Use of mediation and/or counselling services. |

| | | | |
|---|---|---|---|
| | | for incidents and near misses. | |
| **Hazards related to working alone**<br>• **Threat of violence**<br>• **Medical emergencies when alone** | Communication devices. Restricted access. Workplace design considerations. Panic alarms. Bright lighting. Mirrors to facilitate seeing around corners or hallways, surveillance cameras. | Scheduling to avoid having workers work alone. Worker training. Working alone policies. Adequate security. Escort services to parking lots. | |
| **Stress related to critical incidents** | | Training to increase awareness of signs and symptoms of critical incident stress. Critical incident stress team to respond to incidents. Communication and call procedures to mobilize team. Defusings and debriefings. | Development of support systems to assist in dealing with stress. Use of counselling services. |
| **"Technostress" related to the introduction of new technology** | Design of instruments or equipment with user-friendly features. | Selection procedures to ensure user-friendly technology choices. Provision of sufficient training for workers. Worker participation in selection and implementation of new technology. Provision of problem solving resources and support workers. Back-up plans in the event of failures. Change management strategy for introduction of new technology. Realistic expectations regarding use of communication technology. Limit use of technological monitoring of worker productivity. Setting and communication of priorities. | Self-education concerning new technologies. Time management strategies. Open communication about stress related to change. Healthy lifestyles. Setting realistic goals. Limiting the need to multi-task. Technology "time outs". E - vacations. |
| **Hazards related to impacts of aging on workers** | | Management policies and procedures that ensure no age discrimination. Proactive policies to accommodate aging workers. Training opportunities for aging workers. Education for all workers on intergenerational communication. Aging workers as trainers/mentors. Flexible work arrangement. Job redesign to accommodate aging workers. | Healthy lifestyle. Use of client and material handling equipment. Adequate sleep. Awareness of potential side effects of medication. |
| **Hazards related to shiftwork and** | Work environment designed to | Management policies and procedures | Appropriate sleep |

| | | | |
|---|---|---|---|
| **hours of work** | improve alertness (and minimize drowsiness). Appropriate lighting levels. Lighting levels that are adjustable by workers. Appropriate thermal environment. Well lit, safe and secure working environment. | to address working hours and shift design. Worker involved in design of shift schedule. Limit hours of work and overtime. Shifts designed so workers get enough rest between shifts. Split shifts are avoided, if possible. Train workers and management in fatigue and shift work issues. Work shift schedules designed to minimize fatigue (e.g. maximum number of consecutive night shifts, forward rotation, etc.). Work designed so that critical tasks are not conducted at ends of shifts or "low points" in shift. Quality breaks are in place. Policies to encourage the reporting of concerns associated with fatigue. Thorough investigation of incidents and near misses with fatigue as a possible cause. | schedule and sleep environment. Strategies in place to promote sleep. Diet adjusted to accommodate shift schedule. Healthy lifestyle. Physical exercise. Safe plan for commute to work. Plan for family and friends. Use of stimulants and sedatives are minimized.<br><br>Alertness strategies are utilized (e.g. bright lighting levels, regular short breaks, communication with co-workers, etc.). |
| **Exposure to nuisance or irritating noise levels that may induce stress** | Any engineering controls required to abate noise to allowable levels, if over PEL. Sound absorber panels. Personal communication devices rather than overhead pagers. Maintenance and repair of facility equipment, including the ventilation system. Lubrication of equipment with moving parts. Design considerations related to noise reduction in new/renovated facilities. Padded chart holders and pneumatic tube systems. Sound-masking technology. | Lower rings on telephones. Encourage use of soft-soled shoes. Worker education on noise levels created by various activities. Posted reminders to reduce noise. Purchasing decisions that take into account noise levels of equipment. Location of noisy equipment to more isolated areas. Work organization at nursing stations to reduce noise. | |
| **Exposure to poor indoor air quality that may induce stress** | Proper ventilation system design. Ventilation system maintenance activities. Isolation/segregation of work processes that may create | Contractor requirements to reduce air contamination. Selection of low-pollutant cleaning chemicals. Cleaning schedules. Infection prevention and controls standards. Rules regarding the | |

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|---|---|---|
| | contaminants. | use of personal appliances that may impact HVAC operations. Procedures to report and investigate indoor air quality complaints. Worker involvement in indoor air quality investigation. Communication to enable frank and timely discussion of IAQ issues and what is being done to resolve them. |

## Selected notes about controls for psychological hazards

Potential psychological hazards and controls vary greatly in jobs, locations and organizations and are only briefly discussed here. Personal factors impact how stressors are viewed and addressed. A comprehensive discussion of causes and impacts of psychological stressors on workers and on the organization can be found in Best Practices for the Assessments and Control of Psychological Hazards – Vol. 5.

### *Program elements for preventing or controlling abuse towards workers in the workplace*

Because the scope of abuse of workers is broad, with a wide range of potential internal and external perpetrators and a myriad of individual considerations, prevention of abuse of workers is multi-faceted. This list of prevention procedures and control techniques is not all-inclusive, but rather a sample of the complexities that should be considered in a program for dental facilities:

- ☐ Development, communication and enforcement of policies that indicate no tolerance for any form of violence, harassment, or abuse including bullying. Awareness sessions for all workers on abuse and violence in the workplace, reporting procedures and controls.
- ☐ Staff identification to reduce unauthorized access to areas – this includes a requirement of all workers to wear identification badges. It is suggested that information that is not necessary not be shown on the front to the badge to reduce risk to workers.
- ☐ Client guidelines and signage to emphasize that abuse will not be tolerated – this may include the preparation and dissemination of client information guidelines, in which client behaviour is discussed, the commitment to no tolerance for abuse against workers and the encouragement of mutual respect are covered.
- ☐ Working alone guidelines and communications protocols. Working alone guidelines are required by Alberta occupational health and safety legislation (OHS Code, Part 28), and must include a written hazard assessment as well as communication protocols for workers who must work alone.

- ☐ Alarm systems and emergency communication devices (panic buttons, etc.). Identification of workers or locations that should be provided with alarm systems and panic buttons should occur. Once any alarm systems are installed or provided, all workers should be trained on how to use them and how to respond to alarms.
- ☐ Identification and correction of high risk facility issues (e.g., isolated areas, parking lots, low lighting, no escape routes, etc.). There are many risk factors posed by the design of the facility. The dental facility should identify risk factors and work to reduce the risk in the areas. A checklist would be useful for departments to help identify facility issues contributing to worker risk.
- ☐ Training programs that include non-violent crisis intervention and assault management techniques.

### *Working alone*

Working alone is addressed in the Alberta OHS Code 2009.

**Controls required**

Employers must, for any worker working alone, provide an effective communication system consisting of

- radio communication,
- and land line or cellular telephone communication, or
- some other effective means of electronic communication that includes regular contact by the employer or designate at intervals appropriate to the nature of the hazard associated with the worker's work.

If effective electronic communication is not practicable at the work site, the employer must ensure that

- the employer or designate visits the worker, or
- the worker contacts the employer or designate at intervals appropriate to the nature of the hazard associated with the worker's work.

Alberta OHS Code 2009, Part 28

### *Work-Life balance*

An employer should strive to develop policies and programs that support work-life balance. The following is a list of general work-life balance policies and programs to consider:

- Flexible time arrangements including alternative work schedules, compressed work week, voluntary reduced hours / part-time work and phased in retirement
- Flexible work locations through the use of technology such as telecommuting and satellite offices
- Flexible job design through job redesign, job sharing
- Wellness programs
- Flexible benefits including paid and unpaid leaves for maternity, parental care giving, educational and sabbatical leaves
- Employer sponsored childcare and eldercare practice and referral services

A work-life conflict issue recognized in healthcare is often brought on by workload and work demands. Some strategies to reduce the impact of increased workloads and work demands include the following:

- Identify methods to reduce worker workloads. According to research, special attention is required for managers and professionals.
- Track the costs associated with understaffing and overwork (paid and unpaid overtime, increased turnover, employee assistance program use, increased absenteeism).
- Strive to reduce the amount of time workers spend in job-related travel.
- Reduce reliance on paid and unpaid overtime.
- Consider a “time in lieu” system to compensate for overtime.
- Develop norms regarding the use of technology (e.g. cell phones, PDA, laptops, email) outside of work time.
- Allow workers to say “no” to overtime without repercussions.
- Provide a limited number of days of paid leave per year for caregiver responsibilities (childcare and eldercare) and personal problems.
- Measure the use of work-life practices (e.g. job sharing, compressed work week, etc.) and reward sections of the organization with high usage. Investigate sections where usage is low.
- Increase supportive management. Specifically, organizations should increase the extent to which managers are effective at planning the work to be done, make themselves available to answer worker questions, set clear expectations, listen to worker concerns and give recognition for a job well done.

*Shiftwork*

The following guidelines will assist in reducing the psychological impacts of shift work.

**Good Practice Guideline for Shift Work Schedule Design**[9]

- Plan a workload that is appropriate to the length and timing of the shift.
- Strive to schedule a variety of tasks to be completed during the shift to allow workers some choice about the order they need to be done in.
- Avoid scheduling demanding, dangerous, safety-critical or monotonous tasks during the night shift, particularly during the early morning hours when alertness is at its lowest.
- Engage workers in the design and planning of shift schedules.
- Avoid scheduling workers on permanent night shifts.
- When possible, offer workers a choice between permanent and rotating shifts.
- Use a forward-rotating schedule for rotating shifts, when possible.
- Avoid early morning shift starts before 7 AM, if possible.
- Arrange shift start/end times to correspond to public transportation or consider providing transport for workers on particular shifts.
- Limit shifts to a maximum of 12 hours (including overtime) and consider the needs of vulnerable workers.
- Limit night shift to 8 hours for work that is demanding, dangerous, safety critical or monotonous.
- Avoid split shifts unless absolutely necessary.
- Encourage and promote the benefit of regular breaks away from the workstation. Where possible, allow workers some discretion over the timing of breaks but discourage workers from saving up break time for the end of the workday.
- In general, limit consecutive working days to a maximum of 5-7 days.
- For long work shifts (>8 hours), for night shifts and for shifts with early morning starts, consider limiting consecutive shifts to 2-3 days.
- Design shift schedules to ensure adequate rest time between successive shifts.
- When switching from day to night shifts (or vice versa), allow workers a minimum of 2 nights' full sleep.
- Build regular free weekends into the shift schedule.

[9] Adapted from Government of the U.K; Health and Safety Executive; Managing shift work HSG256; 2006; www.hse.gov.uk/pubns/priced/hsg256.pdf

For a more detailed discussion of controls to prevent or reduce psychological hazards, please consult Best Practices for the Assessments and Control of Psychological Hazards – Vol. 5.

# APPENDIX 1 - OHS-related Competencies for dental personnel

**OHS – related Competencies for Dental Hygienists**

The Canadian Dental Hygienists Association provides these "Entry to Practice" Competencies for Dental Hygienists. For more detail, consult http://www.cdha.ca/AM/Template.cfm?Section=Entry_To_Practice_Competencies_and_Standards_for_Canadian_Dental_Hygienists&Template=/CM/HTMLDisplay.cfm&ContentID=7727

| **Competency** |
|---|
| Competencies related to workplace *Health and Safety* include the ability to: |
| • Apply current knowledge regarding infection prevention and control. |
| • Respond to medical emergencies based on CPR and first aid standards. |
| • Apply principles of risk reduction for client, colleague and practitioner safety, health and wellbeing |
| • Integrate principles of body ergonomics to support clinician's health. |
| • Apply quality assurance standards and protocols to ensure a safe and effective working environment. |
| • Take responsibility for maintaining equipment used for services, including service records. |
| • Protect the environment by responsible use of consumables and disposal of waste products including biohazardous wastes. |
| • Contribute to a healthy work environment for individuals involved in the practice. |

**OHS – related Competencies for Dentists**

The National Dental Examining Board of Canada has identified the following OHS-related competencies for beginning dental practitioners in Canada. A comprehensive list of competencies can be found at http://www.ndeb.ca/en/accredited/competencies.htm

| **Competency** |
|---|
| A beginning dental practitioner in Canada must be competent to: |
| • Prevent the transmission of infectious diseases by following current infection control guidelines |
| • Recognize and institute procedures to minimize occupational hazards related to the practice of dentistry. |
| • Recognize and manage systemic emergencies which may occur in dental practice |
| • Apply accepted principles of ethics and jurisprudence to maintain standards and advance knowledge and skills |
| • Apply basic principles of practice administration, financial and personnel management to a dental practice. |
| • Demonstrate professional behaviour that is ethical, supercedes self-interest, strives for excellence, is committed to continued professional development and is accountable to individual patients, society and the profession. |

## APPENDIX 2 - Additional Resources

The following are useful references and links to relevant resource materials. For complete reference lists, please consult the Best Practice documents developed by Alberta Employment and Immigration available at http://www.employment.alberta.ca/SFW/6311.html

Alberta Government legislation related to chemicals in the workplace may be accessed through the Government website at http://employment.alberta.ca/SFW/307.html

Alberta OHS Code 2009, Part 18 – Personal Protective Equipment

Alberta Workplace Health and Safety *Preventing Violence and Harassment at the Workplace*, Bulletin VAH001, 2006, retrieved from http://www.employment.alberta.ca/documents/WHS/WHS-PUB-VAH001.pdf

American Chemical Society – Chemical Storage Resources
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_ARTICLEMAIN&node_id=2231&content_id=WPCP_012310&use_sec=true&sec_url_var=region1&__uuid=dae6dbb6-9d03-4590-8995-5325374e8844

American College of Surgeons; Statement by the American College of Surgeons – *Statement on Sharps Safety; October 2007*
http://www.facs.org/fellows_info/statements/st-58.html

BC Centre for Disease Control – A Guide for the Selection and Use of Disinfectants http://www.mtpinnacle.com/pdfs/disinfectant-selection-guidelines.pdf

Berguer, R., Heller, P.; *Preventing Sharps Injuries in the Operating Room*; Journal of the American College of Surgeons; 2004; http://www.facs.org/about/committees/cpc/preventingsharpsinjuries.pdf

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## APPENDIX 3 - Learning Objectives for this Module

1. Understand the need for and the procedure for conducting hazard assessments and risk evaluations.
2. Identify significant biological hazards that may impact dental personnel.
3. Identify significant chemical hazards that may impact dental personnel.
4. Identify significant physical hazards that may impact dental personnel.
5. Identify potential psychological hazards that may impact dental personnel.
6. Identify the hierarchy of controls that should be implemented to control hazards in the workplace.
7. Identify engineering controls and describe how they work.
8. Provide examples of administrative controls.
9. Describe the important considerations when selecting personal protective equipment.
10. For each type of hazards, identify possible engineering, administrative and personal protective equipment controls.

## APPENDIX 4 - Test Your Knowledge

1. In what way can dental personnel be exposed to biological hazards?
2. What is meant by the “hierarchy of controls”?
3. Give three examples of engineering controls.
4. Give three examples of administrative controls.
5. Give three examples of personal protective equipment.
6. What are the major physical hazards that dental personnel may be exposed to?
7. Give five examples of chemical hazards in dentistry.
8. Name the five criteria for choosing the proper gloves to use.
9. Name the six criteria for selecting appropriate eye protection.
10. What administrative controls can be put in place to reduce the risk of exposure to hazardous chemicals?

**Test Your Knowledge - Answers**

1. Dental personnel may be exposed to biological hazards through contact with patients, members of the public or through contaminated products or contaminated ventilation systems.
2. The hierarchy of controls refers to a preferred order of controls for implementation. The highest level is engineering controls, because these control the exposure at the source. The next level is administrative controls, which relies on worker compliance. The least effective and lowest level of control is personal protective equipment, because if the equipment fails the worker is likely to be exposed.
3. Tool design, shielding, preventive maintenance of equipment, safety engineered medical devices, segregated areas, automated procedures, ergonomically designed work stations, machine guarding, etc.
4. Training, policies, safe work procedures, restricted access, appropriate staffing, purchasing diluted solutions, signage, purchasing standards, etc.
5. Protective eyewear, gloves, lab coats, respirators, etc.
6. Ergonomic, slips, trips, falls, temperature extreme, motor vehicle collisions
7. Chemical hazards in dentistry may include exposure to:
    a. Mercury
    b. Silica
    c. Beryllium
    d. Latex
    e. Nitrous oxide
    f. Disinfectant chemicals
8. Criteria for glove selection include:
    a. The nature and concentration of the chemicals.
    b. The amount of time the gloves will be exposed to the chemical.
    c. Dexterity required to perform the task.
    d. Extent of protection needed (to wrist or higher).
    e. Decontamination and disposal requirements.
9. Criteria for the selection of eye protection include:
    a. Level of protection required.
    b. Comfort of the wearer.
    c. Secure fit that does not interfere with vision or movement.
    d. Ease of cleaning and disinfection.
    e. Durability.
    f. Compatibility with prescription glasses and other PPE that must be worn at the same time (e.g. respirators).

10. Administrative controls may include safe work procedures including spill procedures with consideration to the specific product and manufacturer’s instructions; waste handling procedures; education of workers in the nature of the hazard; availability of appropriate equipment and PPE; accommodation for workers with special needs (pregnant workers, persons with sensitivities or other health issues).

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