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Exposure Control Plan for Carcinogens, Reproductive Toxins and Sensitizers

1. PURPOSE

The University of British Columbia (UBC) is committed to providing a safe and healthy workplace by protecting all campus occupants from the potential adverse effects from exposure to carcinogens, reproductive toxins and sensitizers in accordance with the Occupational Health and Safety (OHS) Regulations.

Section 5.57 of the Occupational Health and Safety (OHS) Regulation defines the "Designated substances" category. These are carcinogens, reproductive toxins, sensitizers and ACGIH L note compounds (see definitions in part 3). If elimination or substitution of these compounds is not possible, the ALARA (as low as reasonably achievable) exposure principle applies and the employer must implement an exposure control plan (ECP).

This ECP is applicable to all UBC employees, contractors and students carrying out work with substances identified as carcinogenic, reproductive toxins or sensitizers at UBC. In this ECP, the three categories of substances will be collectively referred to as "designated substances".

The document contains the following appendices:

Appendix A – Applicable WorkSafeBC regulation

Appendix B – Chemical and Biological Designated Substances

Appendix C – Job tasks and controls table - acceptable control methods for specific job tasks

2. ROLES AND RESPONSIBILITIES

Employer (UBC/Faculty/Department)

- Develop, implement and maintain an ECP to ensure exposure to designated substances is maintained ALARA as per OHS Regulations

- Protect workers from hazards in the workplace by considering the hierarchy of controls (e.g. in order of elimination, substitution, engineering, administrative and personal protective equipment (PPE))
- Ensure workers are informed of the hazards of designated substances and trained on how to minimize exposure to these designated substances
- Occupational exposure to designated substances is conducted, when required
- Provide workers with the necessary materials, tools and equipment, PPE and other resources required to minimize exposure to designated substances
- If an exposure incident occurs at the workplace, ensure it is investigated and, based on the findings, develop ways to prevent similar incidents from occurring.
- Ensure that workers who are exposed to designated substances participate in health monitoring, when required.

Department Manager/Supervisor Responsibilities

- Attend education and training sessions provided by the employer
- Identify and evaluate occupations, areas or tasks where the potential for exposure to designated substances exists
- Ensure necessary resources are available to conduct occupational monitoring for exposure to designated substances when required
- Ensure employees have the appropriate education and training for working with designated substances and demonstrate competency for identified tasks
- Ensure employees are able to identify the signs and symptoms associated with exposure to designated substances
- Ensure the hierarchy of controls (e.g. elimination/substitution, engineering, administrative, PPE) are considered and implemented accordingly
- Ensure all equipment, PPE, and materials needed to control against exposure to designated substances are available
- Complete site-specific ECPs and provide to workers, when required
- Develop safe work procedures and provide to workers
- Provide workers with adequate supervision to ensure that work practices eliminate or minimize exposure to designated substances
- Ensure incidents involving exposure to designated substances are investigated appropriately
- Report any incident *via* the UBC Centralized Accident/Incident Reporting System (CAIRS).

Worker Responsibilities

- Attend education and training sessions provided by the employer
- Adhere to the hierarchy of controls (e.g. elimination/substitution, engineering, administrative, PPE)

- Follow the ECP and safe work procedures established by the employer
- Ensure all controls for minimizing exposure to designated substances are in good working condition
- Report unsafe exposure conditions to their supervisor
- Participate in incident/accident investigations, where required.

Risk Management Services (RMS) Responsibilities

- Assist in the implementation of this ECP for Carcinogens, Reproductive Toxins and Sensitizers through training and consultation
- Provide education and training on exposure to designated substances including how to recognize early signs and symptoms associated with the exposure
- Assist with risk identifications and assessments of exposure to designated substances as requested
- Ensure occupational exposure monitoring for designated substances is conducted, when required
- Conduct respirator fit testing sessions for tight-fitting respirators
- Assist in the development of ECPs and conduct annual reviews of the ECPs
- Conduct annual reviews of the effectiveness of this ECP for Carcinogens, Reproductive Toxins and Sensitizers.

3. DESIGNATED SUBSTANCES – DEFINITIONS

See Appendix B for a list of common chemical and biological designated substances.

3.1 Carcinogens

According to WorkSafeBC, "carcinogen" means a substance or a mixture of substances which is identified as a carcinogen in section 5.57(1), or

(a) Causes an increased incidence of benign or malignant neoplasms, or

(b) Substantially decreases the latency period between exposure and onset of neoplasms in humans, or

(c) Results in the induction of tumors at a site other than the site of administration in one or more experimental mammalian species as a result of any oral, respiratory, or dermal exposure, or any other exposure, or

(d) Is metabolized into one or more potential occupational carcinogens by mammals;

The American Conference of Government Industrial Hygienists (ACGIH) and the International Agency for Research on Cancer (IARC) classify carcinogenic compounds in the categories below defined in the table below.

Section 5.57(1) identifies as carcinogens chemical/biological compounds with the ACGIH notation A1 and A2 and IARC notation 1, 2A and 2B.

Table 1: Classifications of carcinogenicity

ACGIH: American Conference of Governmental Industrial Hygienists	
A1	**Confirmed human carcinogen** The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies.
A2	**Suspected human carcinogen** Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; OR, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. The A2 is used primarily when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals with relevance to humans.
A3	**Confirmed animal carcinogen with unknown relevance to humans** The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or level of exposure.
A4	**Not classifiable as a human carcinogen** Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. *In vitro* or animal studies do not provide indications or carcinogenicity which are sufficient to classify the agent into one of the other categories.
A5	**Not suspected as a human carcinogen** The agent is not suspected to be a human carcinogen on the basis of properly conducted epidemiologic studies in humans. These studies have sufficiently long follow-up, reliable exposure histories, sufficiently high dose, and adequate statistical power to conclude that exposure to the agent does not convey a significant risk of cancer to humans, OR, the evidence suggesting a lack of carcinogenicity in experimental animals is supported by mechanistic data.
IARC: International Agency for Research on Cancer	
Group 1	**Carcinogenic to humans** There is sufficient evidence of carcinogenicity in humans.
Group 2A	**Probably carcinogenic to humans** This category is used when there is limited evidence of carcinogenicity in humans and sufficient evidence or carcinogenicity in experimental animals
Group 2B	**Possibly carcinogenic to humans** This category is used for agents for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals.
Group 3	**Not classifiable as carcinogenic to humans** Used most commonly for agents for which the evidence of carcinogenicity is inadequate in humans and inadequate or limited in experimental animals.
Group 4	**Probably not carcinogenic to humans** Used for agents for which there is evidence suggesting lack of carcinogenicity in humans and in experimental animals.

3.2 Reproductive toxins

ACGIH reproductive toxins are noted by the letter "R" in the notations column of the WorkSafeBC's Table of Exposure Limits for Chemical and Biological Substances.

Substances designated by the ACGIH as reproductive toxins have the potential for causing adverse reproductive effects on female and male reproductive organs, tissues, or cells; on fertility; on the embryo or fetus; and may result in developmental abnormalities; tumors; and adverse effects on the newborn.

Depending on the exact mechanism of action, some reproductive toxins can also be classified as mutagens and/or teratogens. Mutagens and teratogens are part of the cytotoxic group of substances, covered by Part 6 of the Occupational Health and Safety (OHS) Regulation. For more information, review the ECP for Cytotoxic Substances.

3.3 Sensitizers

ACGIH sensitizers are identified by the terms "S", "S(D)", or "S(R)" in the notations column of the Table of Exposure Limits for Chemical and Biological Substances.

This provision refers to substances that have been designated by ACGIH as having a sensitization effect. The ACGIH identifies sensitizers in several ways. The designation "SEN" in the "Notations" column of ACGIH's annually updated TLV booklet, refers to the potential for a substance to produce sensitization as confirmed by human or animal data. "DSEN" indicates a substance with specific evidence of sensitization by dermal route and "RSEN" indicates a substance with specific evidence of sensitization by respiratory route. Methyl methacrylate is an example of a substance with dermal sensitization effects. For some substances, such as isophorone diisocyanate and natural latex rubber, the ACGIH determined that the sensitization effect of these substances is a primary determining factor on which the TLV (threshold limit value) is based. These substances are identified as entries in the "TLV® Basis" column of the TLV booklet.

The "S", "S(D)", and "S(R)" notations in the Table of Exposure Limits for Chemical and Biological Substances cover all ACGIH-identified sensitizers.

For a substance with a TLV based on sensitization, the TLV is meant to protect workers from becoming sensitized to the substance. However, it is not intended to and likely will not protect those workers who have already become sensitized.

Depending on the substance, workers can become sensitized to the substance through the respiratory system, the skin, or the eyes. Sensitization often involves a response by the body's immune system. Initially, there may be little or no response to a sensitizing substance. However, after a person is sensitized, subsequent exposure may cause severe reactions even at low exposure concentrations, including at levels below the exposure limit.

3.4 L endnote substances

The "L" endnote appears for some substances in the "TWA" column of the WorkSafeBC's Table of Exposure Limits for Chemical and Biological Substances. "L" is defined as "exposure by all routes should be carefully controlled to levels as low as possible." WorkSafeBC uses this notation primarily for substances considered highly toxic, and which have not been assigned a TLV. Examples of substances in this category include benzo[*a*]pyrene, chrysene, and rosin core solder thermal decomposition products (colophony).

3.5 "Skin" notation

Section 5.52 of the OHS Regulation states: "If skin absorption may contribute to the overall exposure, effective measures must be taken to limit exposure by this route". These substances are listed with a "Skin" notation in the WorkSafeBC's Table of Exposure Limits for Chemical and Biological Substances (see Appendix B).

The notation refers to the potential significant contribution to the overall exposure by skin absorption (called the cutaneous route) either by contact with vapours or, of probable greater significance, by direct skin contact with the substance. This includes contact with the mucous membranes of the eyes. Specific substances (vehicles) in solutions or mixtures can also significantly enhance potential skin absorption. Although some substances are capable of causing irritation, dermatitis, and sensitization in workers, these properties are not considered relevant by the ACGIH when assigning a "Skin" notation. However, a dermatological condition can significantly affect the potential for skin absorption.

The "Skin" notation is intended to alert the reader that air sampling alone is insufficient to quantify exposure accurately and that measures to prevent significant skin absorption should be considered.

4. HEALTH HAZARDS ASSOCIATED WITH EXPOSURE

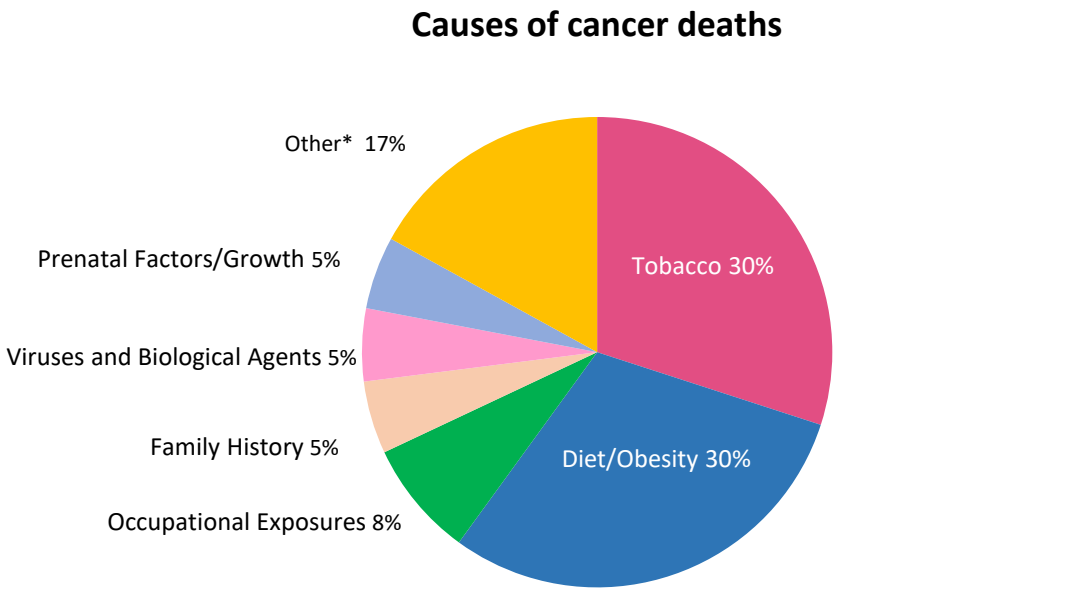
4.1. Carcinogens

A carcinogen is a substance, mixture or agent that can cause cancer or increases the risk of developing cancer. Occupational carcinogens are carcinogens that workers may be exposed to as a result of work activities. Occupational cancer is cancer that arises out of a work activity. Occupational cancers are usually indistinguishable from cancers that are unrelated to the occupation.

Although scientists have identified a number of confirmed human carcinogens, they are often unsure of how multiple agents can work together to increase one's risk of developing cancer. Studying occupational cancer is very challenging because of the long latency of cancer and the involvement of many factors in the development of cancer. Exposure to more than one potentially cancer-causing agent could result in no interaction, an additive effect, or more than an additive effect.

The presence of a chemical in the work environment does not automatically mean that workers are exposed to it. There is no risk of cancer unless an agent is incorporated into the body through inhalation, ingestion, absorption through the skin, or direct exposure.

Based on current scientific data on occupational exposures and cancer, it is estimated that occupational exposures account for approximately 8% of cancer cases in the population.



* Other factors include Reproductive factors, Alcohol, Socioeconomic Factors, Environmental Pollution, and Radiation/Sunlight
(Source: Alberta Cancer Foundation)

4.2. Reproductive toxins

A reproductive toxin could cause one or more health effects, depending on when the woman is exposed. For example, exposure to harmful substances during the first 3 months of pregnancy might cause a birth defect or a miscarriage. During the last 6 months of pregnancy, exposure to reproductive hazards could slow the growth of the fetus, affect the development of its brain, or cause premature labor.

The following problems may be caused, in women, by workplace exposure to reproductive toxins:

- Menstrual cycle effects – chemicals may disrupt the balance between the brain, pituitary, and ovaries resulting in a hormonal imbalance that may lead to changes in menstrual cycle length, regularity and ovulation
- Infertility and subfertility – caused by chemically induced damage to the eggs
- Miscarriage and stillbirths – there are various reasons responsible for miscarriages and stillbirths

- Birth defects – the first 3 months of the pregnancy is a very sensitive time of development; reproductive toxins can disrupt normal development at this time
- Low birth weight and premature birth
- Developmental disorders – resulted from the inadequate development of the brain of the fetus

Exposure of male workers to reproductive toxins can affect the following functions:

- Number of sperm – some reproductive toxins can stop or slow down the production of sperm
- Sperm shape – reproductive toxins may cause the shape of sperm cells to be different thus influencing their swimming ability
- Sperm transfer – hazardous chemicals may kill the sperm, change the way in which they swim, or attach to the sperm and be carried to the egg or the unborn child
- Sexual performance – toxins can influence amounts of hormones that can, in turn, affect sexual performance
- Sperm chromosomes – damaged chromosome DNA

4.3. Sensitizers

Symptoms associated with skin and respiratory sensitizers vary depending on which body system is affected.

Effects on the respiratory can be the runny, itching eyes and nose typical of hay fever. These may be followed by more severe symptoms typical of asthma such as:

- Wheezing
- Tightness of the chest
- Breathlessness
- Coughing

Symptoms of the skin can be itchy, dry, red, and cracked skin typical of irritation. These may be followed by more severe dermatitis symptoms such as:

- Bleeding
- Spread of symptoms to other body parts

5. RISK IDENTIFICATION AND ASSESSMENT

The degree of risk is dependent on the inherent toxicity of the substance, as well as the extent of exposure. Workers may be exposed via inhalation of dusts or aerosols, absorption through the

skin, needle stick injuries, and ingestion (e.g. because of contact with contaminated food). Compliance with the personal hygiene requirements (sections 5.82 to 5.84) should eliminate ingestion as a source of exposure.

Chemical compounds that had been classified as a carcinogen, reproductive toxin or respiratory sensitizer will display the "health hazard" pictogram and the hazard statements associated with the respective classification. The "exclamation mark" pictogram is used for skin sensitizers. Table two below is an example of information that will be present in section 2, hazard identification, of the SDS of a carcinogen, reproductive toxin or sensitizer.

Table 2: Relevant GHS classification elements for a carcinogen, reproductive toxin or sensitizer

Classification	Pictogram	Hazard statements
Carcinogen (Category 1 and 2)		• May cause cancer • Suspected of causing cancer
Reproductive toxin (Category 1 and 2)		• May damage fertility or the unborn child • Suspected of damaging fertility or the unborn child
Respiratory sensitizer (Category 1)		• May cause allergy or asthma symptoms or breathing difficulties if inhaled
Skin sensitizer (Category 1)		• May cause an allergic skin reaction

Section 11 of the SDS contains important toxicological information about the substance including information on whether potential exposure to the hazardous chemical has immediate or delayed health effects or both and which routes of exposure are known to cause harm.

Exposure to designated substances may occur while completing a variety of tasks. Knowing the route of exposure is a key factor in working out which controls will be most effective for eliminating or minimizing the risk.

5.1 Routes of exposure

Inhalation

Breathing contaminated air is the most common way that workplace chemicals enter the body. Some designated substances are naturally in the gas phase but more commonly, they are liquids that evaporate into vapors that can be inhaled. Toluene and benzene, for example, are carcinogenic organic solvents that readily produce vapors. Different techniques and processes can generate aerosols (fine solid particles or liquid droplet) from solid or liquid samples.

In general, substances present in air as a vapor or gas are reported in parts per million (ppm). Substances present in air as an aerosol (dust, fume, mist) and mixtures such as diesel fuel are typically reported in milligrams per cubic meter (mg/m^3).

Skin and Eye Contact

Chemicals which pass through the skin are nearly always in liquid form. Solid chemicals and gases or vapors do not generally pass through the skin unless they are first dissolved in moisture on the skin's surface. The skin is the second most common route by which occupational chemicals enter the body. In general, there are three types of chemical–skin interactions of concern: direct skin effects, immune-mediated skin effects, and systemic effects.

If a substance identified as a carcinogen, reproductive toxin and/or sensitizer has also a “skin” designation, then skin absorption is a significant route of exposure. Dermal contact with a skin sensitizer has direct skin effects and/or immune-mediated skin effects while absorption of carcinogens or reproductive toxins lead to systemic effects.

Absorption *via* the mucous membranes of the eyes follows a similar mechanism to skin absorption, therefore, both are included in the dermal route of exposure.

Injection

In some instances, chemicals may enter the body by accidental injection through the skin. Although injection as a route of exposure is mainly associated with a hospital setting, syringes are also widely used in academic research (e.g. transfer chemicals). Once in the bloodstream, these chemicals can be transported to any site or organ of the body where they may exert their effects.

Ingestion

Chemicals can enter the stomach either by swallowing contaminated mucus which has been expelled from the lungs, or by eating and drinking contaminated food. Food and drink are most frequently contaminated by contact with unwashed hands, gloves or clothing, or by being left exposed in the workplace. Nail-biting and smoking can also contribute to exposure.

Some chemicals may pass across the stomach wall and enter the bloodstream but most will enter the bloodstream *via* by passing through the small intestine wall into the veins.

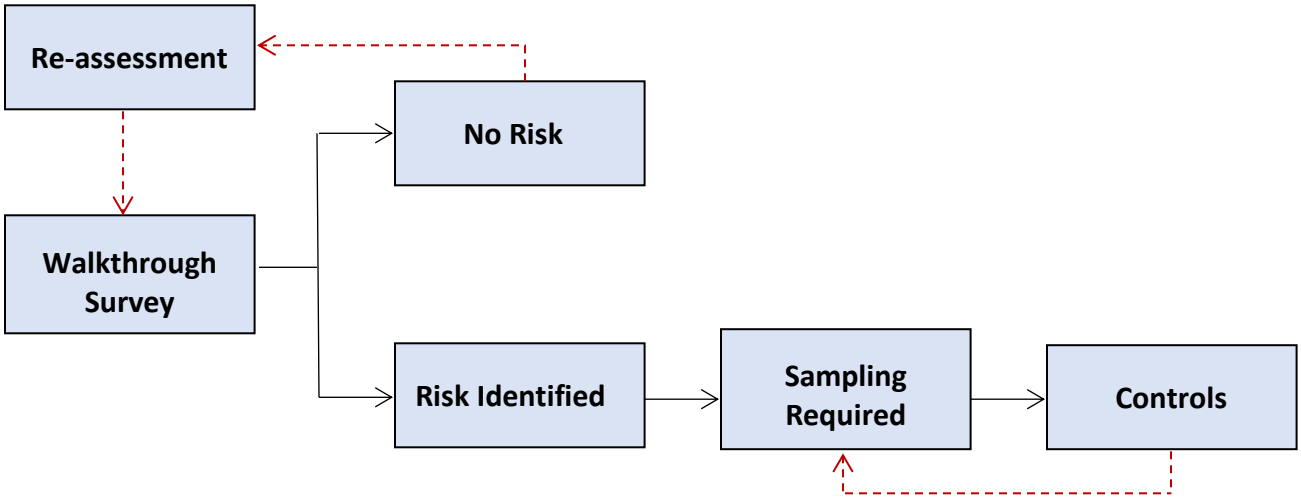
5.2 Risk assessment

Workplace monitoring can provide information on the level of exposure present in the workplace. An initial assessment can be done during a walkthrough survey to assess the potential for overexposure taking into consideration all routes of exposure. Re-assessment may be necessary when there is a change in work conditions, which may increase the exposure. If the initial survey reveals that a worker may be at risk of overexposure to an airborne contaminant, the employer must ensure that air sampling is conducted to assess the potential for

overexposure. Sampling Workplace exposure monitoring and assessment must be conducted using occupational hygiene methods.

Results of the air sampling can be compared against the occupational exposure limits discussed below.

Exposure Assessment



6. OCCUPATIONAL EXPOSURE LIMITS

The occupational exposure limit (OEL) or permissible exposure level (PEL) represents the maximum airborne concentration of a toxic substance to which a worker can be exposed over a period of time without suffering any harmful consequences. These limits are set out by many professional organizations around the world, such as the American Conference of Governmental Industrial Hygienists (ACGIH), and the National Institute for Occupational Safety and Health (NIOSH) in the United States. They are established based on the chemical properties of the substance, experimental studies on animals and humans, toxicological and epidemiological data. Different organizations may use different terminology for the OEL. For example, the ACGIH term for OEL is "Threshold Limit Value" (TLV) while the NIOSH term is "recommended exposure limits" (REL).

In British Columbia, the Occupational Health and Safety Regulations (B.C. Reg. 296/97) made under the Workers' Compensation Act (R.S.B.C. 1979, c. 437) published a Table of exposure limits for chemical and biological substances.

ACGIH defines three categories of threshold limit values:

Threshold Limit Value – Time-Weighted Average (TLV-TWA): The concentration of a hazardous substance in the air averaged over an 8-hour workday and a 40-hour workweek to which it is

believed that workers may be repeatedly exposed, day after day, for a working lifetime without adverse effects.

Threshold Limit Value – Short-term exposure (TLV-STEL): A 15-minute time weighted average exposure that should not be exceeded at any time during a workday, even if the overall 8-hour TLV-TWA is below the TLV-TWA. Workers should not be exposed more than four times per day to concentrations between TLV-TWA and TLV-STEL. There should be at least a 60 minute interval between exposures. The short-term exposure threshold has been adopted to account for the acute effects of substances that primarily have chronic effects.

Threshold Limit Value – Ceiling (TLV-C): This is the concentration that should not be exceeded during any part of the working exposure. Peak exposures should be always controlled. For substances that do not have TLV-TWA or TLV-C established, the maximum admissible peak concentrations must not exceed:

- Three-times the value of the TLV-TWA for no more than 15 minutes, no more than four times per workday. Exposures must be at least 1 hour apart during the workday.
- Five times the TLV-TWA under any circumstances.

Action Level: is the level of exposure to a hazardous substance at which an employer must take the required precautions to protect the workers; it is normally one-half of the permissible exposure limit.

According to the OHS Regulation if a substance identified as a carcinogen, reproductive toxin, and/or sensitizer is present in the workplace, the employer must replace it, if practicable, with a material that reduces the risk to workers. If substitution is not practicable, the employer must implement an ECP to maintain workers' exposure ALARA below the exposure limit established.

7. RISK CONTROL

Once a risk to a carcinogen, reproductive toxin and/or sensitizer has been identified and assessed, the appropriate hierarchy of controls must be implemented to ensure the risk is eliminated or mitigated. The hierarchy of controls is as follows (in priority of most effective to least effective):

1. Elimination or Substitution
2. Engineering
3. Administrative
4. Personal Protective Equipment

The types of controls needed will be dependent on the task being performed.

Substitution / Elimination

Whenever practical, designated substances should be eliminated or substituted with a material, which reduces the risk to workers (WorkSafeBC Regulation 5.57(1)).

Engineering

Engineering controls are those controls, which aim to minimize the exposure to designated substances through physical modifications to facilities, equipment and processes. Because carcinogens, reproductive toxins and sensitizers are designated substances under section 5.57 of the OHS Regulation, the use of a general dilution ventilation system is restricted by the provisions of OHS Regulation 5.70, Table 5-1.

Most common engineering controls are fume hoods and biological safety cabinets. Laboratory fume hoods and related ductwork must be designed, installed and maintained in accordance with the *Industrial Ventilation, A manual of Recommended Practice*, published by the American Conference of Governmental Industrial Hygienists. WorkSafeBC OHS Regulations 30.8- 30.11 detail the mandatory operational requirements of a fume hood. At UBC, fume hoods are annually audited by RMS to ensure they are functioning optimally and are in compliance with the regulations.

Biological safety cabinets are regulated by WorkSafeBC in section 30.12 of the OHS regulation. They need to be annually certified to meet the requirements of the National Sanitation Foundation (NSF) Standard 49-2002, Class II (Laminar Flow) Biohazard Cabinetry. At UBC, biological safety cabinets are tested by external contractors and it is the responsibility of the laboratory supervisor and/or manager to schedule the testing and maintain the records.

Whenever there is the risk of inhaling vapours or particles of a carcinogen, reproductive toxin or sensitizer, work should be performed in a fume hood or in a biological safety cabinet that is exhausted externally (ducted BSC).

Laminar flow hoods (clean air benches) are not acceptable for work with designated substances.

Administrative

Administrative controls are those that aim to control or minimize exposure to designated substances using work methods and work procedures.

- Maintaining an effective Workplace Hazardous Information System (WHMIS), which includes labels, SDS, and training. An important step in assessing the risk to designated substances, is to identify them. Training the employees to recognize the pictograms on the supplier label and to find relevant information on the SDS of the chemical is very important for hazard recognition.
- Conducting regular inspections for proper storage, handling and disposal of designated substances.
- If present in a workplace, the policy and procedures must inform workers about the reproductive toxin.

- A job review will be conducted for an employee or student who has advised his/her supervisor of pregnancy or the intent to conceive a child or of sensitivities to a substance. The job review will evaluate the hazards, assess the risk and suggest an appropriate resolution. This may include protective reassignment is deemed necessary.
- Develop and implement safe work procedures for aspects of receiving, storage, preparation, administration and waste handling. The work safe procedures must be readily available for reference by workers.
- Effective training in safe work procedures and appropriate control measures.

Personal Protective Equipment (PPE) and Other Protective Clothing

PPE and protective clothing is the least effective control. However, when used in conjunction with other controls (e.g. engineering and administrative), PPE and protective clothing can help further reduce the worker's exposure to designated substances.

The specific PPE that is required for each task in the workplace is determined by a risk assessment. Workers should refer to the safe work procedures at their workplace for determining what types of PPE they are required to wear when handling hazardous substances.

Gloves

Nitrile or natural rubber latex is a preferred basic glove material, while vinyl is considered inappropriate because of its generally increased permeability. If there are workers who are sensitive or allergic to latex, then latex gloves should not be present in the particular space. For extended exposure to designated substances double gloving, using thicker gloves and frequently changing gloves increases their protective power.

When following best practices for the use of gloves during handling of hazardous drugs, workers should:

Wear double gloves when the risk for dermal contamination with hazardous drugs is high (this is determined as part of your workplace risk assessment)

- Follow steps to avoid contamination when putting on gloves and during removal, including washing hands before and after wearing gloves
- Change gloves after 30 minutes of continuous compounding or if they have been contaminated or compromised
- Remove outer gloves before taking them out of a fume hood or biological safety cabinet

Lab coat / gown

The use of a lab coat is mandatory any time a carcinogen, reproductive toxin and/or sensitizer is handled. Other facilities might use gowns for the same purpose.

Contaminated lab coats represent a source of cross contamination, if handled without skin protection (gloves). Lab coats should be immediately changed if contaminated and placed in a designated container. Laundry of contaminated garments should be done separately

Face and eye protection

Eye protection, such as splash goggles, must be used in any situation where there is a risk of splashing, which may occur when handling liquid forms of chemical substances and waste. Eye protection must also be used when cleaning up spills or chemical substances.

For tasks were face exposure is anticipated, workers should:

- Wear full-face shields
- Use disposable face protection whenever practicable
- Clean non-disposable face protection immediately after use

Footwear and shoe covers

Workers must ensure their footwear is in a condition to provide protection against exposure to hazardous materials, such as by wearing closed shoes that are made of a material that prevents liquids from soaking through. Refer to section 8.22 of the WorkSafeBC Regulation for more information on the requirements for footwear. Shoe covers are part of sterile preparation procedures but also help reduce exposure by preventing contamination being spread to other areas of the workplace on workers' shoes. Wearing shoe covers is recommended when cleaning up spills.

Respirators

An approved and fit-tested respirator must be worn when there is a risk of exposure to airborne particulates, aerosols, or vapours from designated substances. This type of exposure may occur when workers:

- Handle designated substances on a counter or some other place that is outside of a fume hood or ducted BSC
- Clean up spilled designated substances

The respirator selected must provide protection from particulates as well as gases or vapours that can be generated from solid or liquid forms of these hazardous substances, depending on the activity. This could include a half-or full-face air-purifying respirator that has a particulate filter (such as P100) and a **chemical cartridge** that removes vapour contaminants from air as it is inhaled.

The choice of respirator must be made as part of the risk assessment based on the potential exposure to airborne particulates, aerosols, or vapours from designated substances for each task in the workplace. Fit tests must also be carried out before a

respirator is issued to a worker. The worker must perform a seal check before each use. Respirator fit testing is performed by Risk Management Services.

More information on how to select an appropriate respirator can be found in the WorkSafeBC publication Breathe Safer: How to Use Respirators Safely and Start a Respirator Program.

8. EDUCATION / TRAINING

A worker involved in any aspect of handling designated substances must know the content of this ECP, receive pre-job education and on-the-job training on the handling of these substances.

Personnel must be trained to a level of "demonstrated competency". While not an exhaustive list, education and training may include:

- Known health risks, including any potential reproductive hazards,
- Relevant techniques and procedures for safe handling,
- Proper use of protective equipment and materials, and
- Spill and waste disposal procedures
- Procedures for reporting known exposures and suspected health effects.

The Occupational & Preventive Health, on Vancouver UBC campus, provides services and programs to help UBC employees manage potential risks in the workplace.

9. WRITTEN WORK PROCEDURES

The OHS Regulation requires that an ECP for designated substances be developed and implemented when a worker may be occupationally exposed to one of these designated substances.

The ECP must be reviewed at least annually and updated as necessary by the employer, in consultation with the joint committee or the worker health and safety representative, as applicable.

The employer must ensure site-specific ECPs and written safe work procedures are developed and implemented to ensure controls are in place to minimize the risk of exposure to designated substances. The ECPs and safe work procedures must be made readily available to workers. Refer to the following documents:

- Appendix D: Job Tasks and Controls Table
    - This table lists job tasks where exposure to the designated substances may occur and respective controls that are to be implemented to avoid exposure to designated substances. Specific Safe Work Procedures are generated based on the identified tasks.
- Task-Specific Safe Work Procedures (developed as necessary)

10. HYGIENE FACILITIES

Hygiene facilities must be made available to permit proper hand washing and cleaning of reusable personal protective equipment such as respirators and safety eyewear. Reusable lab coats / gowns must be laundered and changed regularly. Lab coats / gowns must not be worn outside the designated work area (i.e. must be removed while eating lunch). Disposable gowns / lab coats must be discarded accordingly.

Eating, drinking, smoking, application of cosmetics or storage of food is prohibited in any area where the designated substances are mixed, administered or stored.

11. HEALTH MONITORING

Health monitoring may be required if workers are exposed to designated substances. The necessity of health monitoring will be decided from case to case by an occupational health professional. Contact Occupational & Preventive Health, on Vancouver UBC campus, with any questions and concerns.

All personnel involved in any aspect of the handling of designated substances should be informed about the risks of occupational exposure to these hazardous substances. A worker who is pregnant or intends to conceive, should advise her supervisor. The supervisor must develop policy and procedures appropriate to the risk, which may include protective reassignment.

12. DOCUMENTATION

Documentation associated with the Exposure to Carcinogens, Reproductive Toxins and Sensitizers Program will need to be maintained. The documentation includes, but not limited to:

- ECP for Carcinogens, Reproductive Toxins and Sensitizers and Safe Work Procedures
- Project/task specific ECP and safe work procedures – when necessary
- Education and training records
- First aid records pertaining to exposures to designated substances
- Incident/accident investigation reports pertaining to exposures to designated substances
- WorkSafeBC inspection reports, if applicable
- Respirator fit test records
- Safety meeting minutes

13. PROGRAM REVIEW

This program is to be reviewed at least annually by the responsible departmental representative in Risk Management Services.

14. REFERENCES

Occupational Health and Safety Regulations Part 5.54 – Exposure Control Plan
Occupational Health and Safety Regulations Part 5.53 – Workplace Monitoring
Occupational Health and Safety Regulations Part 5.57 – Designated Substances
Occupational Health and Safety Regulations Part 5.58 – Protective Policy
Occupational Health and Safety Regulations Part 6.49 – Reproductive Toxins
Alberta Cancer Board – Cancer and the Workplace (2005)
National Institute for Occupational Safety and Health – The Effects of Workplace Hazards on Female Reproductive Health (1999)
National Institute for Occupational Safety and Health – The Effects of Workplace Hazards on Male Reproductive Health (1996)
British Columbia Institute of Technology – Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan (2014)

15. DOCUMENT INFORMATION

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APPENDIX A: APPLICABLE WORKSAFEBC REGULATION

5.54 Exposure control plan

(1) An exposure control plan must be implemented when

(a) exposure monitoring under section 5.53(3) indicates that a worker is or may be exposed to an air contaminant in excess of 50% of its exposure limit,
(b) measurement is not possible at 50% of the applicable exposure limit, or
(c) otherwise required by this Regulation.

(2) The exposure control plan must incorporate the following elements:

(a) a statement of purpose and responsibilities;
(b) risk identification, assessment and control;
(c) education and training;
(d) written work procedures, when required;
(e) hygiene facilities and decontamination procedures, when required;
(f) health monitoring, when required;
(g) documentation, when required.

(3) The plan must be reviewed at least annually and updated as necessary by the employer, in consultation with the joint committee or the worker health and safety representative, as applicable.

5.57 Designated substances

(1) If a substance identified as any of the following is present in the workplace, the employer must replace it, if practicable, with a material which reduces the risk to workers:

(a) ACGIH A1 or A2, or IARC 1, 2A or 2B carcinogen;

(b) ACGIH reproductive toxin;

(c) ACGIH sensitizer;

(d) ACGIH L endnote.

(2) If it is not practicable to substitute a material which reduces the risk to workers, in accordance with subsection (1), the employer must implement an exposure control plan to maintain workers' exposure ALARA below the exposure limit established under section 5.48.

(3) The exposure control plan must meet the requirements of section 5.54.

5.58 Protective policy

(1) At any worksite where a worker is exposed to a substance which is identified in section 5.57(1) as an ACGIH reproductive toxin or an ACGIH sensitizer, the employer must develop policy and procedures appropriate to the risk, which may include protective reassignment.

(2) The policy and procedures required by subsection (1) must

(a) inform workers about the reproductive toxin and identify ways to minimize exposure to the toxin for a worker who has advised the employer of pregnancy or intent to conceive a child, and

(b) identify ways to eliminate or minimize exposure to a sensitizer for a worker who is or may be sensitized to that substance.

6.49 Reproductive toxins

(1) At any worksite where a worker is occupationally exposed to a cytotoxic drug that is a reproductive toxin, the employer must develop policy and procedures appropriate to the risk, which may include protective reassignment.

(2) The policy and procedures must inform workers about the reproductive toxin and identify ways to minimize exposure to the reproductive toxin for a worker who has advised the employer of pregnancy or intent to conceive a child.

APPENDIX B: CHEMICAL AND BIOLOGICAL DESIGNATED SUBSTANCES*

Chemical (CAS #)	Designation**	Chemical (CAS #)	Designation**
Acetaldehyde [75-07-0]	A2, 2B	Acetamide [60-35-5]	2B, (I)
Acetophenone [98-86-2]	R	Acrylamide, Inhalable [79-06-1]	2A, Skin
Acrylic acid [79-10-7]	R, Skin	Acrylonitrile [107-13-1]	2B, Skin
Alachlor, Inhalable [15972-60-8]	S(D)	Allyl glycidyl ether [106-92-3]	S
Allyl propyl disulfide [2179-59-1]	S(D)	4-Aminodiphenyl [92-67-1]	A1, 1, L, Skin
Amitrole [61-82-5]	R	Ammonium sulfamate [7773-06-0]	R
tert-Amyl methyl ether (TAME) [994-05-8]	R	*o*-Anisidine [90-04-0]	2B, Skin
Antimony trioxide - Production [1309-64-4]	A2, 2B, L	Arsenic and inorganic compounds, as As [7440-38-2]	A1, 1
Asbestos - All forms [1332-21-4]	A1, 1	Atrazine [1912-24-9]	R
Azinphos-methyl, Inhalable [86-50-0]	S(D), Skin		
Benomyl, Inhalable [17804-35-2]	R, S(D)	Benz[*a*]anthracene [56-55-3]	A2, 2B, L
Benzene [71-43-2]	A1, 1, Skin	Benzidine [92-87-5]	A1, 1, L, Skin
Benzidine based dyes	2A	Benzo[*b*]fluoranthene [205-99-2]	A2, 2B, L
Benzo[*a*]pyrene [50-32-8]	A2, 1, L	Benzotrichloride [98-07-7]	Skin, A2, 2A
Benzoyl chloride [98-88-4]	2A	Benzyl chloride [100-44-7]	2A
Beryllium and compounds, Inhalable, as Be [7440-41-7]	A1, 1; Skin, S(D), S(R)	1-Bromopropane [106-94-5]	R
1,3-Butadiene [106-99-0]	A2, 1	*n*-Butyl acrylate [141-32-2]	S(D)
n-Butyl glycidyl ether (BGE) [2426-08-6]	Skin, S(D), R	*n*-Butyl mercaptan [109-79-5]	R
Cadmium and compounds, as Cd [7440-43-9]	A2, 1	Cadmium and compounds, Respirable, as Cd [7440-43-9]	A2, 1
Calcium chromate, as Cr [13765-19-0]	A2, 1	Captafol [2425-06-1]	2A; S(D); S(R), Skin
Captan, Inhalable [133-06-2]	S(D)	Carbaryl [63-25-2]	R
Carbon black, Inhalable [1333-86-4]	2B	Carbon monoxide [630-08-0]	R
Carbon tetrachloride [56-23-5]	A2, 2B, Skin	Catechol [120-80-9]	2B, Skin
Chlordane [57-74-9]	2B	Chlorinated camphene [8001-35-2]	2B, Skin
2-Chloroacetophenone [532-27-4]	S	*p*-Chloroaniline [106-47-8]	2B
o-Chlorobenzylidene malononitrile [2698-41-1]	S(D), Skin	Chlorodiphenyl (42% chloride) [53469-21-9]	2A, Skin
Chlorodiphenyl (54% chloride) [11097-69-1]	2A, Skin	Chloroform [67-66-3]	2B, R
bis(Chloromethyl) ether [542-88-1]	A1, 1	Chloromethyl methyl ether [107-30-2]	A2, 1, L

Chemical (CAS #)	Designation**	Chemical (CAS #)	Designation**
1-Chloro-2-propanol [127-00-4]	R, Skin	2-Chloro-1-propanol [78-89-7]	R, Skin
beta-Chloroprene [126-99-8]	A2, 2B, R, Skin	2-Chloropropionic acid [598-78-7]	R, Skin
4-Chloro-*o*-Toluidine [95-69-2]	2A	Chromite ore processing (Chromate), as Cr	A1
Chromium (VI) inorganic compounds - Insoluble, as Cr [7440-47-3]	A1, 1	Chrysene [218-01-9]	2B, L
Citral, inhalable [5292-40-5]	S(D)	Coal tar pitch volatiles, as benzene-soluble aerosol [65996-93-2]	A1, 1
Cobalt and inorganic compounds, as Co [7440-48-4]	2B	Cobalt carbonyl, as Co [10210-68-1]	2B
Cobalt hydrocarbonyl, as Co [16842-03-8]	2B	Cumene [98-82-8]	2B
DDT (Dichloro-diphenyltrichloroethane) [50-29-3]	2A	Demeton-*S*-methyl, Inhalable [919-86-8]	S(D), Skin
2,4-Diaminoanisole [615-05-4]	2B	2,4-Diaminotoluene [95-80-7]	2B
Diazinon, Inhalable [333-41-5]	2A, Skin	Diazomethane [334-88-3]	A2
1,2-Dibromo-3-chloropropane [96-12-8]	2B	Dibutyl phthalate [84-74-2]	R
Dichloroacetic acid [79-43-6]	2B, R, Skin	*p*-Dichlorobenzene [106-46-7]	2B
1,4-Dichloro-2-butene [764-41-0]	A2, Skin	Dichloromethane [75-09-2]	2A
1,3-Dichloropropene [542-75-6]	2B, Skin	Dichlorvos (DDVP), Inhalable [62-73-7]	2B, S(D), Skin
Dieldrin [60-57-1]	R, Skin	Diethanolamine [111-42-2]	2B
Diethylene triamine [111-40-0]	S	Di(2-ethylhexyl)phthalate (DEHP) [117-81-7]	2B
Diethyl sulfate [64-67-5]	2A	Diglycidyl ether (DGE) [2238-07-5]	R
Diisocyanates, not elsewhere specified, NOS	S	3,3'-Dimethoxybenzidine [119-90-4]	2B, L
Dimethyl carbamoyl chloride [79-44-7]	A2, 2A	1,1-Dimethylhydrazine [57-14-7]	2B, Skin
1,2-Dimethylhydrazine [540-73-8]	2A	Dimethyl sulfate [77-78-1]	2A, Skin
N,*N*-Dimethylacetamide [127-19-5]	R, Skin	Dimethylamine	S(D)
Dinitrotoluene [25321-14-6]	2B, R, Skin	1,4-Dioxane [123-91-1]	2B, Skin
1,3-Dioxolane [646-06-0]	R	Dodecyl mercaptan [112-55-0]	S(D)
Epichlorohydrin [106-89-8]	2A, R, Skin	2-Ethoxyethanol (EGEE) [110-80-5]	R, Skin
2-Ethoxyethyl acetate (EGEEA) [111-15-9]	R, Skin	Ethyl acrylate [140-88-5]	2B, S(D)
Ethyl benzene [100-41-4]	2B	Ethyl *tert*-butyl ether (ETBE) [637-92-3]	R
Ethylenediamine [107-15-3]	S, Skin	Ethylene dibromide [106-93-4]	2A, Skin
Ethylene dichloride (1,2-dichloroethane) [107-06-2]	2B	Ethylene oxide [75-21-8]	A2, 1, R

Chemical (CAS #)	Designation**	Chemical (CAS #)	Designation**
Ethyleneimine [151-56-4]	2B, Skin	2-Ethylhexanoic acid, Inhalable [149-57-5]	R
Ethyl isocyanate [109-90-0]	S(D), Skin		
Flour dust, Inhalable	S(R)	Folpet [133-07-3]	S(D)
Formaldehyde [50-00-0]	A1, 1, S(D), S(R)		
Gasoline [86290-81-5]	2B	Glutaraldehyde, Activated & inactivated [111-30-8]	S(D); S(R)
Glycidol [556-52-5]	2A	Glyoxal, Inhalable [107-22-2]	S(D)
Halothane [151-67-7]	R	Hard metals, containing Cobalt and Tungsten Carbide, as Co [7440-48-4; 12070-12-1]	A2; S(R)
Heptachlor [76-44-8]	2B, Skin	Hexachlorobenzene (HCB) [118-74-1]	2B, Skin
Hexachloroethane [67-72-1]	2B	Hexafluoroacetone [684-16-2]	R, Skin
Hexahydrophthalic anhydride, all isomers, Inhalable [85-42-7; 13149-00-3; 14166-21-3]	S(R)	Hexamethyl phosphoramide [680-31-9]	2B, Skin
Hexamethylene diisocyanate (HDI) [822-06-0]	S(R)	1-Hexene [592-41-6]	R
Hydrazine [302-01-2]	2B, Skin	Hydroquinone [123-31-9]	S(D)
2-Hydroxypropyl acrylate [999-61-1]	S(D), Skin		
Indium and compounds, as In [7440-74-6]	2B	Isophorone diisocyanate [4098-71-9]	S(R)
Lead - elemental and inorganic compounds, as Pb [7439-92-1]	Elemental 2B, R, other 2A, R	Lead chromate, as Cr [7758-97-6]	A2, 1; R
Lead chromate, as Pb [7758-97-6]	A2, 1; R		
Malathion, Inhalable [121-75-5]	2A, Skin	Maleic anhydride [108-31-6]	S(D), S(R)
Manganese - Elemental & inorganic compounds, as Mn [7439-96-5]	R	Mercury - Elemental, as Hg [7439-97-6]	R, Skin
Mercury - Inorganic compounds, as Hg [7439-97-6]	R, Skin	Mercury - Methyl, as Hg [7439-97-6]	2B, Skin
Methomyl [16752-77-5]	R, Skin	2-Methoxyethyl acetate (EGMEA) [110-49-6]	R, Skin
2-Methoxyethanol (EGME) [109-86-4]	R, Skin		
Methyl acrylate [96-33-3]	S(D), Skin	Methyl *tert*-butyl ether (MTBE) [1634-04-4]	R
Methyl *n*-butyl ketone [591-78-6]	R, Skin	Methyl chloride [74-87-3]	R, Skin
Methylene bisphenyl isocyanate (MDI) [101-68-8]	S(R), Skin	4,4'-Methylene bis(2-chloroaniline) (MBOCA; MOCA) [101-14-4]	A2, 1, Skin
Methylene bis(4-cyclo-hexyl-isocyanate), [5124-30-1]	S(R)	4,4'-Methylene dianiline [101-77-9]	2B, Skin
Methyl isobutyl ketone [108-10-1]	2B	Methyl isocyanate [624-83-9]	S(D), Skin

Chemical (CAS #)	Designation**	Chemical (CAS #)	Designation**
Methyl isopropyl ketone [563-80-4]	R	Methyl methacrylate [80-62-6]	S(D)
alpha-Methyl styrene [98-83-9]	R; 2B	Methyl vinyl ketone [78-94-4]	S, Skin
Naled, Inhalable [300-76-5]	S(D), Skin	Naphthalene [91-20-3]	2B, Skin
beta-Naphthylamine [91-59-8]	A1, 1,L	Natural rubber latex, as total proteins, Inhalable [9006-04-6]	S(D); S(R), Skin
Nickel - Insoluble inorganic compounds, as Ni [7440-02-0]	A1, 1	Nickel - Elemental, Soluble inorganic compounds, as Ni [7440-02-0]	1, 2B
Nickel carbonyl, as Ni [13463-39-3]	1	Nickel subsulfide, as Ni, Inhalable [12035-72-2]	A1, 1
Nitrobenzene [98-95-3]	2B, Skin	4-Nitrodiphenyl [92-93-3]	A2, L, Skin
Nitromethane [75-52-5]	2B	2-Nitropropane [79-46-9]	2B
N-Nitrosodiethanolamine [1116-54-7]	2B	*N*-Nitrosodiethylamine [55-18-5]	2A
N-Nitrosodimethylamine [62-75-9]	2A	*N*-Nitrosomethylethylamine [10595-95-6]	2B, L, Skin
N-Nitrosomorpholine [59-89-2]	2B	*N*-Nitrosopiperidine [100-75-4]	2B
N-Nitrosopyrrolidine [930-55-2]	2B	Nitrotoluene, all isomers [88-72-2; 99-08-1; 99-99-0]	2A, Skin
Nitrous oxide [10024-97-2]	R		
Oil mist - mineral, mildly refined	1	*p*,*p*'-Oxybis(benzenesulfonyl hydrazide), Inhalable [80-51-3]	R
Parathion, Inhalable [56-38-2]	2B, Skin	Pentachlorophenol [87-86-5]	2B, Skin
p-Phenylenediamine [106-50-3]	S(D)	Phenyl glycidyl ether (PGE) [122-60-1]	2B, S(D), R, Skin
Phenyl isocyanate [103-71-9]	S(D), S(R), Skin	Phenylphosphine [638-21-1]	R
Phthalic anhydride [85-44-9]	S(D), S(R), Skin	Picric acid [88-89-1]	S(D)
Piperazine and its Salts, as Piperazine [110-85-0]	S(D); S(R)	Platinum - Soluble salts (as Pt) [7440-06-4]	S
Propane sultone [1120-71-4]	2A, L	beta-Propiolactone [57-57-8]	2B
Propylene dichloride [78-87-5]	1; S(D)	Propylene oxide [75-56-9]	2B; S(D)
Propyleneimine [75-55-8]	2B	Pyrethrum [8003-34-7]	S
Rosin core solder thermal decomposition products (colophony) [8050-09-7]	S(D); S(R), L		
Silica, Crystalline - alpha quartz [14808-60-7; 1317-95-9] and Cristobalite, Respirable [14464-46-1]	A2, 1	Silicon carbide, Fibrous (including whiskers) [409-21-2]	A2
Strontium chromate, as Cr [7789-06-2]	A2	Styrene - monomer [100-42-5]	2B
Subtilisins, as crystalline active enzyme [1395-21-7; 9014-01-1]	S(R)	Sulfuric acid, Thoracic [7664-93-9]	A2, 1
Synthetic Vitreous Fibres - Special purpose glass fibres	A2, 2B		

Chemical (CAS #)	Designation**	Chemical (CAS #)	Designation**
Talc - Containing asbestos fibres [14807-96-6]	A1, 1	1,1,2,2-Tetrachloroethane [79-34-5]	2B, Skin
Tetrachloroethylene (Perchloroethylene) [127-18-4]	2A	Tetrafluoroethylene [116-14-3]	2A
Tetranitromethane [509-14-8]	2B	Tetrakis (hydroxymethyl) phosphonium sulfate [55566-30-8]	S(D)
Tetryl [479-45-8]	S	Thiram [137-26-8]	S(D)
Titanium dioxide [13463-67-7]	2B	*o*-Tolidine [119-93-7]	2B, Skin
Toluene [108-88-3]	R	Toluene-2,4-diisocyanate (2,4-TDI) [584-84-9]	2B; S(D); S(R), Skin
Toluene-2,6-diisocyanate (2,6-TDI) [91-08-7]	2B; S(D); S(R), Skin	2,4- and 2,6-Toluene diisocyanate as a mixture [584-84-9; 91-08-7]	2B; S(D); S(R), Skin
o-Toluidine [95-53-4]	1, Skin	Trichloroacetic acid [76-03-9]	2B
Trichloroethylene [79-01-6]	A2, 1, Skin	1,2,3-Trichloropropane [96-18-4]	A2, 2A, Skin
1,3,5-Triglycidyl-s-triazinetrione [2451-62-9]	R; S	Trimellitic anhydride [552-30-7]	S(D); S(R), Skin
Turpentine [8006-64-2] and selected monoterpenes [80-56-8; 127-91-3; 13466-78-9]	S(D)		
Uranium (Natural) - Insoluble compounds, as U [7440-61-1]	A1, 1	Uranium (Natural) - Soluble compounds, as U [7440-61-1]	A1, 1
Vanadium pentoxide, as V, Inhalable [1314-62-1]	2B	Vinyl acetate [108-05-4]	2B
Vinyl bromide [593-60-2]	A2, 2A	Vinyl chloride [75-01-4]	A1, 1
4-Vinyl cyclohexene [100-40-3]	2B; R	Vinyl cyclohexene dioxide [106-87-6]	2B; R, Skin
Vinyl fluoride [75-02-5]	A2, 2A		
Warfarin [81-81-2]	R	Wood dust - Allergenic species	A1, A2, 1
Wood dust - Non-Allergenic Hardwood	A1, A2, 1	Wood dust - Non-Allergenic Softwood	1
Zinc chromates, as Cr [13530-65-9; 11103-86-9; 37300-23-5]	A1, 1		

* Designated substances table compiled from the WorkSafeBC “Table of exposure limits for chemical and biological substances”

** For an explanation of the designations, see Chapter 3: Designated Substances - Definitions

APPENDIX C: JOB TASKS AND CONTROL TABLE - ACCEPTABLE CONTROL METHODS FOR SPECIFIC JOB TASKS

Work Activity	Control Methods	Personal Protective Equipment (PPE)	Comments
Receiving and storage	• Secondary containment for storage • Storage shelves with fall guards	• Disposable gloves • Lab coat / gown • An approved and fit-tested respirator if handling damaged packages	Surface contamination of containers and packaging is a potential source of exposure
Handling (weighing, compound, dilution, mixing)	• Handling should always be done in a fume hood or in a ducted BSC • When weighing of powdered compounds cannot be done inside the fume hood the estimated amount can be placed in a pre-weighed vial (inside the fume hood), capped and weighed on the bench top • Follow recommended procedures for handling waste and/or cleaning spills	• Disposable gloves • Lab coat / gown • Eye protection • An approved and fit-tested respirator (if necessary)	Inhalation route of exposure can only be controlled by working in a fume hood; to avoid cross-contamination, gloves should be changed frequently
Administration (animals: injections, topical)	• Treatment of animals should be done in a well ventilated area (fume hood or ducted BSC are recommended) • When protocol allows, use bandages over areas where a topical medication has been applied • Follow recommended procedures for handling waste and/or cleaning spills	• Disposable gloves • Lab coat / gown • Eye protection	For other modes of administration (i.e. inhalation, oral) contact RMS to create a specific risk assessment
Non-invasive monitoring of animals treated with designated substances (before the first cage change)	• Animals should be housed in microisolator type cages until the first cage change • Removal of animal from the cage should be done inside a fume hood or ducted BSC	• Disposable gloves • Lab coat / gown	Non-invasive monitoring tasks include observing the animal without direct contact as well as procedures requiring physically handling the animal (i.e. weighing, injection site evaluation, and electrocardiogram).

Work Activity	Control Methods	Personal Protective Equipment (PPE)	Comments
Invasive monitoring of animals treated with designated substances (before the first cage change)	• Procedures must be done inside a fume hood or ducted BSC • Follow recommended procedures for handling waste and/or cleaning spills	• Disposable gloves • Lab coat / gown • Eye protection	Invasive monitoring tasks involve direct contact with bodily fluids (i.e. surgery, IV treatment)
Bed changing and cage cleaning	• Cleaning of contaminated cages (first change after treatment) should be done inside a fume hood or ducted BSC • Contaminated waste should be disposed of according to specific procedures for bedding waste	• Heavy duty cleaning gloves on top of disposable gloves • Lab coat / gown • Eye protection • An approved and fit-tested respirator (if task is not completed inside a fume hood, ducted BSC or efficient local exhaust ventilation)	Cleaning cages or changing bedding of animals designated substances exposes the worker to contaminated residues resulted from the animals excreting the drug or metabolites.
Waste disposal	• Follow the chemical waste disposal or the biological waste disposal guideline • Sharps used must be disposed of in the sharps waste container	• Disposable gloves • Lab coat / gown	Workers can be exposed to designated substances via contact with contaminated waste and/or waste containers
Spill response	• Spill clean-up kits are available in the area where designated substances are stored and used • Regular training on emergency spill procedures is provided	• Heavy duty cleaning gloves • Lab coat / gown • Eye protection (goggles) • An approved and fit-tested respirator (if necessary)	While responding to a spill, workers can be exposed to a leak, spill, or can inhale aerosols, vapours or particulates released.