



# Environmental Health and Safety

UNIVERSITY OF WASHINGTON

## Guidance about Workplace Hazards Impacting Reproduction and Development

March 5, 2009

### Introduction

University employees working with any hazardous agent must know how to safely work in order to protect their health, and use good procedures at all times to minimize their potential exposures to hazardous agents. The University of Washington strives to ensure a safe workplace for all workers by implementing environmental and occupational health and safety standards and practices.

This guidance has been developed to inform employees about potential reproductive and developmental hazards to ensure safe work conditions and practices in their work environment. The department is available to assist in evaluating risks, and to advise on steps that can help reduce potential for risks. Although primarily meant for UW employees, this guidance should also be helpful for students and instructors. Also, this guidance may alert an individual about risks in the home environment, including hobbies.

Hazardous agents could be chemical, biological, radiological, or physical. Agents that adversely affect sexual function or the ability of men or women to conceive and reproduce are referred to as developmental or reproductive hazards depending on what processes they may impact. Agents that disturb the proper growth or health of the offspring, acting at any point between conception and puberty, are identified as developmental toxicants. Agents that affect sperm production can be referred to as male reproductive toxicants. Although some mention is made of biological, radiological, and physical agents that are reproductive or developmental hazards, this guidance primarily addresses chemical agents. The [Radiation Safety Manual](http://www.ehs.washington.edu/manuals/rsmanual/index.shtml) (<http://www.ehs.washington.edu/manuals/rsmanual/index.shtml>) and the Radiation Safety Office ([radsaf@u.washington.edu](mailto:radsaf@u.washington.edu), 206-543-0463), should be referred to for questions concerning radiation exposures.

The Washington Department of Labor and Industries performed a detailed evaluation of possible reproductive hazards in 1999 and their final report ("[Workplace Hazards to Reproduction and Development](#)", [Technical Report Number 21-3-1999](#)) concludes:

It is important to remember that exposure to toxic agents is only one of many factors that can harm reproduction and result in poor pregnancy outcomes. Although much is still unknown about the extent to which workplace hazards contribute to these health problems, hazardous workplace exposures are generally preventable. Therefore, the goal for employers and workers should be

to reduce exposures as much as possible. This is the surest way to prevent toxic exposures from harming workers or the fetus.

## **Background**

Some agents can affect the potential to conceive a child or affect the embryo or fetus early in the pregnancy or even before. If a pregnancy is possible, you and your partner should be aware of any chemicals in the work area that may cause reproductive or developmental hazards prior to pregnancy. Possible reproductive hazards caused by agents include those that affect male or female reproductive abilities, embryo or fetal development, development after birth, and the mother or child while breast feeding. Both partners before and during reproductive periods need to be conscious of these hazards. Appendix A contains a glossary covering many terms used when describing reproductive and developmental hazards.

Appendix B lists examples of agents that have appeared in the literature as being known or probable reproductive hazards. The literature for most chemicals has little if any information about the dose and time of exposure (e.g., prior to conception, during the embryo stage, etc.) that increases the reproductive risk in humans. Frequently, risks are extrapolated for humans from studies using other species. Appendix B does not include all chemicals that can cause reproductive or developmental risks, because reproductive effects have not been adequately studied for many chemicals and chemical mixtures. Material Safety Data Sheets (MSDSs) and other literature sources can provide additional information about the chemicals in use in a particular workplace.

## **Steps to Reduce Reproductive Risks in the Workplace**

1. The first step you can take is to learn about possible workplace hazards that could have an effect on reproduction. The questionnaire in Appendix C of this guidance is a tool that you can use to help compile relevant information. As you complete this questionnaire, these sources of information may be helpful:
  - Review the MyChem inventory of chemicals for your workplace;
  - Obtain information about the ingredients in chemical mixtures from the chemical's MSDS;
  - Talk with your supervisor;
  - Contact UW Environmental Health & Safety (EH&S) Industrial Hygienists and Occupational Health Nurse (543-7388);
  - Contact UW Employee Health Clinic practitioners;
  - Talk with your personal physician; and
  - Make use of the "Additional Information" section later in these guidelines.

2. The next step is to minimize exposures as much as you can.

Note: This should be an on-going effort within the workplace, regardless of one's reproductive status.

Ways to reduce exposures can include:

- Changing the process to avoid use of the hazardous material;
  - Replacing a reproductive hazard solvent with one that is less likely to be a reproductive hazard;
  - “Down-sizing” experimental procedures to the smallest quantities needed or most dilute formulations needed;
  - Buying pre-mixed or pre-diluted formulations;
  - Performing procedures with adequate ventilation that pulls the hazardous material away from you, like a properly operating fume hood, in a biological safety cabinet that does not re-circulate air back into the room, or another ventilation control system such as a swinging arm exhaust system (Note: always check to make sure the ventilation system is actually operating before starting the procedure);
  - Following laboratory rules, such as “No food or drinks in the laboratory”;
  - Following all steps in your standard operating procedures (SOPs);
  - Reducing chances for spills by eliminating clutter, working on flat surfaces, mounting equipment firmly, and carrying containers in tubs;
  - Making sure all containers are closed as soon as feasible;
  - Avoiding skin contact with hazardous materials.
  - Wash hands after removing gloves but before touching anything you will put in your mouth;
  - Wear appropriate personal protective equipment (PPE) such as lab coats, liquid repellent aprons, chemical goggles, impervious gloves (Note: thin latex gloves are not impervious for most chemicals); and,
3. If you are concerned about your reproductive health, and your health care provider has advised you to modify your work procedures or take special precautions because of possible reproductive hazards in the workplace, you should immediately notify your supervisor or department administrator. The Occupational Health Nurse in Environmental Health & Safety and the Campus Health Service's Employee Health Clinic, located in Hall Health Center can assist in reviewing the workplace to determine what, if any modifications may be appropriate. (See seven and eight below) Exposure to ionizing radiation necessitates steps starting on page 6-6 of the Radiation Safety Manual. Contact

the Radiation Safety Office at 543-0463 or [radsaf@u.washington.edu](mailto:radsaf@u.washington.edu) if there are any questions.

4. Potential occupational exposures should be described to your health care provider, using the questionnaire in Appendix C to describe workplace conditions.
5. Concerns about reproductive health generally do not require an employee to perform different job duties or take time off to avoid potential reproductive hazards. However, if your health care provider advises you to temporarily change job duties, or take a leave of absence, the University will consider such requests. In order to determine what action is most appropriate, the University may request that you provide a release from your health care provider to inform the University about medical circumstances that have resulted in the health care provider's recommendation.

If you wish to request leave because of concerns about reproductive health, you should follow your department's normal leave request procedures. If you wish to request a temporary or permanent change in job duties you should contact the human resources consultant that serves your department (<http://www.washington.edu/admin/hr/contacts/hrrep.assignments/index.html>). You should be prepared to provide information from your health care provider documenting the reason for the request in change of duties.

6. If your job requires that you perform certain physical duties that must be limited during your reproductive period, you may request a temporary change in job duties or request a leave of absence through the same procedures outlined in step number five above.
7. Services that EH&S can provide include:
  - Performing workplace assessments of activities involving chemical, radioactive, physical and biological reproductive hazards;
  - Providing information about hazards;
  - Recommending ways to minimize exposures to workplace hazards; and,
  - Providing general training to employees.
8. Employees may contact the Occupational Health Nurse in Environmental Health & Safety and the Campus Health Service's Employee Health Clinic, located in Hall Health Center, on a voluntary basis and at the employee's initiative to discuss reproductive health concerns in confidence.
9. Occasionally, people want to use a respirator to reduce exposures. Respirators are not desirable because they also stress the body and should not be needed if

other steps as previously described are rigorously followed. If respirators are suggested by your health care provider, all steps in the UW Respirator Protection Program must be complied with, including requirements to be medically qualified to wear a respirator and completion of training and fit testing. The medical evaluation and fit testing should be periodically re-accomplished to assure the respirator is fitting properly. For additional information concerning PPE, please contact EH&S at 206-543-7388.

## **Additional Information**

Northwest Pediatric Environmental Health Specialty Units (PEHSU), <http://depts.washington.edu/pehsu/>, 1-877 KID CHEM (toll free). PEHSU Units have been developed in 10 US regions (1) to improve the health of children with respect to environmental exposures, and (2) to inform families, communities, and health care providers regarding environmental hazards, their effects, and practical ways to protect children's health.

Teratogen Information System (TERIS), <http://depts.washington.edu/~terisweb/teris/> is a subscription service computerized database designed to assist physicians or other healthcare professionals in assessing the risks of possible teratogenic exposures of pregnant women. An updated, automated version of Shepard's Catalog of Teratogenic Agents is distributed with TERIS. Users can access both systems simultaneously. Together, the two databases provide authoritative clinical teratogenic information on over 2800 agents.

"The Effects of Workplace Hazards on Female Reproductive Health," National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 99-104, February 1999, at <http://www.cdc.gov/niosh/99-104.html>, which contains good, general information. "The Effects of Workplace Hazards on Male Reproductive Health," National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 96-132, January 1997, at <http://www.cdc.gov/niosh/malrepro.html>, which also contains good general information. Or, you can order copies from NIOSH by dialing 1-800-35NIOSH (1-800-356-4674).

"Reproductive Hazards," Occupational Safety & Health Administration. This web site contains short summary information and many links to other sites for more detailed information, at <http://www.osha.gov/SLTC/reproductivehazards/index.html> [keep hot link]

"Workplace Hazards to Reproduction and Development," Sharon L. Drozdowsky and Stephen G. Whittaker, Technical Report Number 21-3-1999, August 1999, Washington Department of Labor and Industries (L&I), Safety and Health Assessment & Research

for Prevention (SHARP) Program. This document gives good overall information, available for viewing at [http://www.ini.wa.gov/Safety/Research/files/repro\\_dev.pdf](http://www.ini.wa.gov/Safety/Research/files/repro_dev.pdf) [link to pdf] or you can order a copy through <http://www.ini.wa.gov/Safety/Research/Pubs/default.asp>.

## Appendix A

### Glossary – Useful Terms for Researching Reproductive Hazards

(Most of the following definitions are from L & I Technical Report Number: 21-3-1999)

<b>agent</b>	For purposes of these guidelines, a chemical substance, biological substance or organism, radioactive substance or ionizing radiation exposure, or physical exposure (such as intense noise) that can affect a human.
<b>birth defect</b>	A structural, functional, or biochemical abnormality present at birth that is not due to injuries suffered during birth. The cause may be either genetic or due to a problem that occurred during development in the uterus. A birth defect is not always detected at the time of birth.
<b>CAS number</b>	An assigned number that identifies the material. CAS stands for Chemical Abstracts Service, a Columbus, Ohio, organization that indexes information published in Chemical Abstracts by the American Chemical Society and provides index guides by which information about particular substances may be located in the Abstracts when needed. CAS numbers identify specific chemicals and are assigned sequentially. (Chemical Abstracts Service, Division of American Chemical Society, Box 3012, Columbus, OH 43210 [614] 421-3600, <a href="http://www.cas.org">http://www.cas.org</a> .)
<b>carcinogen</b>	A chemical or physical agent capable of causing cancer. Such an agent is “carcinogenic”. The ability to cause cancer is “carcinogenicity”.
<b>childhood cancer</b>	A cancer occurring in a child or young adult.
<b>clastogen</b>	A chemical or physical agent that can cause breaks in chromosomes (genetic material in the cell).
<b>congenital malformation</b>	A physical abnormality present at birth (birth defect).
<b>developmental disorders</b>	Abnormal mental development and behavior, as manifested in effects which may be temporary or permanent.
<b>developmental hazard</b>	An agent that could result in an adverse effect in an individual as it grows from conception to puberty, depending on the dose and on the individual’s susceptibility.
<b>developmental toxicant</b>	An agent which disturbs the proper growth or health of the

offspring, acting at any point between conception and puberty. The resulting effects include spontaneous abortion, growth retardation, birth defects, and functional alterations.

<b>dose</b>	The amount of a chemical that enters or is absorbed by the body. Dose is usually expressed in milligrams of chemical per kilogram of body weight (mg/kg).
<b>embryo</b>	The developing organism from conception until about 8-9 weeks.
<b>embryotoxicity</b>	Increased risk of embryo death as measured in studies involving animals; also see spontaneous abortion.
<b>endocrine</b>	Organs and structures whose function is to secrete into the blood or lymph a substance (hormone) that has a specific effect on another organ or part.
<b>engineering controls</b>	Methods of controlling worker exposure by modifying the source or reducing the amount of contaminants released into the workplace. Engineering controls include process design and modification, equipment design, enclosure and isolation, and ventilation.
<b>epidemiology</b>	The study of the patterns of health and disease in a population of people.
<b>exposure</b>	An encounter between a chemical, biological, or physical agent and a worker. Usually expressed in terms of amount in air, water, dusts.
<b>fertilization</b>	The union of egg and sperm to form an embryo.
<b>fetotoxicity</b>	Increased risk of fetal death as measured in studies involving test animals; also see stillbirth.
<b>fetus</b>	The developing human from about 8-9 weeks until birth.
<b>gene</b>	The part of the genetic material of a cell that encodes a particular protein
<b>genetic defects</b>	Abnormal cell and organ development and growth, due to changed germ cells (sperm or egg cells) prior to conception or altered genetic material in developing cells prior to birth. Physical, chemical or biological agents causing such effects are

frequently identified as “mutagens.”

<b>hormone</b>	A chemical substance, produced in the body or by an organ or cells of an organ which is secreted into the bloodstream and has a specific regulatory effect on the activity of a certain organ or organs.
<b>impotence and decreased libido</b>	Alterations in the nervous system or in the secretion of sex hormones which results in lower libido (sex drive) or altered sexual response in either men or women.
<b>infertility</b>	The inability of a couple desiring a child to become pregnant.
<b>ingestion</b>	Taking in a substance through the mouth and swallowing it, including substances first inhaled, adsorbed, and then ingested.
<b>inhalation</b>	Breathing in a substance.
<b>irritant</b>	A substance which can cause an inflammatory response or a reaction of the mucous
<b>low birth weight</b>	Delayed growth of the embryo or fetus. This condition may also be due to a premature birth. membranes of the eye, skin or respiratory system.
<b>material safety data sheet (MSDS)</b>	A legally-mandated form which lists the hazardous ingredients, physical and chemical properties and health and safety hazards of a product or substance.
<b>menstruation</b>	Shedding the lining of the uterus.
<b>menstrual disorders</b>	Changes in the balance of sex hormones in women that may potentially cause menstrual irregularities, although limited information is presently available as to the agents producing such changes; increased bleeding during menstruation.
<b>miscarriage</b>	Loss of the embryo or fetus before full term; also referred to as a spontaneous abortion.
<b>mutagen</b>	A chemical or physical agent which can change the DNA (genetic material) in cells.
<b>ovulation</b>	Release of an egg from the ovary.

<b>premature birth</b>	A birth prior to 37 weeks of gestation.
<b>permissible exposure limit (PEL)</b>	A maximum allowable exposure level under OSHA and WISHA regulations. Weighted over an 8-hour work shift.
<b>personal protective equipment</b>	Equipment and clothing designed to control exposure to hazards, e.g., hard hats, safety shoes, protective eye wear, protective clothing and gloves, hearing protectors and various types of respirators, such as dust and gas masks.
<b>Regulatory Code of Washington RCW</b>	The laws of Washington State.
<b>reproductive health hazards</b>	Agents which can adversely affect sexual function or the ability of men and/or women to produce healthy children.
<b>reproductive toxicant</b>	An agent which interferes with the sexual or reproductive function or performance of an adult.
<b>respirator</b>	A device worn to prevent inhalation of hazardous substances.
<b>route of exposure</b>	The way in which a chemical enters the body. The common routes of exposure in the workplace are inhalation, ingestion and absorption through the skin.
<b>spermatogenesis</b>	The ten-week cycle of sperm production. Sperm are produced in a man's testicles.
<b>spontaneous abortion</b>	Death of the embryo or fetus before full term (usually defined as before 20 weeks). Also known as miscarriage.
<b>still birth</b>	Death of the embryo or fetus before full term (usually defined as after 20 weeks).
<b>teratogen</b>	A chemical, biological or physical agent which can lead to malformations (physical defects) in the fetus. Such an agent is "teratogenic." The ability to cause birth defects is "teratogenicity."
<b>toxicant</b>	An agent that interrupts the normal function of a cell, tissue, organ or organism.

**transplacental  
carcinogen**

A carcinogen which crosses the placenta and causes cancer in the child or young adult.

**Washington  
Administrative  
Code WAC**

The rules and regulations adopted to carry out the laws of the state of Washington.

## Appendix B

### Reproductive/Developmental Hazards List

Even though an agent may be listed, there may be no significant risk from small doses. In some cases, an agent is listed due to positive studies involving non-human species, even though human metabolism may differ. This list is based on the citations listed in the "Sources/References" section at the end of the list, primarily from the reference by Drozdowsky and Whittaker. This list is not complete, due to insufficient information.

Other organizations may have other listings due to differing criteria. The State of California Proposition 65 requires the state to generate a list of chemicals known to cause cancer and reproductive toxicity annually. A recent list can be viewed at [http://www.oehha.ca.gov/prop65/prop65\\_list/files/P65single121908.pdf](http://www.oehha.ca.gov/prop65/prop65_list/files/P65single121908.pdf). The US Navy Department has also generated a list (<http://www.ehs.washington.edu/ohsreprohaz/USNavyReprodev2006.pdf>) that also provides a list with citations as to their rationale for including the chemical.

[Revised as of 1/6/09.]

Name of Chemical, Physical, or Biological Agent	CAS #	Literature Reported Effects, Without Regard to Dose	Comments
Acetaldehyde	75-07-0	See "Ethyl alcohol" below	Not considered a serious risk in typical occupational settings; effects thought to be due to metabolizing to ethyl alcohol.
Acetone	67-64-1	Birth defects, Menstrual disorders	May be due to other solvents mixed with acetone.
Acrolein	107-02-8	Birth defects, Embryotoxicity	
Acrylamide	79-06-1	Fetotoxicity, Infertility	No human studies available.
Acrylonitrile	107-13-1	Birth defects	Reductions in serum testosterone in humans.
Aldrin	309-00-2	Birth defects, Fetotoxicity, Infertility	
Aluminum	Varies by compound, Aluminum is 7429-90-5	Birth defects	Exposures via water ingestion.
Ammonia	7664-41-7		Related to Toxemia in third trimester.
Aniline	62-53-3		May induce fetal methemoglobinemia.
Antimony	7440-36-0	Spontaneous abortion, Stillbirth	

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Antimony Potassium Tartrate	28300-74-5	Premature birth, Spontaneous abortion	
Arsenic and Arsenic Compounds	Varies by compound, Arsenic is 7440-38-2	Birth defects, Spontaneous abortion	
Atrazine	1912-24-9	Birth defects	Increased ratio of male to female embryos.
Benomyl	17804-35-2	Teratogen	
Benzene	71-43-2	Menstrual disorders	
Benzo(a)pyrene	50-32-8	Birth defects, Fetotoxicity, Infertility, Stillbirth	
Beryllium	Varies by compound, Beryllium is 7440-41-7	Mutagen	
Boric Acid	10043-35-3	Infertility	Effects testes and sperm.
Boron Oxide	1303-86-2		Thought to be similar to boric acid.
Bromine	7726-95-6	Exposure after birth, Infertility	
1-Bromopropane	106-94-5	Birth defects	No human studies available.
2-Bromopropane	75-26-3	Infertility	Exposure levels were on the high end of routine workplace levels.
Busulfan	55-98-1	Birth defects, Spontaneous abortion	Known reproductive hazard for males and females.
Butyl Benzyl Phthalate (BBP)	85-68-7	Birth defects	Exposure levels were higher than are estimated to occur in workplaces.
Cadmium and Cadmium Compounds	Varies by compound, Cadmium is 7440-43-9	Infertility	
Carbamide (Urea)	57-13-6	Spontaneous abortion	
Carbaryl	63-25-2	Infertility	
Carbon Dioxide	124-38-9	Birth defects	
Carbon Disulfide	75-15-0	Birth defects, Impotence and decreased libido, Infertility, Menstrual disorders, Premature birth, Stillbirth	
Carbon Monoxide	630-08-0	Developmental disorders, Low birth weight	
Carbon Tetrachloride	56-23-5	Embryotoxicity, Fetotoxicity	Exposure levels were higher than routine workplace levels.
Chlorambucil	305-03-3	Birth defects, Infertility	
Chlordecone (Kepone)	143-50-0	Infertility	

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Chloroform	67-66-3	Embryotoxicity, Fetotoxicity, Teratogen	Teratogenic effects in mice and rats but not rabbits.
Chloroprene	126-99-8	Infertility	
Chlorpyrifos (Dursban)	2921-88-2		Exposure levels would have exceeded permissible exposure limits.
Copper and Copper Compounds	Varies by compound, Copper is 7440-50-8	Birth defects, Spontaneous abortion	May be due to other metals mixed with copper.
Cyclophosphamide (Cytoxan; Neosar)	50-18-0 (anhydrous), 6055-19-2 (hydrated)	Birth defects	Effects identified through therapeutic applications as a drug and may not appear at occupational dose levels.
Cytomegalovirus	N/A	Birth defects, Developmental disorders, Stillbirth	
Diazinon	333-41-5	Birth defects, Impotence and decreased libido	
Dibromochloropropane (DBCP)	96-12-8	Infertility	
Di-n-Butyl Phthalate	84-74-2	Birth defects, Infertility	Exposure levels may have been higher than levels found in workplaces.
1,2-Dichlorobenzene (ortho-Dichlorobenzene)	95-50-1	Birth defects, Infertility	
Dichlorodiphenyl-trichloroethane (DDT)	50-29-3	Exposures after birth	
1,1-Dichloroethane	75-34-3	Low birth weight	Test doses were so high that maternal effects were also observed.
1,2-Dichloroethane	107-06-2	Embryotoxicity, Possible Mutagen	
2,4-Dichlorophenoxy-acetic Acid (2,4-D)	94-75-7	Birth defects, Spontaneous abortion	
Dichlorvos	62-73-7	Birth defects	
Dicofol	115-32-2	Birth defects	
Dieldrin	60-57-1	Birth defects	Post natal death
Di(2-ethylhexyl) phthalate (DEHP)	117-81-7	Birth defects, Fetotoxicity	
Diethylstilbestrol (DES)	56-53-1	Transplacental carcinogen	
Dimethoate	60-51-5	Birth defects, Fetotoxicity, Premature birth	Testicular toxicant.
Dimethylformamide (DMF)	68-12-2	Birth defects, Spontaneous abortion, Stillbirth	
Dimethyl Phthalate	131-11-3	Fetotoxicity, Teratogen	
Dimethyl Sulfoxide (DMSO)	67-68-5	Birth defects, Fetotoxicity, Infertility	Experimental animals showed developmental effects.

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Dinitrotoluene	25321-14-6	Spontaneous abortion	May induce fetal methemoglobinemia.
Dinoseb	88-85-7	Embryotoxicity, Fetotoxicity, Teratogen	
1,4-Dioxane	123-91-1	Fetotoxicity	Effects observed at the highest dose only.
Endosulfan	115-29-7		Experimental animals showed reproductive organ effects.
Epichlorohydrin	106-89-8		Male experimental animals showed reproductive organ effects.
Ethyl Alcohol	64-17-5	Birth defects, Fetotoxicity, Infertility	Fetal alcohol syndrome. Effects known from ingestion studies but expected to be similar for high dose inhalation exposures.
Ethylene Dibromide (EDB)	106-93-4	Fetotoxicity, Infertility	
Ethylene Dichloride	107-06-2		See 1,2-Dichloroethane
Ethylene Glycol Monoethyl Ether (EGEE)	110-80-5	Birth defects	
Ethylene Glycol Monomethyl Ether (EGME)	109-86-4	Birth defects, Infertility	Testicular toxicant.
Ethylene Oxide	75-21-8	Fetotoxicity, Spontaneous abortion	
Ethylene Thiourea	96-45-7	Teratogen	No human studies.
Fluoroacetic Acid	144-49-0		Thought to be similar to sodium fluoroacetate.
Fluorocarbons	Varies by compound	Birth defects, Fetotoxicity	Examples include Dichlorofluoromethane at high exposure levels, and Trifluoromethane. Many fluorocarbons do not seem to present a hazard.
Fluoxetine	59333-67-4	Low birth weight, Exposures after birth	
Formaldehyde	50-00-0	Menstrual disorders, Spontaneous abortion	
Formamides	Varies by compound	Birth defects, Embryotoxicity, Fetotoxicity	Examples include Dibutylformamide, Dimethyl formamide, Formamide and Methylformamide,
Gasoline	8006-61-9	Birth defects, Menstrual disorders	Effects not well documented.
Halothane	151-67-7	Developmental disorders	No human studies.
Heat, Excessive	N/A	Infertility	
Heavy, Physical Exertion	N/A	Low birth weight, Premature birth, Spontaneous abortion	Repetitive heavy lifting, stooping or climbing.

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Hepatitis B Virus	N/A	Low birth weight	Increased risk of liver disease in the child.
High Frequency Electromagnetic Radiation	N/A	Infertility	Exposure levels were higher than routine workplace levels.
Human Immunodeficiency Virus (HIV)	N/A	Birth defects, Premature birth	
Ionizing Radiation	N/A	Developmental disorders, Mutagen, Spontaneous abortion	
Lead and Lead Compounds	Varies by compound, Lead is 7439-92-1	Developmental disorders, Exposures after birth, Infertility, Low birth weight, Spontaneous abortion	
Lindane	58-89-9	Exposures after birth, Menstrual disorders, Stillbirth	
Lithium	7439-93-2	Birth defects	Positive human studies from therapeutic doses, which may not be equivalent to occupational exposures.
Malathion	121-75-5	Infertility	Test doses were so high that maternal effects were observed.
Manganese	7439-96-5	Impotence and decreased libido	Manganese excess and manganese deficiency are both hazardous.
Mercury (Metallic Mercury and Inorganic Salts)	Varies by compound, Mercury is 7439-97-6	Exposures after birth, Impotence and decreased libido	
Mercury (Methyl Mercury and Organic Mercury Compounds)	Varies by compound	Birth defects, Developmental disorders, Exposures after birth, Stillbirth	
Methane	74-82-8	Birth defects	No human studies.
Methanol (Methyl Alcohol)	67-56-1	Birth defects	
Methotrexate	59-05-2	Birth defects, Exposures after birth, Infertility	
Methoxychlor	72-43-5	Infertility, Fetotoxicity	
Methylene Chloride	75-09-2	Birth defects, Exposures after birth, Low birth weight, Spontaneous abortion	
Methyl Ethyl Ketone (MEK)	78-93-3	Birth defects	Exposure levels were higher than routine workplace levels.

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Methyl Methacrylate	80-62-6	Birth defects	
Methyl n-Butyl Ketone	591-78-6	Birth defects	
Methyl Parathion	298-00-0	Birth defects	
N-Methylformamide	123-39-7	Teratogen	No human studies.
N-Methyl-2-Pyrrolidone	872-50-4	Fetotoxicity, Teratogen	No human studies.
Nickel	7440-02-0	Embryotoxicity, Teratogen	No human studies.
Nitrogen Dioxide	10102-44-0	Fetotoxicity, Infertility, Menstrual disorders,	
Nitrous Oxide	10024-97-2	Birth defects, Spontaneous abortion	
Noise, Intense	N/A	Infertility, Low birth weight	Effects may be due to standing or excessive stress.
Oral Contraceptives	Varies by compound	Birth defects, Infertility	
Ozone	10028-15-6		
Paints	Varies by compound	Birth defects, Spontaneous abortion	Effects may be due to some specific ingredients such as lead or methylene chloride.
Parathion	56-38-2	Embryotoxicity, Fetotoxicity	No human studies.
Parvovirus B19, Human	N/A	Spontaneous abortion	
Perchloroethylene	127-18-4	Birth defects, Exposures after birth, Menstrual disorders	
Phenol (Carbolic Acid)	108-95-2	Impotence and decreased libido, Spontaneous abortion	
Platinum and its Compounds	Varies by compound, Platinum is 7440-06-4		
Poisonous Plants: Broom Snakeweed, Larkspurs, Locoweeds, Lupines, Ponderosa Pines, Poison Hemlock, Wild Tobacco	N/A	Birth defects, Fetotoxicity, Spontaneous abortion	Causative agents identified as labdane acid resins (acetyl isocupressic acid, isocupressic acid, and succinyl isocupressic acid), piperidine alkaloids, quinolizidine alkaloids, and swainsonine
Polybrominated Biphenyls (PBBs)	Varies by compound	Exposures after birth, Teratogen	
Polychlorinated Biphenyls (PCBs)	Varies by compound	Birth defects, Developmental disorders, Exposures after birth, Low birth weight, Menstrual disorders, Premature birth, Stillbirth	
Polyvinyl Chloride (PVC Resin)	9002-86-2	Spontaneous abortion, Stillbirth	

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Potassium Silver Cyanide	506-61-6	Birth defects	Although adult testicular effects are presumed due to its cyanide content, effects appear at lower exposure levels than other cyanide compounds.
Radioactive Isotopes	Varies by compound	Childhood cancer, Developmental disorders, Genetic defects	
Ribavirin (Virazole)	36791-04-5	Embryotoxicity, Teratogen	
Rubella (German Measles)	N/A	Birth defects, Developmental disorders, Stillbirth	Especially serious during first 16 weeks of pregnancy.
Selenium	7782-49-2	Birth defects, Menstrual disorders, Spontaneous abortion	Trace element necessary for metabolism.
Sodium Fluoroacetate	62-74-8		Damaged testes and sperm.
Solvents	Varies by compound	Birth defects, Impotence and decreased libido, Menstrual disorders, spontaneous abortion	Effects may be due to some specific ingredients.
Styrene (Vinyl Benzene)	100-42-5	Birth defects, Menstrual disorders, Spontaneous abortion	
Sulfur Dioxide	7446-09-5	Low birth weight, Spontaneous abortion	
Tellurium	13494-80-9	Birth defects	No human studies.
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	Birth defects, Spontaneous abortion	
Tetrachloroethylene	127-18-4	Fetotoxicity, Developmental disorders	
Thalidomide	50-35-1	Birth defects	Positive human studies from therapeutic doses, which may not be equivalent to occupational exposures.
Thallium and its Compounds	Varies by compound, Thallium is 7440-28-0	Developmental disorders	Testicular damage observed in rats.
Toluene	108-88-3	Menstrual disorders	Positive human studies due to inhalation abuse, expected to be higher than routine occupational exposures.
Toluene-2,4-Diisocyanate	584-84-9		
o-Toluidine	95-53-4	Menstrual disorders, Transplacental carcinogen	
Toxaphene (Camphechlor)	8001-35-2	Birth defects	No human studies.

<b>Name of Chemical, Physical, or Biological Agent</b>	<b>CAS #</b>	<b>Literature Reported Effects, Without Regard to Dose</b>	<b>Comments</b>
Toxoplasmosis	N/A	Birth defects, Developmental disorders, Spontaneous abortion, Stillbirth	
1,1,1-Trichloroethane	71-55-6	Birth defects, Fetotoxicity, Low birth weight	No human studies. Other references list it as Possible
Trichloroethylene	79-01-6	Birth defects, Spontaneous abortion	
Trinitrotoluene (TNT)	118-96-7	Male Infertility	Exposure levels were higher than routine workplace levels.
Triorthocresyl Phosphate (TOCP)	78-30-8		No human studies. Testicular toxicant.
Triple Super Phosphate, Granular (TSP)	7758-23-8	Menstrual disorders	Calcium and phosphate are required for normal fetal growth.
Varicella-zoster Virus	N/A	Birth defects, Low birth weight	
Vinclozolin	50471-44-8	Male infertility	No human studies.
Vinyl Chloride Monomer	75-01-4	Birth defects, Fetotoxicity, Impotence and decreased libido	
Vinylidene Chloride (1,1-Dichloroethylene)	75-35-4	Birth defects, Fetotoxicity, Infertility	
Warfarin	81-81-2	Birth defects, Developmental disorders, Spontaneous abortion	
Xylene	1330-20-7	Birth defects, Menstrual disorders	

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## Appendix C

### Questionnaire to Help in Estimating Exposures that May Need Reduction

The questionnaire on the following pages is for **men and women** who use chemicals at work or may be exposed to other hazardous conditions.

Although meant primarily for use of chemicals at the work place, there are also spaces for noting exposures to biological, radiological and physical hazards, and spaces for considering exposures at home and from other jobs and hobbies.

#### **Instructions for Workers:**

Collect the information you need to complete these questions. Share the information with your doctor or other health professional, such as a nurse or genetics counselor. He or she can help you determine if the chemicals you work with can harm you, your fertility or your fetus. If your health care provider needs help in determining if there is a problem, suggest that he or she consult with a board-certified occupational medicine physician or other occupational health specialist.

This questionnaire was adapted from the one in "Workplace Hazards to Reproduction and Development, Appendix D" Sharon L. Drozdowsky and Stephen G. Whittaker, Technical Report Number 21-3-1999, August 1999, Washington Department of Labor and Industries (L&I), Safety and Health Assessment & Research for Prevention (SHARP) Program.

Name:

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Date Questionnaire Completed:

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1. What is your current job title? (If you are not currently working, or have changed jobs in the last year, where were you last employed and what was your job title?)

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2. Describe the tasks or activities you perform at work.

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3. What does your company manufacture, or, what kind of services does it provide?

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4. Within your company, what does your particular work area manufacture, or, what kind of services does it provide?

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5. How many hours per week do you work? \_\_\_\_\_ hours

6. Do you work rotating shifts? Yes \_\_\_\_\_ No \_\_\_\_\_

7. Do you do any of the following in the work area?

EAT Yes \_\_\_\_\_ No \_\_\_\_\_

DRINK Yes \_\_\_\_\_ No \_\_\_\_\_

SMOKE Yes \_\_\_\_\_ No \_\_\_\_\_

APPLY MAKEUP Yes \_\_\_\_\_ No \_\_\_\_\_

8. Write the names of any chemicals you work with at the end of this question in the column at the left. If you use more than one, list them in order of how frequently you use them. Put the one you use most frequently in the top space.

In the column on the right, describe how you use each chemical. Write when and for how long you use them. For example, "twice a day for ten minutes each time." Also, write how much of each chemical or product you use each time you work with it, for example, "1-2 gallons."

Brand names aren't very helpful. Sometimes a product label has ingredient information, but often the information on labels is incomplete and unreliable. The best way to find out what chemicals are in the product(s) being used is to get a copy of the Material Safety Data Sheet (MSDS) for that product from the employer. An MSDS lists the hazardous ingredients in the product. MSDSs are available from the MyChem system or EH&S (616-3441) if you have any difficulty getting them from the MyChem system. Employers must also provide this information to a treating doctor on request.

	Chemical Name	How, when I use them, and how much I use
Most Freq. Use	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
Least Freq. Use	_____	_____
	_____	_____
	_____	_____

9. In your work area, how many other people also use these chemicals? \_\_\_\_\_

10. Besides the chemical that you work with, what other chemicals do people in your area use?

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11. List any of these chemicals that you or other workers in your area use that are heated. Also, write the temperature to which they are heated.

Chemicals that are heated	Temperature
_____	_____
_____	_____
_____	_____

12. Can you smell or taste any chemical fumes or vapors where you work?  
Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, list them by chemical name.

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13. Do you feel sick when you work with any of the chemicals? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, list which chemicals in the column on the left. In the column on the right, describe how you feel when you work with each chemical.

Chemicals	Symptoms
_____	_____
_____	_____
_____	_____
_____	_____

14. If working with any chemicals makes you sick, do you feel better at other times?  
Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please explain when it is you feel better.

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15. If you are pregnant, did you have these symptoms before becoming pregnant?  
Yes \_\_\_\_\_ No \_\_\_\_\_ N/A \_\_\_\_\_

16. List any of the chemicals that you work with that get on your skin.

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**The following questions are about protective measures used in your workplace.**

17. Mark the type of VENTILATION used in your work area

- \_\_\_\_\_ hood with power exhaust  
\_\_\_\_\_ general ventilation (wall fans, roof fans, ceiling vents)  
\_\_\_\_\_ natural ventilation (open windows and doors)

18. Do you think the ventilation is effective in reducing your exposure? Yes \_\_\_\_\_ No \_\_\_\_\_

19. Is the ventilation always turned on when you are using chemicals? Yes \_\_\_\_\_ No \_\_\_\_\_

20. Does the ventilation usually work well? Yes \_\_\_\_\_ No \_\_\_\_\_

21. Are hand-washing facilities available? Yes \_\_\_\_\_ No \_\_\_\_\_

22. Are showering facilities available? Yes \_\_\_\_\_ No \_\_\_\_\_

23. Describe the types of PROTECTIVE CLOTHING you wear on the job.

Type of Gloves

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Type of Apron/Coat

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Type of Eyewear

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Ear Protection? Yes \_\_\_\_\_ No \_\_\_\_\_

24. Do chemicals leak through your gloves or clothing? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please explain.

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25. Mark the kind of RESPIRATORY PROTECTION (respirator) you use on the job.

- \_\_\_\_\_ none
- \_\_\_\_\_ paper dust mask
- \_\_\_\_\_ paper mask with filter
- \_\_\_\_\_ half-face mask with cartridges
- \_\_\_\_\_ full-face mask with cartridges
- \_\_\_\_\_ air-supplied respirator

If you wear a cartridge respirator (if not, skip to question 31):

26. What kind of cartridge? \_\_\_\_\_

27. When do you wear a respirator? \_\_\_\_\_

28. For what chemicals do you wear a respirator?

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29. Have you been fit-tested and trained to use your respirator? Yes \_\_\_\_\_ No \_\_\_\_\_

30. Have you received instructions about changing your cartridges and other maintenance?  
Yes \_\_\_\_\_ No \_\_\_\_\_

31. Are there any unusual situations at work, such as equipment breakdowns or spills, that may expose you to any other chemicals or to larger amounts of those you use routinely?

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, explain

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32. What types of instructions and warnings has your employer given you about the use of chemicals?

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33. Have the air levels of chemicals in your work area been measured? Yes \_\_\_\_\_ No \_\_\_\_\_

If monitoring has been done, you have a legal right to see the results relevant to your work area (WAC 296-62-052). If you are a member of a union, the union can help you enforce this right. If you know the results, write them here.

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34. Do you wear your own street clothes at work? Yes \_\_\_\_\_ No \_\_\_\_\_

35. Are there laundry facilities at work for contaminated clothing? Yes \_\_\_\_\_ No \_\_\_\_\_

36. Is there a medical surveillance program at work? Yes \_\_\_\_\_ No \_\_\_\_\_

(A medical surveillance system involves an initial physical exam or lab tests, and periodic exams or tests due to the type of work you perform.)

37. If you are involved in any of the following physical activities on the job, please describe them and write how many hours per day you perform each below.

	Description	Hours/day
Lifting	_____	_____
Climbing	_____	_____
Bending	_____	_____
Twisting	_____	_____

Description (continued)

Hours/day

Sitting \_\_\_\_\_

Standing \_\_\_\_\_

38. If you are exposed to any of the following on your job, describe them by writing when, how often and how much you are exposed to each:

Noise

\_\_\_\_\_

Vibration

\_\_\_\_\_

Temperature Extremes

\_\_\_\_\_

Radiation

\_\_\_\_\_

Infectious Agents

\_\_\_\_\_

Psychological Stress

\_\_\_\_\_

39. Do you handle animals at work, or have a pet cat at home? Yes \_\_\_\_\_ No \_\_\_\_\_

40. Do you do any other work outside your regular job, or have any hobbies, which involve exposure to chemicals or the stressors previously noted? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, describe them:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Adapted from "Workplace Hazards to Reproduction and Development, Appendix D" Sharon L. Drozdowsky and Stephen G. Whittaker, Technical Report Number 21-3-1999, August 1999, Washington Department of Labor and Industries (L&I), Safety and Health Assessment & Research for Prevention (SHARP) Program.