WORKPLACE REPRODUCTIVE HEALTH

research & strategies

Best Start:

Ontario's Maternal Newborn and Early Child Development Resource Centre

2001

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Purpose

Health promoters have recently become interested in improving reproductive health in the workplace. Best Start resources and services such as posters and booklets, on-site consultations and phone assistance have linked individuals with accurate information and have helped them improve workplace policies and practices. This resource will further support work across the province by providing background information, current research, ideas and sample initiatives. It covers the full range of reproductive concerns for men and women, prior to conception and during pregnancy. The resource includes information on how to address a variety of workplace reproductive concerns including chemical, biological, ergonomic, physical, lifestyle, work schedule and stress related concerns. In addition, each section includes examples of approaches that can be used to reduce or eliminate the risks.

This resource will help workplaces and those working with workplaces to:

- **Understand how work can impact reproductive health**
- **Identify reproductive concerns in the workplace**
- **Reduce or eliminate workplace risks**
- **Select and implement a range of initiatives**
- **Access relevant resources**

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Part A: the context

The Influence of Work on Reproductive Health

Introduction

An increasing body of evidence shows that risk conditions are present in a variety of workplaces in Canada. Canadian workers may be exposed to a number of workplace hazards on a daily basis. Many of these risk conditions have the potential to adversely affect the reproductive health of both male and female workers, including their ability to produce healthy offspring. Harm may be caused to the individual exposed, to the partner of the individual exposed, or to the fetus. Adverse effects may not be evident until an individual decides to start a family that may potentially impact a broad range of reproductive processes. (Fedoruk, 1994). At least 1.5 million Canadian workers are exposed to known or suspected reproductive hazards in their workplace (Baird et al., 1993).

While workplaces present a range of reproductive risks to male and female workers, it is important to remember that work itself has health benefits. Many women who work outside the home do so right up until their due date. Research reports that most women can safely work throughout their pregnancy without any adverse effects on the fetus (Gabbe and Turner, 1997). Overall, women who work are more likely to have a healthy baby. Salaries, social support, benefit packages and other aspects of work are helpful to pregnant women (Romito, 1989).

Efforts should be made to identify, eliminate or reduce the risks associated with each employee's duties. To date, improvements to reproductive health in the workplace have been hampered by the notion that women's

jobs are safe and problems are due to women who are unfit for the job or have unnecessary complaints (Messing, 1997).

There are numerous workplace reproductive hazards, however, only a few apply to each individual employee. For example, extensive sitting, standing and heavy lifting are concerns during pregnancy. Care should be taken not to raise undue fear or worry about the reproductive risks associated with work.

Workplace health promotion goes well beyond risk reduction and workplace safety. It can include opportunities to support and promote good health. Workplaces can work towards an environment whereby risks are reduced, and health is improved through health promotion practices. A healthy physical, social and economic workplace environment promotes individual health and well being. While some of these factors are beyond the immediate control of an individual employee, workplace policies and supportive workplace practices can assist in providing a health promoting environment for employees.

The Value of Workplace Reproductive Health

New and expectant parents represent a large percentage of the workforce. In Canada, women make up over 50% of the workforce, 91% of these women are in their prime childbearing years (Voices for Children, N.d.). Eight out of ten women will become pregnant during their working years. Most of these women continue to work during pregnancy and plan to return to work after the baby is born. Providing information and support about reproductive health and work is no longer an "extra". Most workers will require this information at some point in their working lives. The workplace is becoming an increasingly important location from which to deliver health promotion programs for those contemplating parenting and those who could become parents.

Work and pregnancy are not mutually exclusive. While in general it is quite safe for a pregnant woman to continue working during pregnancy, a supportive and safe work environment can create healthier employees, which can lead to healthier pregnancies. A healthy work environment increases the chance that a pregnant employee will continue to be productive during pregnancy and when she returns to work after the baby is born.

While reproductive health promotion can seem a narrow focus for some employers, in fact many of these policies and practices are health enhancing for all employees. From a workplace perspective, having healthy employees makes good business sense. Healthy employees are more efficient, energetic and committed to their workplace. They are more apt to care about their work and can therefore be good advocates for their employers. Workers who have more flexibility and control over when and how they work are also less likely to be absent or late due to sickness, are more able to manage stress and to balance the many aspects of their lives (Duxbury and Higgins, 1997). Introducing reproductive health and family-friendly policies and practices is a

way for a workplace to protect its bottom-line while also creating a general culture of caring and valuing employee health and wellness.

Costs associated with employee illness and injury are a significant expense for employers. Promoting wellness among employees avoids the costs related to hiring, retaining, training and employing replacement staff (Robson et al., 1998). Not only does health promotion improve the health of mothers and babies, but employers also benefit from decreased absenteeism, improved productivity, shorter disability leaves, reduced staff turnover, improved employee morale and an enhanced image in the community (Duxbury and Higgins, 1997). Promoting employee health ultimately helps make businesses more productive and competitive, especially if parents adopt the healthier choices in the long term.

Reducing risks to very low levels in the workplace does have a cost, but there are also costs associated with failing to reduce these risks. No workplace can be made completely safe, but specific strategies can nevertheless minimize risks to the reproductive health of workers (Baird et al., 1993).

Overview of Reproductive Risks

Reproductive hazards are agents or conditions that result in harm to the reproductive system in adults or impair development in the fetus or resulting children (Baird et al., 1993). There are various stages at which exposure of men and women to hazards can affect the reproductive process. It should be noted, however, that the reproductive system in itself is highly complex and its mechanisms are not fully understood. Workplace exposures have the potential to interfere with:

- male and female hormonal systems
- women's menstrual cycle
- development and function of sperm and ova
- process of fertilization and implantation
- fetal growth and development, and
- lactation of process.

Possible adverse outcomes from hazards to the reproductive system include:
Prior to conception:

- decreased male and/or female sexual desire or function
- male and/or female infertility or sterility
- menstrual disorders.

During pregnancy

- miscarriage
- premature or low birth weight infants
- children born with birth defects, cancer or developmental problems (Baird et al., 1993).

The adverse effects of a particular workplace hazard are influenced by many contributing factors and variables including:

- type of hazard
- dosage or intensity of its exposure
- duration of the exposure
- timing of the exposure in relation to the reproductive process
- susceptibility of the individual
- external variables such as demographic, nutritional, genetic and health status
- and the combined effects of hazards (Lindbohm, 1999).

The most sensitive period of time for a fetus to be affected by a toxic agent is 17 to 56 days after conception when all major organ systems are developing. Exposure to a teratogen between days 1 through 17 can lead to loss of the fetus, while exposure later in pregnancy (after day 56), can lead to more functional problems in the newborn (Cefalo and Moos, 1995). Finally, exposure to some workplace hazards can be carcinogenic; leading to the development of cancer of the reproductive organs in the worker or, if exposed prenatally, in the resulting child (Filkins and Kerr, 1993; Paul, 1997).

Individuals often associate workplace reproductive risks with chemical use. In reality, the range of risks is very broad, including the way people work, the substances they work with, and the schedules they must follow. The following is a summary of the major categories of reproductive risk.

Risk category	Examples
Chemical	Lead Solvents
Biological	German measles Toxoplasmosis
Ergonomic	Heavy lifting Standing
Physical	Excessive noise Heat
Lifestyle	Smoking Alcohol consumption
Schedule	Rotating shifts Long work hours

It is important to note that while there are many potential hazards in the workplace that can negatively affect reproductive health, there still exists a 1-5% risk in every pregnancy of birth defects for which causes are unknown. In fact, for 60% of babies born with birth defects the causes are unknown or obscure (Tas et al., 1996). Between 15 and 40% of pregnancies result in miscarriage. Early pregnancy losses are thought to be a kind of natural selection process in the case of structural or chromosomal malformations of the fetus. However, most pregnancies do result in healthy infants (Filkins and Kerr, 1993).

Challenges

Determining and eliminating the risks and providing assistance to those planning a pregnancy or those who are pregnant is not always easy. There are many challenges and much to be learned about improving workplace reproductive health.

PERCEPTIONS OF EMPLOYEES AND EMPLOYERS

The most sensitive time in a pregnancy is the first few weeks following conception, before a woman knows she is pregnant. Women often delay assessing and improving their health until after confirmation of pregnancy, putting their baby at risk during the critical early developmental stages. Similarly, workplace accommodations for pregnant women generally take into consideration the last trimester of pregnancy, once a woman is visibly pregnant. Ideally, women and men should assess workplace risks prior to pregnancy and workplaces should proactively consider any potential risks for both preconception and pregnancy.

EMPLOYMENT EQUITY

The relationship between women's rights to equal treatment in employment, the rights of both male and female workers to safe workplaces, and the legal obligations of workplaces that support practices or use substances known or suspected to be reproductive hazards, can be challenging.

Focusing effert on the fetus often reinforces the notion that the unborn child has separate interests distinct from those of the woman. This leads to the perception that it is appropriate to protect the fetus. This approach distracts attention from the broader health issue, that exposure to a substance at a level that affects the fetus is probably harming the health and fertility of men and women as well. It may put men and women in the difficult position of having to choose between their rights to employment and reproductive health.

FEAR OF REPRISAL

Workers fear the repercussions of complaining about reproductive concerns at work. Many employees are afraid to raise complaints because they feel they may lose their job, may not be considered for a promotion or may have a promotion taken away if they announce they are pregnant (Hanke et al., 1999). This

situation appears to exist at both the professional and factory worker level. The outcome can result in pregnant women attempting to minimize their pregnancy by not taking adequate breaks, working long hours, as well as being concerned about weight gain.

Similarly, women who have families sometimes disguise their parenting responsibilities in an attempt to accommodate the demands of home and office. Workers phone in sick when their baby-sitter is unavailable, send children to school with a slight temperature because they feel they have no other choice, and work when they are sick so they can save sick days for when their children are unwell.

ISSUES FOR WOMEN

Workplaces may not know they have a pregnant worker until well into the second trimester as women often wait until their pregnancy is well established before disclosing. Women may fear a negative reaction at work, may worry about early miscarriage or may feel the issue is a personal and private concern. Workplaces and many women lack knowledge about the importance of health prior to pregnancy and in the early weeks of pregnancy. In addition, over half of all pregnancies in Canada are unplanned, and women may put themselves at risk before they know they are pregnant. The overall lack of information about health and about their staff makes it difficult for workplaces to support their employees in having the healthiest pregnancy possible.

ISSUES FOR MEN

Men may feel uncomfortable discussing their personal reproductive health and requesting information on the subject. Many men are unaware of the fact that it takes three months for a sperm to develop and of the workplace risks that may impact their reproductive health. Men may feel unable to request special considerations at work if they are starting a family. This lack of knowledge and discomfort with discussing reproductive health makes it difficult for men to access needed services and for workplaces to consider their needs.

Research Concerns

In exploring the literature on workplace risk conditions, it is evident that very little is known about the effects of hazards in the workplace on health in general, let alone on reproductive health. Research is far from conclusive about the effects of occupational exposures on reproductive health. This is due in part to inherent challenges in implementing and interpreting both human and animal studies in this area.

Reproductive outcomes are often difficult to measure. For example miscarriage may happen very early, prior to a woman's knowledge of the pregnancy. Some adverse effects are very infrequent and large sample sizes are necessary to discern their impact (Fedoruk, 1994).

The majority of research conducted on workplace hazards has been toxicological, using experimental exposure of animals to draw conclusions about effects on humans. Traditional toxicological studies rarely evaluate reproductive health effects. The scientific community requires an extremely high standard of evidence before it will declare a substance to be a reproductive hazard. In the interim, employees do not know if their workplace conditions are a concern (Baird et al., 1993; Cefalo and Moos, 1995; Sarra, 1996).

Out of the 69,000 to 100,000 chemicals that currently exist in the workplaces, there are only a few thousand for which there exists animal toxicity data. There are many challenges in extrapolating this type of data to humans. For example, the dosage of the exposure is different. People are generally exposed to lower dosages over longer periods of time than animals in an experimental setting. Also, substances which are teratogenic or harmful to the reproductive systems of animals are not necessarily so in humans and vice versa. For example, thalidomide was not shown to be teratogenic for animals, but had tragic effects on fetal development in humans. Finally, animal studies often focus on harmful effects in the last stages of the reproductive process and do not adequately address the preconception period (Baird et al., 1993).

Epidemiological data is more relevant because it is based on the observation of human populations, however, it frequently results in conflicting conclusions. Epidemiological data may generate a strong association between a risk condition and an adverse effect but does not offer definitive evidence (Hunt, 1992). It may be difficult to control for the many confounding variables in workers lives, including socio-economic status, pre-existing conditions, level of prenatal care and responsibilities at home (Chavkin, 1986). Confounding factors are not always taken into consideration (Tas et al., 1996). It is also extremely difficult to isolate one workplace hazard from another and work situations vary considerably. Factors such as schedule, responsibilities and management style have a synergistic effect, further confounding the results. Research on individual reproductive situations needs careful design and controls.

As a result of these methodological issues, it is difficult to define the status (known, suspected or possible reproductive hazards) of many workplace agents and substances (Baird et al., 1993). The existence of a large number of substances and the difficulty of rigorously testing them means that there are many potentially harmful materials and situations in the workplace whose health effects are largely unknown (Baird et al., 1993). While we need to continue to increase scientific knowledge on workplace and reproductive health, there are many issues that we can address at the workplace level.

Part B: the risks

Chemical Concerns

Introduction

An enormous number of different chemicals are available on the market. Research studies report that around 60,000 chemicals are currently in use (Baird et al., 1993) and 4 million are available for use (Messing, 1998). Further, many new chemicals are introduced annually. Those involved in the research and development of newer chemicals, especially bioactive materials, are exposed to unknown reproductive hazards (Clement, 1997). For the vast majority of chemicals there is little or no information on their potential impact on male and female reproductive health (Baird et al., 1993; Cefalo and Moos, 1995). Safety limits that are safe for men may not be safe for women prior to or during pregnancy. Even for chemicals that have been tested there is often disagreement about the effects on the reproductive system. Another increasing concern is exposure to chemicals in the workplace (Messing, 1998). Currently, a complete list of chemical reproductive hazards does not exist.

Few workplaces are free of chemical risks to reproduction. For example, people working in the hospitality industry are frequently exposed to Environmental Tobacco Smoke (ETS) or second hand smoke which is know to have damaging effects of health and reproductions. Chemical hazards are present in health care facilities (anaesthetic gases, solvents, medications), offices (chemicals used in photocopy machines and other office equipment), schools (cleaning solutions, laboratory supplies), factories, parks and other outdoor areas (pesticides, fertilizers), and many other work environments (Baird et al., 1993). Health care workers have the greatest potential for exposure to carcinogens and mutagens such as ethylene oxide, dichloromethane and ethyl acrylate.

Variables and Effects

There is little debate that chemicals in the workplace can have very negative effects on reproductive health. However, the reproductive consequences of an exposure are dependant on many different variables including gender, how the chemicals are used, the combination of chemicals and timing of exposure.

Some chemicals cause severe effects on both mother and fetus, while others harm only the fetus. Other chemicals affect male reproductive health. The consequences of chemicals on reproductive health are not always obvious or immediate. Traditional theory contends that the fetus can usually repair damage caused by low levels of exposure, indicating a threshold of toxic exposure for organ formation. However, recent studies of fetal metabolism suggest that a threshold may not exist for all substances, and for some substances, no exposure level is safe.

Chemicals typically enter the body through inhalation, ingestion or absorption through the skin. Physiological changes that occur in pregnancy, such as increased metabolism and respiration, make a woman and her fetus particularly susceptible to effects of chemical hazards. Chemical exposure has been linked to birth defects and increased abortion rates, as well as impaired development of the egg and sperm (Walker et al., 1999; Messing, 1998). Chemicals may be used in different contexts, combinations and concentrations. To further complicate analysis, chemicals affect each person differently, depending on the time of exposure, dosage or frequency of exposure. As a result, one chemical may have different effects on different people and at different stages of fetal development (Baird et al., 1993).

COMBINED EFFECTS

Chemical combinations increase the risk and complexity of the effects upon the human reproductive system. Two chemical substances that, alone, have no adverse effect on human health may have a combined impact that is altogether different. Multiple exposures are common in the workplace as well as in the environment. This makes it difficult to establish the health effects of any one chemical or to find a comparison group of unexposed individuals. There is an increased risk if both parents have been exposed (Filkens and Kerr, 1993). A higher rate of miscarriage was reported for women working in the textile industry whose husbands worked in a large metallurgical factory (Whorton, 1983).

The effects of chemicals are also dependant on the worker's current health status, lifestyle choices and exposure to other workplace reproductive risks. For example, when combined with another risk factor such as standing for prolonged periods or shift work, chemical levels considered safe could result in poor reproductive outcomes. Reproductive damage is also affected by extrinsic factors such as maternal age, metabolic disorders and nutritional deficiencies (Filkens and Kerr, 1993).

TIMING OF EXPOSURE

The timing of chemical exposure often determines its effect. In the first 2 weeks after conception, significant chemical exposure is most likely to result in severe damage and death of the fetus, and therefore does not usually result in specific birth defects. The period from 3 to 9 weeks after conception is a critical time when birth defects could result from chemical exposure. Growth deficits, minor morphologic abnormalities, and functional abnormalities typically occur after 9 weeks gestation. Carcinogens can cause effects at any stage in development (Welch and Paul, 1998).

A toxic agent can also be a concern before conception. For example, PCB compounds are stored in adipose tissue for a significant period of time, and lead may be stored in bone for years. The stresses of pregnancy may cause the toxicant level in the blood stream to increase. Substances can also injure the male sperm cells (Fedoruk, 1994).

CHEMICAL EFFECTS ON MALES

Chemicals can affect sperm development and sexual function in males. Chemical damage to a man's sperm is most likely to occur in the three months prior to conception (Health Canada, 1998). Male exposure to chemicals may also have implications for pregnancy outcomes. The following is a summary of the range of effects chemicals may have on male reproductive health.

NUMBER OF SPERM

- Occupational agents affect male fertility by disturbing spermatogenesis and interfering with its hormonal regulation (Paul and Himmelstein, 1988). For example, dibromochloropropane, toluenediamine and dinitrotoluene, ethylene dibromide, ethylene glycol monoethyl ether and bromine vapour are reported to lower the number of sperm (NIOSH, N.d.).

SPERM SHAPE

- Substances that cause mutations in female sex cells can also cause mutations in male sex cells. Lead, carbaryl, ethylene dibromide, welding and bromine vapour are associated with abnormal shaped sperm (NIOSH, N.d.).

SPERM TRANSFER

- Hazardous chemicals may collect in the epididymis, seminal vesicles or prostate. These 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 (NIOSH, N.d.).

SEXUAL PERFORMANCE

- Decreased libido and impotence have been reported in workers with heavy metal poisoning or with occupational exposure to estrogen agents such as oral contraceptives (Paul, 1993).

SPERM CHROMOSOMES

- Paternal exposure resulting in genetic alterations of the sperm, may affect fetal development (Savitz et al., 1989). Paternal occupations involving exposure to automobile exhaust have been linked to an increased risk of chromosomal abnormalities resulting in miscarriage (Filkins and Kerr, 1993).

PREGNANCY

- Savitz et al. (1989) reported that paternal exposure to chemicals was associated with small for gestational age infants, preterm birth and stillbirth. Increased risk of preterm delivery was linked with paternal employment in industries involving glass, clay and stone, textiles, mining, rubber, plastics and synthetics. Paternal exposure to polyvinyl alcohol also increases the risk for preterm birth. Elevated risks for small for gestational age and stillbirth were found for paternal employment in the art or textile industry where there was exposure to benzene exposure. Increased rates of pregnancy loss have been reported in partners of men exposed to lead, dibromochloropropane, vinyl chloride and anaesthetic gases.

CHEMICAL EFFECTS ON FEMALES

The short and long term effects of chemicals are often different in women. For example, women eliminate benzene more slowly than men. This is attributed to women's higher proportions of body fat (Chavkin, 1986). One example is beryliosis, a progressive chronic lung disease resulting from exposure to beryllium. Women with beryliosis may experience rapid deterioration and death once they become pregnant (Chavkin, 1986). Chemical exposure can impact women's reproductive health prior to, during and following pregnancy. In addition, pregnancy, in itself, can increase the risk of certain workplace concerns such as falls and back problems.

MENSTRUAL CYCLE EFFECTS

- Exposure to chemicals such as carbon disulfide may disrupt the balance between the brain, pituitary and the ovaries, leading to menstrual disturbances (NIOSH, N.d.).

INFERTILITY AND LOW FERTILITY LEVELS

- Female infertility has been linked to exposures to lead, mercury, cadmium, and textile dyes (Filkins and Kerr, 1993; Paul, 1997).

MISCARRIAGE AND STILLBIRTHS

- Fetal loss has been linked to occupations involving waste treatment, metal work, farming, working with chemicals, and nursing that involved antineoplastic drugs. Stillbirths have been linked to those employed in pharmaceutical laboratories, and congenital malformations have been linked to the chemical 2,4 -D. Increased rates of stillbirth were seen in agriculture, horticulture, and leather work (Filkins and Kerr, 1993; Paul, 1997). Ethylene oxide (a mutagen) is used for sterilization of hospital equipment and may be associated with miscarriage (Stellman, 2000; Gabbe and Turner, 1997).

BIRTH DEFECTS

- Maternal exposure to lead or mercury can result in birth defects (Youngkin and Davis, 1994).

LOW BIRTH WEIGHT AND PREMATURE BIRTH

- Maternal exposure to carbon monoxide or polychlorinated biphenyls is known to cause low birth weight (Welch and Paul, 1998).

DEVELOPMENTAL DISORDERS

- Exposure to lead and mercury can cause developmental disorders (Welch and Paul, 1998).

CHILDHOOD CANCER

- Infant cancer has been associated with women who have been exposed to motor exhaust (Filkins and Kerr, 1993; Paul, 1997).

BREAST MILK

- Some chemicals can be readily passed to the newborn through breast milk (Messing, 1998). Mothers exposed to chemicals at work may have chemical levels in their breast milk that exceed the levels permitted by the United States Food and Drug Administration in cow's milk (Fedoruk, 1994).

Chemicals that Affect Reproductive Health

The following are among the chemicals or classes of chemicals known, or suspected to cause reproductive impairment in men and/or women (Baird et al., 1993):

- heavy metals
- agricultural chemicals such as pesticides
- polyhalogenated biphenyls
- organic solvents
- anaesthetic agents
- epichlorohydin
- ethylene dibromide
- ethylene oxide
- formaldehyde
- vinyl halides
- some hormones

HEAVY METALS

Heavy metals have been shown to cause adverse reproductive effects in human beings and animals. These metals include lead, mercury, cadmium, arsenic, lithium, antimony, boron, nickel and manganese. Other metals that may occur in some workplaces, such as chromium, copper, nickel and selenium, cause reproductive harm in animals, but their effects in human beings have not been determined (Filkins and Kerr, 1993; Baird et al., 1993).

LEAD

- One of the most well-known reproductive workplace toxins is lead, affecting both male and female reproductive health. Lead is a serious occupational hazard for a large number of Canadian workers due to operations involving the extraction and refining of lead. Lead is also associated with a wide variety of environmental and occupational sources.

- In female studies, lead was shown to cross the placental barrier, even at low maternal blood values. There is an indisputable link between high levels of lead toxicity prior to and during pregnancy and infertility, miscarriage, premature delivery, low birth weight, stillbirth and neonatal morbidity, delayed development and infant death (Bryant, 1989; Tas et al., 1996; Savitz et al., 1989).

- Male reproductive processes are also affected by lead and may result in infertility and poor sperm development (Bryant, 1989; Tas et al., 1996; Savitz et al., 1989).

MERCURY

Mercury exists in both inorganic (vapour and metallic) and organic forms. Most individuals are exposed to organic mercury through diet. In the occupational setting, monitoring of the workplace and the employee to minimize exposure to mercury is essential, but not routinely instituted.

- According to Paul (1993) only limited information is available concerning the effects of occupational exposures of mercury on reproduction, with principal occupational exposure via dental amalgams. Current studies of female dentists/dental workers have not demonstrated an increase in birth defects or pregnancy losses.

- Menstrual disorders have been associated with work in mercury plants, especially for women employed longer than 3 years (Paul, 1993).

- A recent epidemiological study concerning paternal exposure to mercury vapour in a chloralkai plant suggests that urinary mercury levels greater than 30 ug/liter were associated with a two-fold risk of miscarriage in the workers' wives. Paul (1993).

CADMIUM

Cadmium is used in nickel-cadmium batteries, paints, electroplating, melting and mining, especially of zinc and lead. Occupational exposure is primarily through inhalation of cadmium fumes.

Cadmium can also be found as cadmium oxide, used in the manufacturing of ceramic, pottery and bricks. Paul (1993) reports there are no epidemiological studies that demonstrate that cadmium affects female fertility or the rate of miscarriages. Animal studies have shown that males are particularly susceptible to the toxic effects of cadmium, with the most common result being testicular damage.

PESTICIDES, HERBICIDES, FUNGICIDES

Agricultural and forestry activities can have significant reproductive health risks if the chemicals are not handled with care. Many agricultural activities in Canada involve the use of herbicides, insecticides, fungicides and pesticides. Combinations of different chemicals may increase the risks.

- There is some evidence that exposure to pesticides can result in miscarriage, congenital malformations, central nervous system defects, oral clefts, musculoskeletal defects, chromosomal defects, preterm birth, low birth weight, and limb reductions (Nurminen, 1995b).

- A Canadian study reported that there was a greater risk of premature deliveries in pregnancies where the father reported mixing and applying herbicides around the farmyard. The rate of premature delivery also increased when the father used insecticides, pesticides or fungicides (Health Canada, 1998).

- Forestry is another industry that involves the use of pesticides and fumigants. A study from the United States reported that exposure to ethylene dibromide fumigant has an adverse effect on semen quality (Tas et al., 1996). These effects occurred at exposure levels near the National Institute for Occupational Safety and Health recommended limit, and significantly below the Occupational Safety and Health Administration U.S. Department of Labor's current standards.

- Exposure to chlorophenols (insecticides, herbicides, molluscicides, fungicidal and anti-microbial agents) increases the risk for adverse pregnancy outcomes (Seidler at al., 1999).

ORGANIC SOLVENTS

Organic solvents belong to many classes of chemicals. Not all of the studies have examined the same solvents', frequency and duration of exposure. Some organic solvents may be more harmful than others. Women are often exposed to more than one chemical in a workplace (McMartin and Koren, 1999; Baird et al., 1993). Solvent use is widespread in chemical mixtures prepared for industrial use (Messing, 1998). Occupations that use solvents include dry cleaning, laundries, and electrical appliance manufacturing. Exposure may be higher in smaller workplaces, due to inadequate ventilation or protective equipment (Stellman, 2000). It is prudent to minimize women's exposure to organic solvents during pregnancy.

- There is an association between exposure to organic solvents, malformations of infants, and miscarriage during pregnancy (McMartin and Koren, 1999; Khattak et al., 1999).

ANAESTHETIC GASES

Studies show strong evidence of a relationship between waste anaesthetic gases (gases which escape during anaesthesia) and poor reproductive outcomes, including mutagenic and carcinogenic effects on the fetus. The most likely responsible agent is nitrous oxide (Shortridge-McCauley, 1995; Walker et al., 1999). Waste gases have been found in high concentrations, even when systems are in place to retrieve gases and vent them away from the workspace (Shortridge-McCauley, 1995). Veterinarians are also exposed to anaesthetic gases (e.g. halothane) in concentrations that often exceeded the national occupational exposure limit (Taskinen et al., 1995).

OTHER CHEMICALS

Many other chemicals are thought to be hazardous to reproduction (Baird et al., 1993). Although not as common in the literature as the previously cited chemicals, they require an equal amount of care when handling.

Key Points: Chemicals

So much is unknown

- Chemicals in the workplace can cause a wide range of serious negative effects on human reproductive health. Conclusive evidence of the damaging effects of chemicals or combination of chemicals is difficult, however, lack of proof does not mean that the chemical is safe. The literature does not present conclusive recommendations for protection of men, women and the unborn child.

Wide ranging

- Males and females may experience negative reproductive consequences throughout the reproductive process.

Synergistic

- There is a negative synergistic effect of chemical exposure with combinations of chemicals, ergonomic factors, work schedules and biological factors.

Recommended Strategies

Due to the complex nature, and limited knowledge of workplace chemical exposure and reproductive health, a comprehensive strategy is needed for workplaces, employers, health professionals and communities.

THE INDIVIDUAL

- Talk to an occupational health nurse, health and safety committee, or health and safety representative about your concerns.
- Suggest safer products that can replace chemicals used in the workplace.

- Talk to your health care provider about the chemicals used at work. Pregnant women who have had exposures to organic solvents or lead may require special medical care, especially if they have also been engaged in strenuous work and are otherwise at risk for preterm delivery (Welch and Paul, 1998).

- Study material safety data sheets in the workplace. Look for short and long term impacts on reproductive health and request additional information if the material safety data sheets do not answer specific questions.

- Follow good hygiene procedures such as washing hands before eating; wearing gloves made of the correct material for protection; using appropriate protective equipment and following proper safety procedures.

- If possible, make adjustments to your work environment by changing where you sit, opening a window, or moving equipment, such as a photocopier, to a room with appropriate ventilation.

THE EMPLOYER

- Chemical exposures should be strictly controlled or eliminated for employees of reproductive age (Welch and Paul, 1998). It is prudent to clean up the workplace and isolate chemicals. If the chemicals appear to be toxic to pregnant women they probably are to everyone (Messing, 1998).

- It is extremely important that the employer provide employees with properly fitted protective clothing, including gloves, boots, etc (McMartin and Koren, 1999). Management should ensure that appropriately sized protective equipment is accessible and used consistently.

- Workplace chemicals can be carried into the home environment on the skin and on work clothing. Workplace contamination of the home can be reduced through improved housekeeping in the workplace, employer laundry of work clothes and protective garments, the use of "clean" and "dirty" change rooms, and mandatory use of showers at the end of the workday (Fedoruk, 1994).

- Proper ventilation in the workplace is critical (McMartin and Koren, 1999).

- When possible, limit hazardous chemical use and investigate alternative safer chemicals and processes.

- If the company has an occupational health professional on staff, the health professional should be available to answer any questions from prospective parents.

- The worker should be provided with alternative tasks when it is not possible to reduce or eliminate the risks in their normal duties.

- If the employee develops symptoms of a possible reproductive problem, it is important that they get medical advice.

THE HEALTH PROFESSIONAL

- Health professionals can advocate for greater enforcement of laws addressing workplace safety and health (Paul and Himmelstein, 1988).

- The health professional can help the employer create workplace policies to protect workers from exposure.

- Health professionals can help employers to decrease workplace hazards. When direct control of hazards is not timely or feasible, a less satisfactory alternative can involve helping employees secure temporary job transfers or compensated leaves during pregnancy (Paul and Himmelstein, 1988).

- Health professionals can provide employees with information on chemical risks at work and can offer advice on individual situations.

Biological Concerns

Introduction

Biological agents causing viral, fungal, bacterial and parasitic infections can present a significant hazard to pregnant women. Sources of biological hazards are human, animal and plant products. Some agents can cause maternal morbidity, other agents can have direct effects on the fetus, which may result in miscarriage, intrauterine fetal death, and birth defects (Paul, 1993; Shortridge-McCauley, 1995).

Occupations at greatest biological risk include health care, childcare, teaching and social work (Misner et al., 1999; Stellman, 2000). Workers in these occupations have a greater chance of being exposed to diseases such as rubella, cytomegalovirus and hepatitis (Baird et al., 1993). Diseases can be transmitted through needle stick injuries, through the eyes, and through other mucous membranes (Misner et al., 1999). Women and men who work in health care or scientific occupations and have contact with patients, are exposed to infectious materials, or are in the production of biological materials have an increased risk of exposure to biological agents that can damage reproductive functions (Baird et al., 1993). Others at risk include janitorial workers and those who work in public safety including police officers, firefighters and ambulance attendants. Workers involved in contact with animals or animal products, refuse collection, earth moving and work or travel in areas where certain infectious diseases are present may also be at risk (Paul, 1997; Youngkin and Davis, 1994).

Biological Agents

RUBELLA OR GERMAN MEASLES

- Teachers, childcare workers, hospital workers, those who work in personal care centres and the biotech industries may be at higher risk for exposure to rubella (Paul, 1997). Transmission occurs by direct contact with urine, stool or nose and throat secretion. Exposure to rubella is a concern during the first trimester and could result in defects of the eyes, ears and heart of the fetus. Other defects may include a decreased head circumference, mental retardation, poor childhood growth, and delayed language and motor development.
- The vaccine for rubella has been available since 1969 (Youngkin and Davis, 1994). Rubella immunization is contraindicated if the woman is already pregnant.

PARVOVIRUS B19 OR FIFTH DISEASE

- This virus can cause an acute infection during pregnancy. Prenatal infection with human parvovirus B19 is associated with non-immune fetal hydrops and fetal death (Paul, 1997). School teachers, day care workers, and mothers of young children have a higher risk of infection.
- Currently, there is no vaccine to prevent parvovirus.

CYTOMEGALOVIRUS

- Cytomegalovirus (CMV) is a known teratogen. The infection is transmitted through contact with saliva, tears, urine, cervical secretions and breast milk. Congenital cytomegalovirus infection, especially during the first 20 weeks, is associated with mental retardation, cerebral palsy, epilepsy and problems with vision and hearing (Youngkin and Davis, 1994). Day care workers, teachers and hospital workers are at risk for this infection (Misner et al., 1999).

- Vaccines for cytomegalovirus are in the research and development stage.

VARICELLA OR CHICKEN POX

- Pregnant women who come in close physical contact with children who have active chicken pox infections are at risk for developing varicella. Congenital anomalies associated with varicella are limb atrophy, microcephaly, cortical atrophy, motor and sensory manifestations and eye problems. Exposure in the first trimester can also result in miscarriage, muscular atrophy, clubbed foot, central nervous system disease and cataracts (Youngkin, and Davis, 1994).

- A vaccine for varicella is available, but is contraindicated during pregnancy.

HEPATITIS

- Hepatitis is an acute viral infection and the most common cause of jaundice during pregnancy. Prenatal exposure may result in prematurity, or psychomotor retardation (Youngkin and Davis, 1994). The transmission of hepatitis A is by the fecal-oral route. Contaminated food, particularly milk, shellfish and polluted water are common agents. Hepatitis B and C are transmitted through contaminated blood and blood products, and through sexual intercourse. Skin punctures with contaminated needles, syringes or medical instruments can also transmit the virus.

- Those who are at risk of hepatitis B through exposure to blood and bodily fluids can also be immunized to prevent infection. There is no contraindication to vaccination of pregnant women for hepatitis B (Baird et al., 1993).

HUMAN IMMUNODEFICIENCY VIRUS

- HIV effects fertility in a variety of ways as it can lead to pelvic inflammatory disease, problems of the lower genital tract and menstrual irregularities. Acquisition of HIV before or during pregnancy is associated with increased health problems in pregnancy and in the newborn. Risk of transmission of HIV from an infected mother to her fetus is 14-30%. Most women who transmit the HIV infection to their fetus are asymptomatic. There are now medical therapies to lower the risk of passing HIV on to the infant (Leuzzie and Scoles, 1996). Health care professionals, emergency workers, and others who encounter needle stick injuries or infected blood are at greatest occupational risk of acquiring HIV.

LISTERIA

- Listeria monocytogenes has been found in mammals, birds, fish, ticks and crustations. It is transmitted through skin and eyes, and is associated with a mild flu like illness. Veterinarians and animal handlers may be exposed when handling infected animals. Infection early in pregnancy can result in miscarriage. Infection later in pregnancy can result in stillbirth and preterm delivery (Clement, 1997).

TOXOPLASMOSIS

- Toxoplasmosis is a common infectious disease caused by a parasite. Infection during pregnancy is associated with miscarriage, stillbirth or congenital infections in 10 -15% of pregnancies complicated by toxoplasmosis. Symptoms usually appear at birth. About 10% of infected infants will have central nervous system disorders, hydrocephaly and mental retardation (Youngkin and Davis, 1994). Risk factors include eating raw or undercooked meats, living in a rural area and working in occupations that require working with animals. Usual transmission is through ingestion of tissue cysts in contaminated meat or through contact with feces of infected cats or farm animals.

Key Points: Biological Concerns

Biological agents

- The reproductive risks associated with biological agents are serious, including birth defects, central nervous system disorders and fetal death.

Occupations

- Those at greatest occupational risk work in the health care, childcare, and elementary teaching professions, positions traditionally filled by women.

Control practices

- Most occupational exposures can be avoided if workers are properly educated and follow strict infection control practices. Engineering controls can provide effective methods to prevent injury by developing mechanisms that reduce the risk of infection. Hand washing, good hygiene and immunization play significant roles in prevention.

Recommended Strategies

THE INDIVIDUAL

- Those at risk of hepatitis B can be immunized to prevent infection.
- Women who could become pregnant should check to make sure they have been immunized for rubella.
- Men and women should be aware of the biological risks in their work environment and of ways to reduce the risks.
- Individuals can decrease their chances of infection by practicing good hygiene, including hand washing. Individuals should use appropriate protective equipment consistently.
- Women should be aware of infection control programs.

THE EMPLOYER

- Employers should ensure that employees receive training in infection control measures (Misner et al., 1999). Employers can provide employees with information about the biological agents related to their work. Employers can use local resources including the public health department for on-site education on biological risks and how to reduce the risks.

- Employers should ensure that protective equipment is available and used consistently by staff. For example, disposable gloves should be located near change tables in day care centres.

- Employers should ensure that facilities and work schedules allow employees to wash and practice good hygiene, as this is an effective way to prevent biological infection.

- The most common source of HIV exposure involves needle stick injuries, which usually occur during disassembly of equipment and re-sheathing.

- Employees may have suggestions for improvements that will provide a safer work environment. Employee-employer communication can lead to the discovery of effective ways to reduce risks.

- If a worker is pregnant or is planning a pregnancy, alternative work arrangements may need to be made in order to prevent accidental infection. A short period of precautionary leave should be arranged for pregnant women when a varicella outbreak occurs in a workplace (Taskinen et al., 1995).

THE HEALTH PROFESSIONAL

- Health care providers can raise awareness about reproductive health and biological agents by providing information on the risks and how they can be reduced.

- Health professionals can help address the concerns of pregnant workers and workers who are planning a pregnancy. Public health personnel should be available to answer questions from employees regarding biological risk factors.

- One of the most effective health promotion activities to reduce biological risks is to encourage immunization. Rubella immunization should be offered to anyone who could become pregnant, and particularly to women who may be exposed to german measles in their work, such as teachers of young children. Those who are at risk of hepatitis B through exposure to blood and body fluids can also be immunized to prevent infection. Health care workers can consider setting up workplace immunization clinics.

- Health professionals can increase employer awareness of workplace biological hazards and can assist employers in decreasing the risks in the workplace.

Ergonomics Concerns

Introduction

Ergonomics is the science of fitting physical workplace conditions and job requirements to the capabilities of the workers. Ergonomic factors include body position, type of movement required to perform a job, and physical forces applied to various parts of the body. Poor ergonomic design can reduce workplace efficiency and worker's health. Ergonomically related disorders are costly and now comprise the largest category of work related injuries. The ability to use proper body mechanics is central to the prevention of ergonomic difficulties, which are largely preventable (Cote et al., 2000; Stellman, 2000).

Women often have different ergonomic concerns, even when they hold the same positions as men. Men and women have different biological and social characteristics and are often required to do different tasks, even if their job titles are the same (Messing, 2000). For example, women are more likely to be required to do work that requires high repetition tasks and frequent lifting, characterized by heavy demand and low control.

Ergonomic factors, including poor workplace design, tend to affect female reproductive outcomes more than male outcomes, due to the physical and physiological changes that occur during pregnancy. A woman's ability to work while pregnant will vary depending on her own individual characteristics and the nature of the tasks. While women can continue to perform most tasks during pregnancy, some tasks, such as standing and heavy lifting, may no longer be advisable. The impact of ergonomic stressors will vary considerably depending on the individual woman's physical fitness and strength, as well as her overall health status (Paul, 1993).

Poor ergonomic design of the physical aspects of the work environment has a direct impact on reproductive outcomes. The consequences include small for gestational age, preterm birth and low birth weight. Heavy lifting, repetitive work, prolonged standing, sitting and walking can negatively affect reproductive outcomes. Pregnant workers are also more susceptible to repetitive stress injuries.

Because so many work conditions present risks to pregnant women, describing all risks can induce unnecessary fear and stress. For example, there are risks associated with extended sitting, standing, heavy work and lifting. It is important to look at each worker's situation and how their individual risks can be minimized or eliminated.

Changes During Pregnancy

Pregnancy is a normal process accompanied by physical and physiological changes. Some of these changes can affect a woman's ability to safely continue with some work tasks.

MUSCLES, LIGAMENTS AND JOINTS

Throughout pregnancy, the muscles and ligaments relax to enable an increase in pelvic size. Several joints, including the backbone, become less stable and show signs of separation.

BACK

The increased size of the abdomen causes the centre of gravity to change. Women may respond by throwing back their shoulders and/or leaning back on their heels. This may curve their back and result in back strain and pain. As pregnancy advances, the back muscles have to work harder to enable the woman to lift, stand and maintain balance.

SWELLING

The swelling of hands and arms during pregnancy may increase the risk for carpal tunnel syndrome, or may aggravate a pre-existing problem. Some symptoms include pain, tingling, numbness and reduced hand strength.

LUNGS

During the last few months of pregnancy, the expanding uterus causes pressure under the lungs, resulting in shortness of breath.

Ergonomic Risks

STANDING

Studies on prolonged standing in pregnancy as a potential risk factor for preterm birth are conflicting, however there is more evidence for an association than against one.

- Work in a standing position significantly increased the risk for preterm birth in some studies (Fortier et al., 1995; Paul, 1993; Teitelman, 1990). The risk of preterm delivery was increased when the woman stood for greater than 4 hours in a shift (Henriksen et al., 1995). Women employed as supermarket clerks, bank tellers and department store sales people often stand for the entire shift (Messing, 1998).
- According to one study, standing longer than 6 hours increased the risk for preterm birth (Peoples-Sheps et al., 1991).
- In a meta-analysis, standing was associated with preterm birth (Mozurkewich et al., 2000).

SITTING

Research varies somewhat on the impact that prolonged sitting has on pregnancy.

- Research conducted by Sohn et al. (1989) found that quality and supply of blood to the uterus seemed

to significantly decrease, with negative impacts on the uterus in extended sitting.

- Studies indicated that sitting, even in an armchair, was especially difficult for most pregnant women. The position and amount of time sitting has an effect on comfort (Nicholls and Grieve, 1992).

LIFTING

The degree of stress on the spine caused by lifting is directly related to the distance from the body that the load is lifted, with greater distance causing greater stress. As the abdomen increases in size, pregnant women must bend over more and reach out further to pick up a load. The amount of stress on the lower back is greater in pregnancy because of the increased size of the abdomen. As the pregnant woman's centre of balance shifts, she may find it more difficult to carry awkward loads (Paul, 1993).

- Risk to pregnant women increases with heavy lifting. Frequent heavy lifting (such as loads greater than 10.5 kg lifted over 50 times per week) is associated with uterine contractions, miscarriages, preterm birth, small for gestational age and low birth weight (Teitelman et al., 1990).
- Increased oxygen uptake and cardio-respiratory demands during late pregnancy can also decrease the maximum amount of weight a woman can lift (Paul, 1993).
- In a multivariate analysis, lifting heavy weights was seen as a high risk factor for preterm birth and small for gestational age (Fourn et al., 1999).
- Heavy lifting and heavy physical effort are associated with increased risk for miscarriage (Goulet and Theriault, 1987).

MUSCULOSKELETAL DISORDERS

Musculoskeletal disorders encompass sprains, strains or inflammation of the muscles, tendons and ligaments of the back, neck and arms, and nerve compression syndromes such as carpal tunnel syndrome. In spite of their common occurrence, musculoskeletal disorders and their treatment are both controversial and poorly understood. The pregnant woman's biomechanics changes her centre of gravity and may increase the stress on an already stressed muscle or joint. Musculoskeletal disorders pose concerns because there are few medications suitable for a pregnant woman who is experiencing pain.

- 16% of postpartum patients showed hand symptoms in one study, including carpal tunnel syndrome. Most problems started in the third trimester and resolved soon after delivery. Swelling was linked to increased risk for hand problems (Fuente Fonnest, 1998).

BACK PAIN

The ability to perform many everyday tasks becomes more difficult during pregnancy. Postural adjustments are made as the abdominal girth increases. Approximately 35 to 78% of working pregnant women report

back pain when sitting or standing (Nicholls and Grieve, 1992). The source of pain is possibly a result of an increase in twisting about the lumbosacral area. Carrying or supporting weight with the upper portion of the body, termed "high postural load" is also associated with back pain. Fatigue was identified as a general aggravating factor (Nicholls and Grieve, 1992).

COMBINED RISK FACTORS

Although the female body adapts to pregnancy, certain combinations of ergonomic factors may compound the stress on her body (Shortridge-McCauley, 1995).

- A woman whose job involves two or more specific ergonomic exposures, or whose work is overall, physically strenuous, should be considered at potential risk for low birth weight, small for gestational age and preterm delivery (Armstrong et al., 1989; Teitelman et al., 1990; Paul, 1993).

- The risks increase when standing and other stressors are involved. Studies by Gold and Tomich (1994), Stellman (2000), Berkowitz and Papiernik (1995) and Luke et al. (1995) reported that physical stressors combined with standing increased the risk of miscarriage and preterm birth. There is a relationship between standing for long periods of time, lifting, long work hours, awkward working postures, and shift work and poor reproductive outcomes for females. Women who reported exposure to both long hours standing and walking had more than three times the risk of preterm birth compared to women who are exposed to prolonged standing or walking (Henriksen et al., 1995).

- In Montreal, a survey of 56,000 women linked miscarriage with heavy lifting and, to a lesser degree, with shiftwork, a work week of 46 hours or more and standing for more than 8 hours per day (Hunt, 1992).

- Some studies have shown that heavy physical work is associated with miscarriage, preterm birth, low birth weight and small for gestational age (Fortier et al., 1995; Paul, 1993; Teitelman et al., 1990; Hunt, 1992).

- Physically demanding work was associated with preterm birth, hypertension or preeclampsia. High levels of fatigue were associated with preterm birth (Mozurkewich et al., 2000).

- Long hours of work, combined with heavy work, increases the risk for low birth weight (Hatch et al., 1997).

- The negative effects of fast paced and heavy work are compounded by low living standards in women (Makowiec-Dabrowska and Siedlecka, 1996).

Work Limitations

In pregnancies without medical complications, work, in general, does not increase the risks. However, some aspects of work can cause problems and should be minimized during pregnancy. Strenuous work, in particu-

lar, should be limited. The Society of Obstetricians and Gynaecologists of Canada recommends limiting the following aspects of work (Schuurmans et al., 1998):

- **STANDING**
  - Prolonged (>4 hours) -after 24 weeks gestation
  - Intermittent (>30 min/hour) -after 32 weeks gestation
- **STOOPING OR BENDING**
  - Repetitive (>10 times per hour) -after 20 weeks gestation
  - Intermittent (>2 times per hour) -after 28 weeks gestation
- **CLIMBING OF LADDERS OR POLES**
  - Repetitive (>3 times/shift) -after 20 weeks gestation
  - Intermittent (<3 times/shift) -after 28 weeks gestation
- **STAIR CLIMBING**
  - Repetitive (>3 times/shift) -after 20 weeks gestation
- **LIFTING**
  - Repetitive (>23 kg) -after 20 weeks gestation
  - Repetitive (>11 kg) -after 24 weeks gestation
  - Intermittent (>23 kg) -after 30 weeks gestation

With these exceptions, work can continue to term, unless there are medical complications or other conditions of concern at work (i.e. chemical hazards).

Key Points: Ergonomic Concerns

Work is changing

- Technology is dramatically changing the types of work and methods of doing work. These changes are affecting the type of injuries that workers now face.

Equipment design

- Women work in environments and with equipment that, for the most part, were intended for the average male physique. This may result in injury, physical and psychological stress and fatigue for the female worker.

Pregnancy brings changes

- Pregnancy brings physical and physiological changes that increase the risk for certain ergonomic problems.

Standing, heavy lifting, physical work or risk factor combinations

- Standing, walking and lifting are related to preterm birth.
- Combinations of standing or walking for long periods of time, lifting, working long hours, and shift work are associated with preterm birth and miscarriage.

Recommended Strategies

If risk factors are absent and the woman is healthy, information and minimal job modifications may be all that are necessary to accommodate for ergonomic situations during pregnancy (Paul, 1993). Women with difficult ergonomic work conditions may require a change in work station, a reduction in weekly working hours, or may request structured sick leave during pregnancy (Gabbe and Turner, 1997).

THE INDIVIDUAL

Women should talk with their health care provider about the type of work that they do and about any necessary limitations or accommodations. By talking with health professionals the pregnant worker can become better informed, and better able to understand the ergonomic ramifications of work on her pregnancy.

The pregnant employee can take responsibility for ergonomic factors within the workplace by ensuring that, whenever possible, she pursues the following:

- work sitting rather than standing, as risks decrease when sitting in a comfortable, appropriately designed chair
- take frequent breaks to relax and give muscles a change of position
- use proper lifting techniques
- heavy loads should be lifted mechanically, or with assistance
- adequate rest should be sought to prevent undue fatigue
- extra caution is necessary as balance changes
- when possible, avoid twisting or other stressing motions.

THE EMPLOYER

Businesses play a key role in preventing ergonomic hazards. Ergonomics is proving to be an effective approach to preventing injuries, reducing sick time, increasing worker satisfaction, saving employer's money and increasing productivity. Ergonomic risks change during pregnancy. Recommendations for ideal ergonomic situations for pregnant workers include:

- modifying workstations
- allowing more frequent breaks
- changing work volume
- revising scheduling and work assignments
- improving support from co-workers and supervisors.

If the pregnant employee has other factors that place her at high risk, explore ways to limit exposure to ergonomic stressors through:

- job modification
- job transfers
- or disability leave (Paul, 1993; Kramer, 2000).

Through education, awareness and support, workplace policies and practices can be developed to improve physical elements of work conditions.

Employers can address the following recommendations:

EMPLOYEES NEED APPROPRIATELY DESIGNED EQUIPMENT

- Equipment design is often based on the average man. The average woman and man have somewhat different physical characteristics and physical abilities, with considerable overlap (Messing, 1998). For many female workers whose body size and proportions differ from an average male, the workstation and safety equipment may be unsuitable or even unsafe (Misner et al., 1999; Stellman, 2000). Poorly designed workstations, monotonous repetitive work, and ill-fitting protective equipment are associated with physical heath problems (Stellman, 2000).

- Equipment modifications could include raising the height of the working surface to reduce bending. Chairs with an appropriate back rest and a footrest can alleviate the back pain that often develops in pregnant women with sedentary jobs. Decreasing workloads or increasing the number of work breaks can often alleviate fatigue (Paul, 1993). It may also be necessary to consider the strength requirements of the task and to provide an opportunity for the female worker to change from a standing to a sitting position (Paul, 1993).

PROVIDE WORKERS WITH DISCRETIONARY POWER TO ADJUST THE WORK ENVIRONMENT

- It is impossible to perfectly assign all tasks according to employee characteristics. However, to promote health and efficiency, make sure that workplaces are designed so that workers can be given discretionary power and means to adapt their work stations and methods to their own abilities (Henriksen et al., 1995).

MAINTAIN GENERAL SAFETY FACTORS

- Slippery floors that are a normal hazard become an even greater risk to a pregnant woman. Safety factors require special consideration in the second and third trimester of pregnancy as body weight increases. Temporary restrictions or job modification may be necessary to avoid injury where balance and agility are required to perform work safely (Hunt, 1992). In one study, 50% of subjects complained of feeling unstable (Nicholls, 1992).

- Women should be provided with information on signs of concern during pregnancy, such as the signs of preterm labour. If pregnant women have any signs of concern or feel that something is not right, they should be encouraged to get medical care as soon as possible.

THE HEALTH PROFESSIONAL

- The health professional has an importance in advocating for appropriate ergonomic workplace design and in providing information to workplaces. The health care worker needs to understand the issues and the possible benefits in order to enlist management participation in ergonomic improvements and to assist workplaces in making changes. Long-term solutions to prevent ergonomic hazards will require partnerships among occupational health specialists, employees and employers. Health professionals can encourage workplaces to increase employee participation in the development of work practice changes and job or equipment alterations.

- In general, pregnant women receive mixed messages regarding the safety of physical activity. One study reported that clear advice would be welcomed concerning suitable and safe work activities. Health professionals can link pregnant workers with current information and advice on ergonomic concerns through workshops and other educational opportunities.

Physical Concerns

Introduction

The human body operates within a fairly well defined range of physiological parameters. When the limits of these parameters are challenged the human body attempts to accommodate. However, as the challenges exceed the body's ability to adapt, difficulties occur. The reproductive organs and their function are dependent on the physiological well being of the body. Physical parameters that challenge the health of the body, challenge its reproductive nature as well. Exposure to excessive noise, temperature extremes, vibration and ionizing radiation affects reproduction (Baird et al., 1993). These physical risks affect both men and women, however, the reproductive consequences differ.

Physical Factors

NOISE

Noise is increasingly pervasive in our society. Sound is measured in decibels (dB), which measure loudness, and Hertz (Hz), which measure frequency. Human hearing lies between 20 and 20,000 Hz. Sounds are well transmitted to the fetus (Paul, 1993). Several studies suggest a relationship between excessive noise and fetal hearing loss, prematurity and low birth weight (Misner et al., 1999; American Academy for Pediatrics, 1997). There has been little research on the effect of noise on the male reproductive function.

CHILDREN WITH HEARING LOSS

Exposure to excessive noise during pregnancy may result in high-frequency hearing loss in newborns (American Academy for Pediatrics, 1997).

- Pregnant women who worked in noise conditions of 85-95 dB had three times the risk of having a child with high frequency hearing loss. There was also an increase in the risk of hearing loss at 4000Hz if the exposures involved strong low frequency noise (Lalande et al., 1986).

PREGNANCY EFFECT

Noise may be associated with prematurity and intrauterine growth retardation (American Academy for Pediatrics, 1997).

- Exposure to environmental aircraft noise has been associated with low birth weight and premature birth (Nurminen, 1995a).

- Hartikainen et al. (1994) studied two groups of women with similar work conditions. One group

was exposed to noise, while the other group was not. With the limit of 78 dB, neither the course nor outcome of pregnancy differed between the two groups. When the noise exposure was 90 dB or more, a decline in birth weight was seen. These findings were more pronounced if the woman was simultaneously exposed to a standing work position or shift work.

TEMPERATURE

Humans have an efficient thermal system designed to maintain body temperature at approximately 98.6 degrees Fahrenheit, or 37 degrees Celsius. However, when body temperature varies significantly from the norm, reproductive functions can be affected.

- Excessive exposure to heat in males results in a decreased sperm count. Both chronic and acute heat exposures to the testes can affect sperm production (Paul, 1993). Male bakers, welders, fire fighters and foundry workers are regularly exposed to high levels of heat (Tas et al., 1996).

- Studies in women show that during exercise fetal temperature changes generally parallel those in the pregnant woman, although a lag period is noticed at the onset and cessation of exercise. Fortunately, heat regulatory mechanisms protect humans under most environmental and occupational circumstances. However, if heat stress is severe enough to elevate core temperature to 39 degrees Celsius, concern is raised not only about effects on the developing fetus, but also about the direct effects on the pregnant woman, including heat exhaustion and heat stroke. Women may require regular breaks and should avoid dehydration by drinking frequently. Even at lesser heat extremes, pregnant workers whose jobs involve prolonged standing or strenuous work may be intolerant of hot, humid environments (Paul, 1993).

VIBRATION

Vibration is distinguished from sound in that vibration travels in solid surfaces such as work stations, equipment or the floor. Examples of occupations that encounter whole body vibration include; bus and truck drivers, farm vehicle and tractor operators, textile machine operators, vehicular body stamping operators, mining and machine tool operators. Examples of occupations that encounter vibration to parts of their body include; chain saw operators, electric grinder operators, mining and pneumatic tool operators and wood products manufacturing. There is increasing evidence of reproductive effects of occupational exposure to vibration.

- Whole body vibration can contribute to menstrual problems, miscarriages and stillbirths. It may also contribute to hearing loss in the fetus. Whole body vibration also causes degenerative effects on the spine, which may be a particular concern in pregnancy (Seidel, 1993).

- Pregnant rats subjected to whole body vibrations responded with changes in uterine and ovarian function, including a decrease in uterine blood flow (Nakamura et al., 1996).

IONIZING RADIATION

Ionizing radiation is radiation such as X-rays and gamma rays that causes ionization, or removal of electrons in living and non-living matter. Since the advent of the nuclear age, we have become increasingly aware that ionizing radiation can have severe and devastating effects on reproduction. These effects are apparent both in terms of immediate negative outcomes during pregnancy and over the longer term in the form of permanent mutations at the single gene or chromosomal level. Exposure to ionizing radiation can produce a wide range of biological effects. The most critical molecular target is DNA. The effects of ionizing radiation differ in nature and severity according to the gestational age at which exposure occurs. Possible outcomes include intrauterine death, congenital abnormalities, growth impairment and nervous system damage. Fattibene et al. (1999) states that during the first 2 weeks of pregnancy the principal effect of radiation exposure is miscarriage. Organ malformations are the main result of radiation exposure between weeks 3 to 7. The most critical period of brain development in a fetus occurs between weeks 8 and 25, when the brain cortex formation and organization occurs. Exposure may also result in defects of the urinary system and eyes, and a reduction of skeletal development.

WOMEN

- Ionizing radiation has been shown to result in infertility, miscarriages, birth defects, low birth weight, developmental disorders, and childhood cancers. Radiation passes directly through the mother's body and may harm her eggs or the fetus (NIOSH, N.d.; Stellman, 2000). Workers at risk of exposure include dental office workers, hospital employees and scientists (Baird et al., 1993).

- The current practice of minimizing the use of X-rays on pregnant women, the use of newer equipment that reduces the risk of exposure, and the use of protective shields have all helped to decrease the likelihood of radiation exposure to the fetus (NOISH, N.d.; Paul, 1993).

MEN

- Exposure to ionizing radiation has been documented to cause male infertility and decreased libido (Zuckerbrot, 1989). The human testes are extremely sensitive to ionizing radiation. A dose of 30 rads (which is considered low) can cause temporary absence of living sperm in the semen (Paul, 1993).

- Male exposure to ionizing radiation can cause adverse pregnancy outcomes not only by damaging the sperm, which can produce an abnormal zygote, but also by the transmission of toxic agents in seminal fluid (Zuckerbrott, 1989).

COMPUTERS

At this time, there is no conclusive evidence that use of computers is a reproductive risk in most workplace situations (Shortridge-McCauley, 1995; Misner et al., 1999).

- Research indicates that working with video display terminals does not increase a woman's risk of delivering a baby of reduced birth weight or delivering prematurely (Blosser, 1998; Marcus et al., 2000).

- Work with video display terminals in most modern offices does not increase the risk for miscarriage (Marcus et al., 2000).

Key Points: Physical Concerns

Physical risk

- Fetal exposure to excessive noise can cause hearing loss in infants and children, as well as disrupt normal fetal growth.
- Excessive heat and cold can cause interruptions in a woman's menstrual cycle and can decrease male fertility.
- Ionizing radiation can result in infertility and birth defects in men and women, and miscarriages in women.
- There is no conclusive evidence that working with computers during pregnancy will increase the risk of a negative outcome.

Combination effect

- Women who were exposed to multiple physical risks such as noise and another risk factor had poorer reproductive outcomes (Hartikainen et al., 1994).

Recommended Strategies

THE INDIVIDUAL

- Men and women planning a pregnancy should avoid exposure to radiation, excessive heat or noise.

- Pregnant women who are exposed to excessive occupational heat should minimize the effects by avoiding heavy exertion and by using appropriate measures.

- If the individual's work involves radiation, proper control measures and safety procedures should be used.

THE EMPLOYER

- Employers have a responsibility to ensure that machinery is working properly and employees are well trained.

- The choice of shielding for radiation depends on the type and energy of the radiation involved. Electromagnetic ionizing radiation can be highly penetrating and requires high-density shielding materials such as concrete or lead. Measures to prevent the deposit of radioactive substances include ventilation, enclosure of work processes, protective clothing and devices and adequate hygiene practices (Paul, 1993).

- Employers can analyze the noise generated by machinery and look at how engineering might minimize unnecessary sound. The noise level might be reduced by repositioning machinery, or by using materials to absorb the sound.

- Employers can use a combination of awareness raising strategies and practice to provide support for pregnant women in the workplace. Where sound cannot be reduced to levels below 78 dB, pregnant women should be provided alternative work arrangements.

- Similarly, the employer should provide alternative work arrangements away from a hot environment, or if heat exposure is not great, provide sufficient periodic reprieve from the environment. This could include opportunities for pregnant workers to remove themselves from the hot working environment, provide adequate environmental cooling and ventilation as well as opportunities to rest. Because more body fluids are lost in hot temperatures, pregnant women require frequent opportunities to replace lost fluids.

- Employers should allow for frequent breaks.

- Employers can provide information and reassurance about the safety of computer use during pregnancy.

THE HEALTH PROFESSIONAL

- Health professionals can help eliminate anxiety by providing information about the differences between ionizing and non-ionizing radiation, and prevention strategies.

- Health professionals can increase general awareness of the impact of excessive noise on fetal development. They can also reassure women that occasional, moderate noise from the envoronment is not harmful.

- Research repeatedly demonstrates that there is a combination risk factor effect. The health of the employee and her baby will improve by reducing noise and standing time or by taking breaks. Health professionals have a distinct role in helping communicate this information and in offering prevention strategies.

- Health professionals can work with employers and managers to investigate cost effective ways of engineering the work environment to reduce noise, heat, and vibration.

- Health professionals can help build awareness in employers about the cost of children being born with hearing loss, communication difficulties, or other poor birth outcomes.

Lifestyle Concerns

Introduction

Lifestyle behaviour refers to a person's particular way of living. Our habits, hobbies and daily activities are all a part of our lifestyle. These behaviours can include exercise, nutrition, smoking, stress and drug or alcohol use. Alcohol and tobacco use are more harmful to an unborn child than many biological or chemical workplace exposures.

The work environment influences lifestyle choices. Stress, smoking policies, management style and other workplace conditions can impact an individual's ability to make healthy choices. Education on healthy behaviours and working in a supportive environment are related to a healthy pregnancy. Healthy lifestyles not only improve individual health, but also has workplace benefits such as decreased absenteeism and increase productivity. Workplaces that support a healthy lifestyle are important to pregnant employees and those who may become parents some day. Employers also benefit from the improved health of employees.

While employees may have unhealthy lifestyle behaviours, few currently seek advice from the workplace regarding these issues (Richmond et al., 2000). Workplaces will need to make a concerted effort to provide needed services and information in ways that are appealing and non-threatening to employees.

Lifestyle and Work

TOBACCO SMOKE

Tobacco smoke has long been associated with increased health risks to the unborn baby. Mothers who smoke tend to have smaller babies and have a higher risk for premature delivery, stillbirth and sudden infant death syndrome. Pregnant women who are exposed to second hand smoke through their partners or workplaces are also at risk. Smoking prior to pregnancy, for both men and women, decreases fertility.

- Workplaces can play a supportive role by providing smoke free policies. The workplace can also support smokers who are in the process of quitting smoking by providing self-help materials and cessation programs (Frankish et al., 1997).

- Second hand smoke in the workplace has similar effects to maternal smoking (Misra et al., 1999).

ALCOHOL

Alcohol is associated with decreased fertility in men and women. Alcohol use during pregnancy can result in a range of birth defects, neurological impairment and growth retardation in the fetus such as fetal alco-

hol syndrome. Workplaces that regularly require long hours of work, where employees have little control over their work, or where the job demands are high, have been shown to have higher rates of employee alcohol consumption (Fenster, 1999).

- A study by Richmond et al. (2000) found that a workplace lifestyle campaign assisted employees in reducing their alcohol consumption.

EXERCISE

Exercise during pregnancy has many benefits, however, workplace exercise programs specifically for pregnant employees are rare. Exercise programs within workplaces are becoming more common. Worksites can support active lifestyle choices in numerous ways, from an onsite workplace program, to supporting employee membership at local fitness facilities.

- A study by Okada (1991) found that long-term corporate fitness programs are effective in improving the health and fitness levels of employees.

NUTRITION

Healthy eating is important. The nutritional status of a woman at the time of conception can set the stage for a healthy pregnancy and infant. Healthy eating during pregnancy is also critical to the health of the fetus. Pregnant women may need to eat frequent healthy snacks and drink often, especially during the early part of pregnancy. Work sites can support healthy eating by offering options for healthy food and drinks at the cafeteria or in vending machines. Maternal vitamins and folic acid supplements may be covered under some employee benefit plans.

CAFFEINE

The Motherisk Program suggests that pregnant women moderate their consumption of caffeine, limiting consumption to 400-450 mg per day or the equivalent of two cups of percolated coffee a day. However, worksite rituals often include drinking coffee. Providing caffeine free beverage options benefits all employees. Worksites can provide caffeine free teas and coffee alternatives, as well as making juice or good quality drinking water available.

Key Points: Lifestyle Concerns

Workplaces impact healthy living choices

- Employees spend a considerable portion of their life at work. Work has implications on the ability to make healthy choices.
- Workplaces can help employees make healthier choices by having smoke free policies, educational opportunities, exercise programs, healthy choices in the cafeteria and supportive management.

Recommended Strategies

THE INDIVIDUAL

- Think about how your work affects the choices you make in your personal life.
- Avoid the smoking areas of your workplace.
- Eat a well balanced diet.
- Find ways to rest.
- Be physically active.
- Drink lots of fluids.

THE EMPLOYER

Employers can play a significant role in supporting lifestyle changes affecting reproductive health.

- Provide places for pregnant employees to rest.
- Provide preferred parking for pregnant women.
- Support employees by creating opportunities for physical activity.
- Provide healthy foods in the cafeteria or vending machines.
- Be a supportive employer.
- Work with health professionals to offer information and education to the employees.
- Invite a health professional to your workplace to provide education on exercise, diet and ways to cope with stress.
- Develop a smoke-free workplace policy.
- Provide programs to help interested employees quit smoking or to stop drinking.
- Provide an Employee Assistance Program with a health promotion component.

THE HEALTH PROFESSIONAL

- Health professionals can support employers by providing information that demonstrates how programs can be instituted efficiently and effectively. Strategies could include employee fitness programs or smoking cessation programs.
- Health professionals can share information about the cost benefits of smoking cessation programs and other health promotion programs to employers (Frankish et al., 1997).
- Health professionals can provide resources, programs, and information sessions, or set up displays on lifestyle factors related to reproductive health.

Stress Related Concerns

Introduction

Planning a family is a major life change for men and women and can be stressful. Most workers experience stress about juggling their paid work and family responsibilities; about looking after their elderly or disabled relatives; about caring for their children; about who will do the household chores; or about trying to find time to spend with their family (Ontario Women's Directorate, N.d.).

Many aspects of work add to the stress load. Approximately 60% of women say stress is their primary workplace concern. Workplace stress occurs when there is conflict between the job demands and the amount of control the employee has over meeting the demands. Harmful physical and emotional responses result from high levels of workplace stress. Stressful work environments are associated with increased job dissatisfaction, employee turnover, absenteeism, illness and injury. While work can contribute significantly to an individual's stress load, the workplace is an environment in which employees can learn helpful coping techniques in dealing with stress.

Social support seems to have a buffering effect on stress. Pregnant women living stressful lives who had strong social supports had one third fewer complications compared to women with fewer supports (Malloy, 1984).

Responses to stress, whatever the source, may include behaviours that themselves become critical stressors, especially for pregnant women. Alcohol abuse is the most recognized and most pervasive of coping mechanisms for stress in the workplace. Alcohol use in pregnancy is a leading cause of birth defects involving damage to the fetal brain. Other so-called stress reducing behaviours including use of drugs, caffeine and cigarettes, have also been implicated in decreased fertility, changes in menstrual function and complications of pregnancy (Malloy, 1984). Women and men who may want to quit using alcohol, cigarettes or any type of drug, are confronted with the negative stress of quitting at a time when they experience the enormous transition to becoming a parent (Malloy, 1984).

Stress and Reproductive Health

PHYSIOLOGY OF STRESS

Stress is the body's response to emotional, physical, social, economic or other changes or tensions in life. Low levels of stress can have positive effects, and are often equated with a sense of excitement, or challenge. When the level of stress exceeds the body's capacity to handle stress, mental and physical changes occur. When stressed, muscles tense, respiration increases and blood pressure rises. The body responds to stress with a variety of hormonal, biochemical and neurological changes. Zuckerbrot (1989), Henriksen et al. (1994) and Fenster (1999) state that stress can interrupt endocrine function in both men and women. Ambiguous, constant stressors where the victim feels helpless have the most severe effects (Malloy, 1984).

HOW STRESS AFFECTS REPRODUCTIVE OUTCOMES

Stress can affect both menstrual and birth outcomes (Fenster, 1999; Paul, 1993). Studies report that women who are highly stressed or anxious may experience reproductive problems such as difficulty conceiving, high rates of miscarriage, toxemia, preeclampsia, excessive weight gain, nausea and hyperemesis, prolonged labour, habitual abortions, and higher rates of prematurity, stillbirth, infants with congenital deformities and mental retardation (Malloy, 1984; Henriksen et al., 1994).

MENSTRUATION

- Menstruation may be irregular or painful when women are highly stressed (Fenster, 1999; Messing et al., 1993).

LOW BIRTH WEIGHT

- Pregnant women working in jobs characterized by stress were more likely to deliver a low birth weight, pre-term infant (Walker et al., 1999).

GESTATIONAL HYPERTENSION

- Gestational hypertension was associated with low decision and job control and low job complexity among women in lower-status jobs. In higher status jobs, gestational hypertension was associated with high job pressures and low control (Landsbergis and Hatch, 1996).

MISCARRIAGES

- An increased risk of miscarriage was found among workers who reported high levels of job stress and high psychological job demand (Walker et al., 1999; Fenster, 1999).

PRETERM DELIVERY

- Stressful work was modestly associated with preterm delivery (Brett et al., 1997).

CAUSES OF STRESS

Workplace stress arises out of a response to a complex web of interdependent stressors. Several studies have found that job dissatisfaction and stress result not only from negative conditions at work, but also from a lack of positive conditions including variety in work, pleasant surroundings and significance of work (Stellman, 2000). The issues are complex, for example, workers who say their motivation for working is primarily financial need are the most at risk for miscarriage (Bryant and Love, 1991). The following are some of the stressors that are found in work situations.

MULTIPLE ROLES

- Research demonstrates that multiple roles i.e. balancing many tasks at work, and responsibilities in the home can produce stress. While multiple responsibilities can provide stimulation, and enhance self-esteem, there may also be conflicts and contradictions between multiple expectations from oth-

ers and personal expectations. Role overload may occur when there are too many roles coupled with too many demands or too few supports (Malloy, 1984).

JOB HOURS

- Job hours per week, especially during the first trimester of pregnancy, is a strong predictor of job stress. Women working more than 45 hours/week were five times as likely to report high stress (Schenker at al., 1997).

CIRCADIAN RHYTHM

- Rotating work schedules and shift work can cause stress. This may result in menstrual disorders in women and disorders of libido in both sexes (Malloy, 1984; Henriksen et al., 1994).

JOB OR FINANCIAL INSECURITY

- Personal health, financial security, and workplace conditions interact in complex ways. Concern about money can result in poor health. Also, low income can worsen health by diminishing access to adequate nutrition and housing.

- Women earn less money in the workplace than men. In Canada, women aged 25 to 45 experience higher rates of unemployment than men in this age range (Messing, 1998).

- Organizational restructuring can be a cause of stress. Generalized threats to employment security are associated with increased rates of low birth weight (Catalano and Serxner, 1992). These findings support the long-standing belief among sociologists that perceived economic insecurity adversely affects health.

MANAGEMENT OR SUPERVISION STYLE

- Management style can have a definite effect on the level of stress felt by employees. Malloy (1984) reported that women who felt very stressed at work because of an authoritarian, verbally abusive boss, reported a number of reproductive system dysfunctions such as menstrual irregularities, infertility and miscarriages.

- Duxbury and Higgins (1997) identified supervisory behaviours that employees consider non-supportive. They include poor interpersonal communication, lack of respect, focus on hours of work rather than output, and inconsistent behaviour. Behaviours identified to be supportive included two-way communication, positive feedback, mentoring employees, and recognition of an employee's life outside work. Employees with supportive managers are more likely to have high job satisfaction, high organizational commitment, and lower levels of job stress and life stress.

PSYCHOLOGICAL DEMANDS AND JOB CONTROL

- Stress can arise from psychological demands. A study of primary school teachers found factors that were not significant individually, when combined, resulted in a large psychological burden.

Combined stress factors included high work speed, concentrating heavily on tasks, multiple tasks and noise (Messing, 1998).

- The feeling of helplessness comprises an important source of stress (Henriksen et al., 1994), and is present in jobs with high demand/low control. In these types of job situations, research demonstrates an independent association with high demand/low control and adverse pregnancy outcome including low birth weight, gestational hypertension and preterm delivery (Landsbergis and Hatch, 1996; Brett et al., 1997; Homer et al., 1990).

PHYSICAL CONDITIONS

- Physical conditions such as noise can also lead to stress (Swanson, 2000).

Key Points: Stress Related Concerns

Independent cause

- The body reacts physiologically in a similar manner to all stressors. Shift work, lack of job control, poor ergonomic workplace design, excessive personal responsibilities, job ambiguity, or inflexibility can all elicit a stress response. When combined these can result in stress. The stress response is very individual in nature and may vary from person to person.

Reproductive outcomes

- Stress can affect the entire spectrum of reproductive processes.

Recommended Strategies

THE INDIVIDUAL

There are a number of strategies an individual can undertake in order to manage stress.

- Take advantage of, and recognize the value of social support, at home, at work, and in the community.
- Encourage your family to help with responsibilities at home.
- Try to identify causes of stress and consider ways to reduce or eliminate the stressors.
- Keep informed.
- Request information about policies regarding sick leave, personal days, flex time and part time options, maternity and paternity leave.
- Follow good health practices; eat properly, get plenty of sleep and drink 6 to 8 glasses of water a day.

THE EMPLOYER

Some of the greatest stressors are interpersonal. The role of the employer or manager can have a significant effect on how employees are able to cope with work stress.

- Employers can ensure that managers and supervisors are adequately prepared to supervise other employees. Managers can benefit from ongoing training and support to improve their management skills. Specific training on stress, work-life balance, communications, and supportive management may be helpful.
- Job control is an important component of job satisfaction. Employers can look at the work system and, in collaboration with the employee, investigate opportunities for the employee to have more control over their work.
- Explore the option of flexible work arrangements for employees.
- Employee participation is one method of helping to reduce stress by improving employer-employee relationships.
- Job sharing, flexible working hours, take-home work and weekend work are only a few of many possible alternatives to the traditional nine-to-five, one-job-one-person model.
- Progressive employment policies that institute supportive practices such as rest and breast feeding areas in the workspace, and Employee Assistance Programs that include health promotion give a strong signal to the employee that they are important.
- Employers should help their workers manage stress through good communication, a supportive environment and stress management workshops. More importantly employers should involve employees in assessing the causes of stress and in reducing or eliminating these stressors. It is most effective in the long term to deal with the causes of stress, rather than its symptoms.

THE HEALTH PROFESSIONAL

- Health professionals can recommend ways to increase each employee's control over their work, to improve co-worker and supervisor support, and can provide additional resources and information.
- Provide training on relaxation techniques to workers.
- Share information about community resources that can help balance the workers' life, for example, recreation, health or fitness centres.
- Help expectant parents prepare for the changes that will occur with pregnancy and parenting.

Effects on Work Schedules

Introduction

The working routine, as well as the workplace conditions, affect health. How the work schedule is designed, whether work includes shift work, has a predictable schedule or entails long hours can all have an impact on reproductive health. The proceeding section on work schedules will review the literature about shift work, rotating shifts, hours of work, and commuting. Included in the review are the synergistic effects of shift work with other risk factors.

Different Work Schedules

SHIFT WORK

In our twenty-four hour, seven day a week society, shift work is becoming the norm. In North America we have come to expect twenty-four hour service, whether it is to grab a bite to eat, pick up groceries or go to the pharmacy. Until recently shift work was primarily seen in the medical sector, police force, military and in large factories. However, shift work now extends to nearly every facet of urban life, affects approximately 15 - 30 percent of employees in major industries, and appears to be growing in use.

Challenging work schedules activate the stress response (refer to the section on Stress for more information). Some of the effects of shiftwork include fatigue, heartburn, constipation, depression, substance abuse and susceptibility to injury.

- Shift work can include variable, rotating, and irregular work schedules. While the definitions vary, research indicates that the more irregular, and the greater the changes in the circadian rhythm, the greater the strain on the worker, and therefore on the reproductive system. Work involving evening and night shifts, rotating or changing schedules and irregular work patterns are of greatest concern (Nurminen, 1998).

- Shift work is associated with an increase in first-trimester miscarriages, preterm deliveries and decreased birth weight for gestational age (Xu et al., 1994; Nurminen, 1995a; Nurminen, 1998).

- The variation of work schedules is associated with and increased prevalence of menstrual-cycle abnormalities. Women who worked night shifts reported more frequent irregular cycles and more miscarriages than women on day shifts. Studies have reported that female flight attendants showed a higher prevalence of menstrual disorders (Baird et al., 1993; Nurminen, 1995a).

- In a meta-analysis, shift work and night work were associated with preterm birth (Mozurkewich et al., 2000).

- Night work and varying shifts were associated with an increased risk for miscarriage (Axelsson et al., 1996).

SHORT NOTICE OF CHANGE IN SCHEDULES

Employees are adversly affected by short notice. Many businesses have adopted a "just in time" (J.I.T.) management style in order to stay competitive. This may result in changes to work duties and shifts with very little notice given to employees. Also, lack of management planning can result in short notice of scheduling changes. Employees often have other responsibilities including child or elder care to arrange. Short notice of work schedule changes leads to increased stress in employees who also provide care for family.

- Frequent or permanent shortage of staff was related to an increased risk for miscarriage (Axelsson et al., 1996).

LONG WORK HOURS

Working longer than 35 to 40 hours a week during pregnancy increases the probability of preterm labour, low birth weight, small for gestational age and miscarriage.

- Working long hours is strongly associated with the probability of low birth weight (Gabbe and Turner, 1997; Peoples-Sheps et al., 1991).

- Preterm birth rates increased for women working more than 36 hours per week and greater than 10 hours per shift. Walker et al. (1999) found an increased risk of miscarriage among lawyers working more than 45 hours/week in the first trimester. There was no increase in miscarriage with female employment overall or in specific jobs around the time of conception or early pregnancy. Luke et al. (1995) found that the risk of preterm delivery was increased when women worked greater than 8 hours of work per shift, or greater than 40 hours work/week.

COMBINED RISK EFFECT

The combined effect of shift work, long work hours and other risk factors increases the risk of adverse birth outcomes including miscarriage, preterm birth and low birth weight.

- Nurminen (1995a) found that high noise levels combined with some forms of shift work may be associated with elevated reproductive risks, primarily low birth weight.

- Luke et al. (1995) and Gold and Tomich (1994) reported that factors significantly associated with preterm birth included hours worked per week or hours worked per shift while standing.

- Frequent fatigue has a negative effect on the ability to become pregnant. Women with a high fatigue score, particularly those with unfavourable working hours, have more difficulty conceiving (Toppari et al., 1996; Makowiec-Dabrowska and Siedlecka, 1996).

- Long hours of physically demanding work can lead to fetal growth reduction and subsequent low birth weight (Hatch et al., 1997).

COMMUTING

Many people commute to work either by car, urban transit or occasionally by bicycle. Commuting extends the length of the work day and can increase fatigue. Commuters who travel by car on busy roads may experience anxiety. Commuters who use public transit may experience other challenges such as crowding or lack of chairs to allow sitting during peak travel times. Nicholls and Grieve (1992) reported that discomfort occurred with driving, particularly with regard to the use of seat belts. Commuting over an hour a day in a sitting position is associated with an increased risk for small for gestation age or preterm birth.

- Studies by Mares and Baron (1989), Saurel-Cubizolles (1992) and Zhang and Bracken (1996) reported adverse pregnancy outcomes, including preterm birth and small for gestational age, when commuting was combined with other risk factors including extended work shifts, working greater than 50 hours per week, squatting during work and having high psychological job demands.

- Mares and Baron (1989) reported that adverse effects of commuting were apparent when the distance was more than 25 km.

- Tuntiseranee et al. (1998) reported the risk of small for gestational age was elevated for women who commuted more than one hour per day.

SECOND SHIFT

Employees often have many different roles. When looking at the number of hours worked, it is important to consider all the duties or responsibilities of the worker, including the unpaid portion of the workday.

Nearly 80% of women of reproductive age work outside the home. Many women continue to work while pregnant and work well into their pregnancies. Work, for most people, is not a lifestyle choice, but an economic necessity. Research indicates that most working women who work outside the home retain a large share of the responsibility for family and household management in addition to career demands. The term "second shift" (Luke et al., 1999) was coined to describe the phenomenon where women work outside the home while retaining primary responsibility for household work.

Work extends beyond the paid working day. A woman who is fatigued from taking care of a child or an ill parent may be less able to resist a virus or to protect herself against chemicals in cleaning solutions. An understanding of woman's occupational health requires an appreciation of the combined effects of balancing work and family responsibilities.

Key Points: Effects of Work Schedule

The twenty-four hour a day, seven day a week society.

- Shiftwork can result in changes to the menstrual cycle and can increase the risk of small for gestational age.

Long hours

- Working long hours (greater than 40 hours per week, and more than 8 hours per day) increases the risk of preterm birth, low birth weight, small for gestational age and miscarriage.

Commuting

- The trend to commute to work continues to affect how we live. Commuting can increase the risk of small for gestational age and preterm birth.

Effects on family

- Employees often have multiple roles. Women often work what is called the "second shift", working a total of 60 to 100 hours per week between paid and unpaid work and responsibilities. Women may be too tired to properly take care of themselves.

Recommended Strategies

THE INDIVIDUAL

- If shift work is necessary, attempts should be made to reduce all other risk factors.
- Find ways to reduce the impact of shift work, for example by resting during breaks.
- Consider working reduced hours or taking some leave during pregnancy.
- Consider less stressful ways of commuting, for example carpooling instead of public transit.

THE EMPLOYER

- Remove or reduce shifts from the pregnant woman's schedule.
- Provide regular shifts, instead of constantly changing the woman's circadian rhythm through shift schedule changes.
- Provide employees with sufficient advanced notice of shift changes. On site child care increases worker satisfaction.
- Allow flexibility for pregnant workers to reduce travel during peak traffic times.
- If telecommuting or working from home is a possibility, allow pregnant workers the option to do so. Employers could consider allowing the employee to work part of the workweek from home.

THE HEALTH PROFESSIONAL

- Provide workplaces with information on the relative risks of different work schedules. Support workplaces in making changes.
- Provide workshops for employees on managing shift work.

Part C: the strategies

Framework for Action

Introduction

In addition to addressing the previous risk factors associated with work and reproductive health, it is helpful to consider what systems or processes can be implemented to optimise the health of working Canadian men and women and to protect them from reproductive harm. It is imperative to address workplace health issues from an ethical and moral perspective, as well as from the economic standpoint. The workplace is an important factor in health, illness and injury. One study showed that 50% of sick leave taken during pregnancy was directly attributable to occupational factors such as walking or standing (Tophoj and Mortensen, 1999). People spend up to half of their waking hours at work (Eakin and Weir, 1995). By not addressing the issue of workplace health, employers put employee health and the economic health of the workplace at risk. Many industrial countries are making progressive changes in workplace health.

There is no "one size fits all" approach guaranteed to improve worker health in a wide range of settings. Strategies to improve workplace conditions and support organisational change must be considered from the perspective of the employee, employer, current government legislation, and available research, and integrate issues of lifestyle, organization, and society (Polanyi et al., 1996). Prevention of reproductive risks in the workplace is a complex issue, as is shifting an organizational culture to focus on protection.

Paramount to creating and sustaining a healthy workplace is the employer and management commitment and support. We have seen significant changes over the past years in how workplaces manage and think about their

employees. Duxbury and Higgins (1997) assert that progressive workplace policies and enlightened managers form a supportive foundation for all other strategies. Companies with satisfied employees are also companies with high productivity, less absenteeism, and lower staff turnover.

For a healthy workplace program to become part of the corporate culture it must be integrated into company mission and values, and all facets of the company's organization. There are many different philosophical approaches to improving reproductive health in the workplace. A combination of the following approaches will result in a well-balanced reproductive health promotion program.

This chapter will provide practical suggestions for workplaces and those working with workplaces on the range of interventions that are aimed at improving the reproductive health of employees while indirectly creating a supportive work environment for all new and expectant parents and their families.

Range of Interventions

Workplaces and those working with workplaces can use the suggestions in this section to introduce very simple or more complex interventions, depending on what practices or policies are already in place. Promoting reproductive health in the workplace can be simple and inexpensive. In fact, many workplaces already have some strategies in place that promote reproductive health. There is a range of possible interventions that can be used to address a single risk condition, or to provide comprehensive supports to employees who may be planning a pregnancy or expecting a baby. Interventions to improve reproductive health can take the form of educational interventions, policy development or supportive practices.

It may be easiest for a workplace to start with educational programs, however, it is often the combination of interventions that promote an overall supportive environment that values the reproductive health of its employees. It should be emphasized that implementing a new policy or educational program may not be effective in itself. It is how a policy is actually put into practice, based on the intent of the policy, that has an impact on workers.

EDUCATION

Educational programs aimed at men and women prior to conception and during pregnancy are often simple for workplaces to implement. Education can take a variety of forms and combining approaches are the most effective. Awareness and knowledge can be increased through brochures, pamphlets, workshops, fairs, informational packages, newsletter inserts, displays or educational programs. Companies can invite occupational health professionals to provide classes for employees on work time or during breaks. Topics of interest may include: nutrition; managing discomforts of pregnancy; fetal development; effects of alcohol,

drugs, and smoking, signs of complications of pregnancy; and the postpartum period. This information can be useful for both men and women in the preconception period to prevent certain risk conditions. During pregnancy, many workers are motivated to learn more about their health. This can be an ideal time for workplaces to provide information that may contribute to significant health changes.

If the workplace or the employees do not have a good understanding of the issues and facts, education is a good place to start. When giving resources to a workplace, you are providing them with an opportunity to increase the health and morale of employees. If the necessary resources are not available, you may have to partner with other workplaces to develop them.

KEEP IN MIND

- Education is a good place to start.
- Addressing education can help you build a relationship with a workplace.
- Educational initiatives can be low cost and easy to implement.
- Information needs to be written at an appropriate literacy level.
- Resources and presentations need to be in the language workers are most comfortable with.
- Building awareness plants the seed for readiness and interest in bigger initiatives.

EXAMPLES OF REPRODUCTIVE HEALTH EDUCATION

- Provide information about how to reduce risks before and during pregnancy
- Offer smoking-cessation programs and resources
- Discuss options for maternity and paternity leave.
- Put up displays and posters about healthy choices.
- Arrange for workshops or presentations by community agencies.
- Develop a binder of community services.
- Distribute information about health risks at work and ways to reduce the risks.
- Offer training in peer-support.
- Offer training to supervisors in sensitivity and supportive management techniques.
- Offer counselling services.
- Provide packages of information on pregnancy.
- Provide packages of information on health prior to pregnancy.

- Start a newsletter or add information on reproductive health to an existing newsletter.
- Link with organizations that have information on community services and programs.
- Start a resource lending library, including books and videos on healthy pregnancies and healthy babies.

POLICY

Once workplaces are aware of the issues, they may be interested in establishing supportive policies. Policies set the tone of a workplace. They are a means of keeping in place important programs that reflect workplace values.

There is no single policy that can effectively address all aspects of reproductive health in the workplace. Rather, reproductive health issues are woven through the premise and content of many policies in a workplace. Review policies from other workplaces. Expect to make some changes, as the policy will need to fit the individual workplace, its organizational culture, and style. Be flexible and recognize that policy change is a slow process. The workplace may want small changes to policy at a time, rather than making comprehensive changes all at once.

Employers can help support their employees by making information regarding the company's policies well known and easy to access. Research has found that a large percentage of employees had no knowledge about their firms' policies regarding maternity and paternity leave.

KEEP IN MIND

- Many workplaces already have some policies in place that support reproductive health.
- Employee input is helpful when creating new policies.
- The workplace, for reasons of confidentiality, may not be able to show you their personnel policies.
- You may need to wait until a policy comes up for review before a workplace is ready to make changes.
- In order to be effective, policies need to come into practice.

EXAMPLES OF REPRODUCTIVE HEALTH POLICIES

- Transportation plan for emergency medical care.
- Emergency first-aid plan.
- "Light-duty" policy for women who do strenuous work.
- Smoke-free workplace.

- Flexible work arrangements: part-time, flex-time, tele-commuting and job-sharing options.
- Additional leave during pregnancy.
- Wage top-up during maternity leave.
- Paid paternity leave.
- Employee and family assistance program .
- Family friendly workplace strategies.
- Designating preferred parking for pregnant employees.
- Discretionary use of sick time and or personal days.
- Discourage overtime.

SUPPORTIVE PRACTICES

Policies and educational programs are not enough on their own. It is how these interventions are actually put into practice, or the overall supportive culture of the workplace that makes a positive difference for pregnant workers and individuals planning a pregnancy. Employees who work in a supportive environment are less likely to feel stressed, are more satisfied with their jobs, more likely to agree with company policies, to trust management and to provide constructive feedback. They are also less likely to be absent, and more likely to take work home.

Supportive managers empower their employees by providing positive feedback and encouragement, and by engaging in two-way communication. They also show respect, compassion for and recognition of, an employee's life outside of work and offer supports and flexibility for employees to balance these often conflicting demands. A supportive workplace environment has a great influence on producing lasting changes in the health of its employees.

To promote health and efficiency, workplaces should ensure that workers have discretionary power and means to adapt their workstations and their methods to their own abilities and other rapidly changing requirements of their work. With increased control over their work conditions, employees report significantly less overall stress, less depression, more satisfaction with their lives, more ability to balance competing work and family demands, lower role overload, and lower interference from work to family and from family to work. They also report significantly less job stress, are less likely to experience job burnout and are significantly less likely to be absent from work. Employers who make it easier for employees to balance work and family demands often see a positive impact on their bottom line (Messing, 1998).

KEEP IN MIND

- Managers need to understand the intent of policies.
- Managers who are supportive and use effective communication skills are key to good workplace practices.
- Workers perceptions of their policies are based on the way they come into practice.
- Flexibility can increase worker productivity and commitment.
- Value a workers' family life and help to balance work and family demands.

EXAMPLES OF REPRODUCTIVE HEALTH PRACTICES

- Protect workers from exposure to chemical, biological, physical and other reproductive hazards.
- Ensure proper protective equipment is available and is used consistently, including gloves and masks.
- Encourage workers to check Material Safety Data Sheets and to call Motherisk for more information.
- Ensure good ventilation, safe temperatures and safe noise levels.
- Be flexible to accommodate needed appointments for prenatal care.
- Schedule short breaks at least every two hours for bathroom, water, food, stretching or resting.
- Set up places where women can rest on breaks (e.g. a couch in the lunchroom).
- Demonstrate a positive attitude towards pregnant women and new parents.
- Show management support for family-friendly approaches in the workplace.
- Provide professional opportunities (training, promotions etc.) to all employees, whether or not they are pregnant.
- Include pictures or illustrations of pregnant workers in promotional materials.
- Be responsive to individual needs and concerns.
- Encourage workers to provide feedback about concerns.
- Make nutritious food available at the worksite.
- Offer preferred parking spaces for pregnant employees.
- Distribute pagers to expectant fathers/partners.
- Ensure private, clean and comfortable facilities for breastfeeding or expressing breast milk.
- Arrange for support or referral services for employees who experience complications in their pregnancies.
- Supply employee benefit packages that cover the cost of medications.

INDIVIDUAL RISK ASSESSMENT

Individuals may ask public health, occupational health or their physician for advice about reproduction and workplace risks. Assessment should include a discussion of past and present work. Advice will be based on the individuals' risks in the workplace, and their present health status. Advice may include altered work duties, preventative leave, protective equipment or re-assurance that the risks are negligible. An individuals' ability to put the advice into practice depends on many things, including their financial situation, conditions at work and the level of social support.

Encourage men and women to ask about reproductive risks at work. The health benefits are greatly increased if risks can be reduced prior to or early in pregnancy. The following chart will help in determining an employee's reproductive risks at work (Youakim, 1999).

Category:	Determine the Following:
Work Exposure	Chemical risks Biological risks Ergonomic risks Physical risks Stress Schedule concerns
Duration of Exposure	Hours per shift Hours per month Months or years of risk Frequency of risk
Intensity of Exposure	Regular amount of risk Peak amount of risk Accidental exposure
Protection	Engineering controls (ventilation, fume hood) Personal protective equipment (gloves, mask, gown, respirator)
Other Exposures	Past work exposures Home, hobby and community risks
Medical History	Present reproductive status (i.e. planning a pregnancy, pregnant) Past illness Previous pregnancy outcomes Medications -Lifestyle issues

Addressing Workplace Reproductive Health

Introduction

Change in workplace reproductive health can either come from within a workplace, or can come from groups working with workplaces. This chapter will provide information and examples on the process of improving workplace reproductive health. The following steps apply both to workplaces and those working with workplaces.

STEPS TO IMPROVING WORKPLACE HEALTH

- Involve workers in planning for a healthier workplace
- Find out about the needs and concerns of employees
- Determine potential reproductive risks in the workplace
- Look at what other companies are doing in this area
- Establish priorities
- Develop a plan
- Consider how to phase in changes
- Decide who will be responsible
- Raise awareness about the new policy or program
- Implement the changes
- Follow-up to make sure initiatives meet the need of employees
- Decide on further actions

Suggestions for Workplaces

The following chart indicates the many components of a reproductive health program (Clement, 1997). Consider the things that you already have in place, as well as those that you can develop. Look for assistance in your community. Services such as public health can help you in improving health in your workplace. Other workplaces may be willing to share their ideas and expertise.

Strategy	Steps
Risk Assessment	Determine all potential risks List ingredients workers are exposed to Assess exposure – volume, protection, length of time, test levels Review available data
Communications	Employees, management, human resources and health and safety committees information on the potential risks and strategies
Health Promotion	Education of workers Counsel individuals with specific concerns Include men and women prior to conception as well as women who are pregnant or breastfeeding Resources, presentations, sources of information
Legal & Ethical Issues	Human rights Right to know Right to refuse work
Reproductive Health Training	Ensure occupational health nurses have needed training and know where to make referrals
Managing Risks	Eliminate risks (substitute safer processes or chemicals) Exposure controls (engineering controls, protective equipment) Exposure monitoring (measurement, testing) Risk management (showers at work, dirty/clean change rooms, employer washes work clothes)
Policy Development	Develop reproductive health policies Make sure policies are put into practice Use protective re-assignment or leave if risks cannot be reduced
Evaluation	Get input from staff at all levels in the workplace Determine if action is making a difference (reduced risks, increased knowledge) Keep up to date information and research Watch for unsuspected risks, or new ways to reduce or eliminate risks

Examples of Progressive Workplaces

These Canadian workplaces have been highlighted as examples of promising interventions that directly or indirectly promote reproductive health:

HUSKY INJECTION MOLDING SYSTEMS LTD.

Husky is a global supplier of injection molding systems to the plastics industry and has a strong commitment to the health and safety of its workers. The company strives to proactively integrate its values of health and safety into all levels of the workplace. Husky has an on-site health and wellness centre that is

fully subsidized and employees are encouraged to access its services. The centre offers a range of supports that may be beneficial for pregnant employees, including a naturopathic doctor, a massage therapist, a chiropractor and physiotherapists. Any supplements that are dispensed to workers, such as folic acid, are covered up to 75%.

STEELCASE CANADA INC.

Steelcase is a designer and manufacturer of office products and furniture. It is proactive in its responsiveness to employee needs and has a range of supportive practices to promote the health of all employees. Management is trained and encouraged to be accommodating, flexible and supportive of staff. Steelcase provides preferred parking for pregnant workers and pagers for expectant fathers. The company has a "light duty" policy for pregnant workers that allows women to move to administrative duties during their pregnancy and then accommodates their return to regular duties after the birth of the baby. Many workers are promoted as a result of new skills that this policy enabled their development during pregnancy. Other supportive aspects at Steelcase include a wellness centre, an Employee Assistance Program, and the availability of nutritious food available in the cafeteria.

ABITIBI

Abitibi Consolidated in Kenora is a newsprint paper mill that has a "modified duty" policy, which allows workers unable to perform their normal duties to be reassigned to other work. The reassignment varies depending on an individual worker's circumstances. The employee can be reassigned to different duties within their current job description, or to a different department (for example from work on the paper machines to work in an office environment). This policy is individualized to meet the specific needs of the worker. Pregnant workers are also able to use the modified duty program for the duration of their pregnancies.

LINDA LUNDSTROM INC.

Linda Lundstrom Inc. is a profitable, growing clothing design and manufacturing company with low staff turnover rates. It boasts a supportive organizational culture that actively recognizes and accommodates its employees needs outside of work. Good relationships and communication between management and employees are considered important. Managers are expected to "walk the talk" and not work overtime. All corporate functions occur during work time reflecting the value placed on an employee's life outside of work.

The company has both policies and practices that support pregnant workers. At its core is a strong wellness program that includes 5 paid wellness days. Women are given extra time off for medical appointments and to accommodate for possible morning sickness. Comfortable rest areas are provided for breaks. An on-site holistic health practitioner is available to assist workers with health concerns.

Working with Workplaces

We know that workplaces have a profound effect on employee health. This section is for organizations that work with workplaces and provides strategies for approaching and partnering with workplaces.

ROLES

Individuals and groups working with workplaces can take on a variety of roles, from acting as a supporting resource person to advocating for change.

RESOURCE PERSON

Individuals or organizations can provide support to the employer and employee by providing information and strategies that improve both the health of the worker and the health of the company. Even a small amount of information on health prior to, and during pregnancy, can have a significant effect on pregnancy outcomes. Improvements in the prospective mother's health may be important in preventing problems for the fetus and potential pregnancy complications for the mother. Work with the employer to help determine the company's needs and tailor a program that is right for them. Respond to workplace or employee questions and concerns. Duxbury (1997) cautions that organizations are not likely to change for moral reasons - you have to make the business case.

The workplace is often viewed as a convenient site for "capturing" an elusive adult population in order to reduce lifestyle risk behaviours. Employees and workplaces may not feel empowered by this approach. They are, however, interested in possible workplace reproductive risks and ways to reduce these risks. Health professionals should be aware that program success is often due to: personal, face-to-face contact; low cost; sensitivity to audience and setting; support of key groups; and legal/policy support.

PREVENTION PROGRAMS

All employees should have access to information about preconception and pregnancy. A risk assessment can be completed for the employee and her family or partner. Risk appraisals can include medical history, infectious disease history, social and occupational history, diet review, reproductive history, medication history, nutritional history and family history. It is important to provide the employee with counselling, support and understanding. Be sensitive to the fact that the employee ultimately makes his or her own decisions regarding the possible effects of potential workplace reproductive hazards.

ROLE OF ADVOCATE

There is tremendous need for more involvement of health care providers and their representative organizations in the development of policies that affect workers exposed to potential reproductive hazards on the job. Individuals can serve as the catalyst to help employers view programs for pregnant employees as a priority. They can also call for increased allocation of government resources for research and standard setting in this area.

WORKPLACE PERSPECTIVE

Most employers will want to know how proposed initiatives will affect their profit margin or bottom line. Often, decision makers will need your help to see the long-term benefits of initiatives. While it may be difficult to prove direct financial return to workplaces, research clearly shows that ignoring the benefits of workplace health promotion, and a healthy work-family balance, can become costly in the long run for employers.

Reproductive health promotion can seem a narrow focus for employers even though many existing workplace practices and policies directly or indirectly impact reproductive health. It may be more beneficial to start with a broader, more familiar "Family-Friendly" approach with some workplaces.

LARGE VERSUS SMALL WORKPLACES

Partnering with large and small workplaces is very different. The needs, risks, approaches and suitable initiatives vary with the size of the workplace. Most workplace health promotion interventions have taken place in large workplaces as these workplaces tend to have policies in place, specialized staff concerned with health and safety issues, and the equipment and information to help staff work safely. Large workplaces may have many women in their childbearing years who benefit from health promotion interventions. Large workplaces may also be more ready to implement progressive initiatives.

Smaller workplaces can be more challenging to approach because they are often less structured and have fewer resources to allow for change. They may not have a staff person responsible for health and safety issues, and are more likely to have health and safety concerns. Small workplaces have higher rates of injury and ill health because they are disproportionately located in certain high hazard industries. Workers are often young and inexperienced. Determining the health needs of this diverse group can be a challenge. The number of workplaces and the small number of employees at each location makes small workplaces hard to reach. There may be few workers of reproductive age in an individual small workplace, making it more difficult to raise concerns around reproductive health. In spite of the difficulties, it is important to try to reach small workplaces as more than 50% of the Canadian workforce is now employed in workplaces with less than 50 employees (Eakin and Weir, 1995). However, smaller workplaces might be able to make rapid policy changes because they do not carry a large corporate framework. Try to find effective and inexpensive ways of including small businesses in your workplace initiatives, for example, by using the local media.

APPROACHING THE WORKPLACES

Different approaches may be necessary depending on the workplace. You need to consider the economic climate, organizational culture, labour relationships, and attitude of management. Try an initial style that emphasizes useful resources that you can provide free of charge. Let the workplace know you can offer a range of supports and services. Talk about the benefits of an initiative or resource and expand on the areas where an interest is shown. If the workplace is not ready for you now, encourage them to contact you if their situation changes and your resources or services are needed.

WORKPLACE CONTACTS

When determining the workplace to contact first, consider which one would be most receptive. It makes sense to work with workplaces that you or your agency has had previous contact with. Large businesses are often a good choice as a first contact. Once you have successfully worked with one workplace, the information and credibility you gain will help you partner with other workplaces.

When you have determined the best place to contact, you will now need to determine the best person to contact in the workplace. The initial point of contact is very important and must be carefully thought out. Every workplace is different and partnerships develop at many different levels. It is important to know the industry, their language and way of thinking. Make sure you are clear about the objectives of your program and how you are presenting it. It is also important to remain flexible, as no two contacts will be the same. The people most likely to be receptive to your work are occupational health nurses, human resource staff, health and safety committee members and management. If possible talk first with people who know the workplace. They may be able to refer you to an appropriate contact and to give you insight into the organizational culture of the workplace.

BUILDING A RELATIONSHIP

It is important to take a non-threatening, uncritical approach, and to praise the workplace for what they already have in place. Try to make introducing health promotion initiatives as easy as possible for the workplace. Start with a low-cost, low-key approach.

Be patient. Emphasize what is "in it" for the workplace. If possible, try to work towards long-lasting changes, for example, policy changes and improved management-employee communication and sensitivity. However it may be too threatening to move directly to management practices and policies. Taking this approach at first may make a workplace unreceptive to your efforts. Ask what would be most helpful to the workplace and involve them in adapting approaches that work for them. Once a comfortable working relationship is established, you may be able to address policies and practices.

START SMALL

Many workplaces already have policies or practices in place that impact reproductive health, for example, an Emergency Transportation Plan, nutritious cafeteria food, or preferred parking for pregnant workers. This is a great start. Many reproductive health interventions are inexpensive, highly visible and have a lasting impact on employee health. Education strategies such as wellness fairs or lunch-hour presentations may increase interest and commitment in more in-depth interventions.

GATHER INFORMATION

It is important to start out by determining the individual and collective needs and concerns of the employees. Most workers exposed to hazards are aware that something is wrong. Involve workers and workplaces

in all aspects of program planning. Workplace reproductive health can encompass a broad scope of perspectives from the employee and employers' point of reference. Gathering information from employees can help you establish your priorities, raise awareness about reproductive health in the workplace, and make sure that initiatives meet the needs of employees. It will also send the message to the employees that the company cares about them.

Employee needs can be determined in many ways including suggestion boxes, surveys, individual interviews, two-way communication and focus groups. Once the needs of the employees have been identified, you proceed in developing a program that is affordable, suits your individual workplace and meets the needs of the employees. Employee participation is increasingly seen as a contributor to good health and is correlated with reduced worker's compensation lost-time frequency rates.

WORKPLACE SURVEYS

Workplace surveys, either across workplaces in a community or within a specific workplace, can help direct your work and make it responsive to employee and employer needs. Surveys can provide information about where your audience of interest is likely to work, and about risks and initiatives that workplaces might be interested in. Surveys take time, however, a carefully drafted survey can save time and money, especially during implementation; increasing the likelihood that initiatives will be well received and successful.

TEAM APPROACH

It is beneficial to work with other groups who are also trying to approach workplaces. Successful, protective strategies are often based on partnerships and collaborations that go beyond those between employers and employees. Partnerships can include Public Health, Ministry of Labour, Workplace Safety and Insurance Board, Safe Workplace Association, Employee Assistance Programs, Human Resource Managers, Benefits and Insurance Carriers and Unions. By working together you can improve the response from workplaces. For example, consider combining surveys, or newsletters, or offer a health fair instead of a single display. Become familiar with other services in your agency and community and develop a menu of programs and services available to workplaces. Share information about what is working and not working. Above all, whenever possible, present a united and coordinated front to workplaces.

WORKPLACE READINESS

Workplaces can be at different levels of readiness for initiatives related to workplace reproductive health. Some may be ready to go directly to policy or to survey employee needs and concerns. Others may be uninterested due to broader issues and priorities, such as re-structuring. Most workplaces fall in between these two extremes, in that they are interested in simple approaches that do not take a lot of time or money to implement. Try to be responsive to the present level of readiness of the organization. Although policy development can have a very positive impact on the reproductive health of employees, some workplaces may not be ready or receptive to policy development but may be quite interested in implementing educational programs.

The following chart details many common levels of readiness for workplace reproductive health initiatives, provides information on the signs that a workplace is at a particular level, and lists initiatives that are appropriate for each level of readiness. Keep in mind that each workplace and each situation is unique and will benefit from a tailored approach. In addition, a workplace may be working at several different levels at the same time.

Level of Readiness	Workplace Signs	Things you can offer
Not interested right now	• Say they aren't interested • Talk about other priorities • Involved in downsizing, re-structuring or re-organization	• Make sure they understand how the initiative will help them • Encourage them to contact you when they are ready • Leave them with a list of services you offer • Send them a newsletter • Ask if there is another area they may want help with • Use the public media to continue to raise awareness around your concern • Do short presentations for business groups • Mention other workplaces they can talk to who have made some changes • Offer to organize a workshop on stress management, or a fun activity for staff or family events
Want information for management	• Ask you to present to management team • Are interested, but seem to need some convincing	• Do a presentation for management and labour • Speak with the occupational health nurse, human resources, or health and safety committee • Provide information such as fact sheets and current research • Ask what would be helpful • Encourage them to call you if they have any questions or concerns
Want to provide information to staff	• Have concerns related to staff knowledge • Have an interest in hand-outs, resources, information or presentations for staff	• Provide them with brochures • Give them posters • Develop inserts for pay stubs • Ask if they can use articles in their newsletter • Offer to put up a display or arrange for a group or series of displays • Ask if they are interested in a short presentation for staff
Want to know what services are available	• Are unfamiliar with your services • Ask about services unrelated to your organization	• Develop a resource that lists your services • Make a community service guide • Be a team and offer a package of programs to workplaces • Put together a binder that shows pictures of the displays you offer • Ask if there is something else they are interested in
Interested in determining employee needs and concerns	• Want to know what the priority concerns are for staff • Want to know what services/solutions interest staff	• Show them survey questions and results from other workplaces • Help the workplace develop a list of questions • Help the workplace develop a plan for distributing survey forms • Assist the workplace in analysing the survey results • Work with the workplace on developing a plan of action based on the results
Interested in specific programs	• Ask about a specific topic of concern • Ask about a specific type of service	• Talk to them about what would be most helpful • Discuss programs you have worked on in the past • Work on any necessary adaptations for the workplace • Talk about what else you can do for them in the future • Refer the workplace to other community programs if necessary
Ready to change policy	• Ask about policies in other workplaces • Ask what policies are effective	• Show them policies used in other workplaces • Show them a sample policy that you have drawn up • If possible, look at their policies and make suggestions • Look ahead to windows of opportunity such as annual policy reviews
Interested in changing the way they work	• Surveys show concerns about management style • Workplace re-organization in process	• Help the workplace look at ways to make policy come into practice • Look at ways to make organisational change • Suggest training sessions on communication and being supportive • Help them plan the process of change • Invite them to send representatives to a workshop
Workplace has made progress	• Workplace has implemented a new policy, practice or education approach	• Congratulate them for the specific change • Give them an award • Feature them in the paper • Ask if you can tell other workplaces about what they have

Examples of Groups Working with Workplaces

The following organizations have encouraged and supported workplaces in the process of improving reproductive health in their workplace. The organizations used a variety of approaches including workshops, displays, resources and surveys. They worked on improving workplace education, policies and practices.

BEST START

Best Start formed several working groups to look at local concerns related to work and pregnancy. Participants included employees, employers, occupational health nurses, a literacy program, and the health unit. A survey of workplaces showed that most women worked in a large business, with about half involved in heavy work such as mining and logging. A lack of resources about workplace reproductive hazards spurred the working groups to focus on developing much needed resources. The committees developed a display, booklet for pregnant women, newsletters and newspaper ads for workplaces and people in their childbearing years. They also held workshops for interested workplaces on family friendly policies and practices. The relationships they built with workplaces through their education campaigns generated interest from employers and employees to improve workplace policies and practices.

One Best Start committee helped workplaces implement policies that could have a positive impact on employees' health. Staff helped the workplaces to survey employees to determine their needs and concerns. The committee then worked to put in place training, policies and practices to address these concerns.

CHATHAM KENT HEALTH UNIT

The Chatham Kent Health Unit initially implemented a survey of 500 workplaces to assess overall health-related needs. The survey included a section on workplace reproductive health. The survey results indicated a need to focus on creating pregnancy-friendly workplaces. In response, the health unit sent out information packages (with resources from Best Start), and displayed posters at various workplaces. They also provided workshops on pregnancy and work for employers, including health and safety representatives, human resources staff and occupational health nurses. Those with special knowledge of the field were brought in to speak at the workshops. The Chatham Kent Health Unit, in partnership with Niagara Health Unit, developed a booklet called "Healthy Pregnancy at Work", which they distribute in their workshops.

CITY OF OTTAWA

The City of Ottawa has a Workplace Health Promotion Group with an interdisciplinary committee that links with other City of Ottawa programs including the Reproductive Health program. The Reproductive Health program developed resources and wrote articles for the Workplace Health Promotion Group newsletter. In 1999, the Workplace Health Promotion Group, in conjunction with Best Start, provided a workshop for occupational health nurses, health and safety personnel, and employers. This session focused

on workplace reproductive health and covered issues such as low birth weight and preterm birth prevention. The Workplace Health Promotion Group developed a comprehensive policy guide for workplaces, including an addendum regarding reproductive health and work.

NIAGARA HEALTH UNIT

The Niagara Health Unit has a comprehensive and cross-divisional approach to workplace health and wellness. The Workplace Wellness in Niagara initiative was established in 1999 and is overseen by representatives from all working areas of the Health Unit. The Workplace Wellness in Niagara initiative involves a yearly symposium for employers in the Niagara region. It reaches large numbers of workplaces and individuals involved in workplace health and safety. Other activities of Workplace Wellness in Niagara include the development of resources on pregnancy and work that are aimed at diverse audiences including pregnant women and their families, employers, and the community at large. Health fairs have been set-up in various workplaces. Information packages are widely distributed. Workplace Wellness in Niagara also distributes sample workplace policies to help employers in establishing pregnancy-friendly policies and practices in their own workplaces. The Niagara Health Unit strives to set an example by becoming a pregnancy-friendly workplace. For example, preferred parking for pregnant women is available as are flexible work arrangements for employees.

Workplace Reproductive Health Legislation

Current Legislation

The public policies addressing workplace reproductive health across Canada and in other countries vary widely. This section looks at a few public policies that have the potential to positively impact workplace reproductive health.

ONTARIO HEALTH AND SAFETY ACT – THE RIGHT TO REFUSE WORK

This act gives workers the right to refuse work that they believe to be unsafe, however, it is rarely used in the case of reproductive health.

ONTARIO HUMAN RIGHTS COMMISSION – PROTECTION FROM DISCRIMINATION

Under the Ontario Human Rights Code it is illegal to discriminate against a woman because she is or was pregnant, because she may become pregnant, or because she has a baby (Ontario Human Rights Commission, 1999). Women are protected from discrimination and harassment based on gender (i.e. pregnancy) and family status (i.e. having a baby or children). For example:

- It is illegal to ask if a woman is pregnant or planning a family during a job interview.
- It is illegal to fire, demote, or lay off staff because they are or may become pregnant.
- Pregnant workers have the right to benefits and opportunities including promotions and training.
- Pregnant women have the right to resume their job following pregnancy or parenting leave.
- Employers must ensure that the workplace is free from harassment related to pregnancy.
- Employers must accommodate special needs due to pregnancy.

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM – THE RIGHT TO KNOW

Under this legislation, workers have the right to know about the chemicals they use in a workplace. The legislation requires that hazardous products be labelled and accompanied by material safety data sheets. While this is helpful in linking workers with current information, often the reproductive risk of a compound is unknown. Workers should be encouraged to look at material safety data sheets for any chemicals that are used in their workplace, and also to call Motherisk for further information and advice.

QUEBEC – PREVENTATIVE RE-ASSIGNMENT AND PAID LEAVE

In 1981 Quebec introduced legislation for reassignment of pregnant or breastfeeding workers under the Occupational Health and Safety Act. Quebec is the only jurisdiction in North America that has introduced

legislation that offers an alternative to the trend toward "fetal protection policies". Fetal Protection Policies discriminate against women and their right to employment. They have been used to exclude women from jobs where reproductive hazards are known to exist, or have required proof of sterilization in order for women to hold certain positions. Quebec's preventive reassignment legislation allows pregnant or breastfeeding women to be reassigned from jobs that could harm their fetus or baby. If the employer does not or cannot appropriately reassign the worker, she may leave her position immediately until reassignment is arranged. If reassignment does not occur she can leave work until the birth of her child (or until the end of breastfeeding). While away from work she receives 90% of her salary. Quebec Appeals Tribunal places the legal onus upon the employer to show that there is no danger. The law has facilitated the use of the right to reassignment and preventive leave (Sarra, 1996). Over time there has been an increasing emphasis on re-assignment and improving workplace conditions, rather than according automatic leave (Turcotte, 1992).

FRANCE – PAID LEAVE AT 37 WEEKS FOR HEAVY WORK

France's success in reducing preterm deliveries from 7.9% in 1971 to 5.8% in 1981 resulted from a multifaceted approach that addressed the whole population, including a policy on paid leave during the final weeks of pregnancy for individuals in occupations that involved heavy work (Papiernik, 1993).

FINLAND – PROTECTION FOR MEN AND WOMEN

In Finland, legislation includes protection of working men, as well as women, and provides protective reassignment and paid leave (Taskinen et al., 1995).

Improving Legislation

The literature provides strong evidence that implementing appropriate provincial or federal policies can significantly improve reproductive heath in the workplace. Progressive workplace policies in Quebec, France, Italy and Denmark demonstrates positive outcomes (Collins et al., 1997). A coordinated legislative response is needed to implement both short and long term protective strategies (Papiernik, 1993; Messing et al., 1993; Sarra, 1996). In implementing workplace legislation, it is also important to take the broad view of reproductive health, to include health promotion, to consider reproductive rights and reproductive health, to support research and information sharing, and to address the issue of compliance.

BROADER DEFINITION OF REPRODUCTIVE HEALTH

Existing literature on workplace reproductive health is narrow in focus, with particular emphasis on the immediate impact of work conditions on pregnancy. Relatively few studies examine the effects of environmental or workplace hazards on reproductive health at earlier stages. Policies should use a broad defi-

nition of reproductive health. The definition should encompass fertility, pregnancy, menstruation, menopause, reproductive disorders, sexually transmitted diseases, breast feeding and contraception (Collins et al., 1997; Baird et al., 1993). Policies should have provisions for male and female workers who plan to have a family and who wish to be removed from working conditions that may be hazardous to their ability to reproduce (Sarra, 1996). There is no Canadian legislation that grants any worker the right to be reassigned during the period prior to conception (Sarra, 1996). The emphasis should be on creating a safe and healthy environment and controlling reproductive risks for all workers, at all stages of reproductive health (Collins et al., 1997). Policies should also address the need to inform workers and supervisors of employee rights and the broad range of workplace risks.

INCLUDE HEALTH PROMOTION

Health and safety laws are designed to prevent industrial disease and accidents, and rarely focus specifically on promoting health, or on preventing reproductive health hazards. Regulations exist to limit exposure for the most toxic substances. Policy makers need to consider developing effective incentives for the development of non-toxic or less toxic alternatives. Government support is needed for research to develop and test less hazardous production technologies and to reduce the use of particularly toxic substances. These approaches, combined with policies that encourage increased worker participation in guaranteeing health and safety in the workplace, could encourage innovation and dissemination of less toxic production alternatives.

RIGHTS TO EMPLOYMENT AND REPRODUCTIVE HEALTH

The Commission on Reproductive Technology (Baird et al., 1993) recommended an obligation to put engineering controls in place to reduce exposure to reproductive hazards so parents would not have to choose between their employment and reproductive health (Sarra, 1996). There currently exists an elaborate human rights regime, articulated in both federal and provincial human rights laws, which prohibits discrimination on the basis of sex. Fetal protection in the workplace cannot be addressed in isolation from women's economic interests and legal rights (Collins et al., 1997).

INFORMATION SHARING AND RESEARCH

Policy development needs to be based on sound research and information. One of the challenges in workplace reproductive health is the lack of information available. Research studies on the impact of designated substances suspected of causing adverse reproductive health effects are needed. Research should not be limited to chemical substances, but should also include biological agents, ergonomic considerations, physical factors, work schedules and other such risks. Occupations with known reproductive hazards need to have appropriate control and prevention measures in place.

Uniform standards in occupational health and safety across the county, in particular in relation to reproductive hazards, need to be established. A cooperative international effort is needed to critically assess existing data on substances that may represent a risk to reproductive health.

PROTECTIVE RE-ASSIGNMENT AND LEAVE

Paid precautionary leave and protective re-assignment policies stipulate that if a pregnant woman or her fetus is considered at risk because of her job, she can take compensated leave or be reassigned to other duties. This is a critical aspect of workplace reproductive health policies. When possible, the emphasis should be placed on improving workplace conditions rather than early leave from work.

In June of 1993, the federal government introduced amendments to Part III of the Canada Labour Code providing maternal reassignment for pregnant workers or nursing mothers. A year after the statutory amendment, the federal government had no documented cases of its use. However, where laws grant protective rights with economic security, pregnant workers have exercised these rights frequently (Sarra, 1996).

COMPLIANCE

If policies are put in place they need to be widely communicated and enforced.
It is often only when unions intervene, generating attention in the media and the legislature, that the government has moved to clear up reproductive health hazards (Sarra, 1996).

In the past, health and safety legislation has been interpreted as balancing worker health and safety against employer economic interest, giving equal weight to both. The effect has generally been not to uphold a worker's health and safety concern, unless there is an explicit standard or regulation enacted which applies to her or his situation. Given that it will be many more years before standards are established for most toxic substances, few workers will be able to effectively use existing health and safety laws to protect their reproductive health (Sarra, 1996). In addition, current safety standards may not apply to many issues related to reproduction, including preconception, pregnancy and breastfeeding.

Resources and Services

Source	Resources and Services
Best Start Resource Centre c/o OPC 180 Dundas Suite West Suite 1900 Toronto, ON, M5G 1Z8 Tel: (416) 408-2249 Fax: (416) 408-2122 beststart@beststart.org www.beststart.org	• Work and Pregnancy Do Mix booklet • Work and Pregnancy Do Mix Poster • Work and Pregnancy Poster • Work and Pregnancy Display • Work and Pregnancy Fact Sheet • Workplace Intervention Package • Work and Pregnancy Newsletter • Prevention of Low Birth Weight in Canada • On and Off Site Consultations • How to Build Partnerships with Workplaces • How to be a Pregnancy Friendly Workplace
Occupational Health Clinic for Ontario Workers 15 Gervais Drive, Suite 308 Don Mills, ON, M3C 1Y8 Tel: (416) 449-0009 Fax: (416) 449-7772 toronto@ohcow.on.ca	• Ergonomics and Pregnancy brochure • Information on specific risks
City of Ottawa 495 Richmond Road Ottawa, ON K2A 4A4 Tel: (613) 722-2328 Fax: (613) 724-4152 info@city.ottawa.on.ca www.city.ottawa.on.ca	• Policy: The Key to a Healthy Workplace, A Guide to making Your Organization Healthier Manual
Motherisk The Hospital for Sick Children Dept. of Clinical Pharmacology 555 University Avenue Toronto, ON, M5G 1X8 Tel: (416) 813-6780	• Pregnancy Wallet Card • Advice and Information
University of North Carolina at Chapel Hill Department of Obstetrics and Gynecology Maternal-Fetal Medicine CB#7570, UNC-Chapel Hill Chapel Hill, NC 275599-7570 Tel: 1-919-966-1601	• New Beginnings Manual
Ontario Human Rights Commission 180 Dundas Street W. 8th Floor Toronto ON M7A 2R9 Tel: (416) 314-4500 Fax: (416) 314-4561 info@ohrc.on.ca www.ohrc.on.ca	• Policy on Discrimination Because of Pregnancy • Pregnancy – Before, During and After: Know Your Rights

References

American Academy of Pediatrics (1997). Noise; A Hazard for the fetus and newborn (RE9728). Policy Statement, 100, Number 4.

Armstrong, B.G., et al. (1989). Work in pregnancy and birth weight for gestational age. British Journal of Industrial Medicine, 46, 196-199.

Axelsson, G., Ahlborg, G., Bodin, L. (1996). Shiftwork, nitrous oxide exposure and spontaneous abortion among Swedish midwives. Occup Environ Med, 53(6): 374-378.

Baird, P., Jantzen, G., Knoppers, B.M., McCutcheon, S.E.M., Scorsone, S.R. (1993). Proceed With Care; Final Report of the Royal Commission on New Reproductive Technologies. Ottawa: Canada Communications Group.

Berkowitz, G.S., Papiernik, E. (1995). Working conditions, maternity legislation, and preterm birth. Semin Perinatol, 19(4): 272-278.

Blosser, F. (1998). Workplace VDT use not a risk for reduced birth weight, premature birth. http://www.cdc.gov/niosh/vdtrisk.html.

Brett, K.M., Strogatz, D.S., Savitz, D.A. (1997). Employment, job strain, and preterm delivery among women in North Carolina. American Journal of Public Health, 87(2): 199-204.

Bryant, H. (1989). Advice on pre-natal work and employment. Can. Fam. Physician, 35, 2323-2327.

Bryant, H.E., Love, E.J. (1991). Effect of employment and its correlates on spontaneous abortion risk. Soc Sci Med, 33(7): 795-800.

Catalano, R., Serxner, S. (1992). The effect of ambient threats to employment on low birthweight. Journal of Health and Social Behaviour, 33, 363-377.

Cefalo, R. C., Moos, M.-K. (1995). Environmental exposures at home and at work. Preconceptional Health Care: A Practical Guide, 2, 38-48.

Chavkin, W. (1986). Work and pregnancy. Review of the literature and policy discussion. Obstetrical and Gynecological Survey, 41, 467-472.

Clement, J. D. (1997). Reproductive health hazards in the pharmaceutical industry. Occupational Medicine: State of the Art Reviews, 12, 131-143.

Collins, B., Hollander, R.B., Koffman, D.M., Reeve, R., Seidler, S. (1997). Women, work and health: Issues and implications for worksite health promotion. Women & Health, 25, 3-38.

Cote, P., Koehoorn, M., Cole, D., Mustard, C. (2000). Report 2000. Institute for Work and Health.

Duxbury, L., Higgins, C. (1997). Supportive managers: What are they? Why do they matter? HRM Research Quarterly, 3,4.

Eakin, J.M., Weir, N. (1995). Canadian approaches to the promotion of health in small workplaces. Canadian Journal of Public Health, 86, 109-113.

Fattibene, P. Mazzei, F., Nuccetelli, C., Risica, S. (1999). Prenatal exposure to ionizing radiation: Sources, effects and regulatory aspects. Scandinavian University Press, 88, 693-702.

Fedoruk, J. (1994). Reproductive and developmental hazard management. ACOEM Guidelines, http://www.acoem.org/paprguid/guides/rdhaz.htm.

Fenster, L. (1999). Psychological stress in the workplace and menstrual function. American Journal of Epidemiology, 149, No.2.

Filkens, K., Kerr, M. J. (1993). Occupational reproductive health risks. Occupational Medicine: State of the Art Reviews, 8, 733-754.

Fortier, I., Marcoux, S., Brisson, J. (1995). Maternal work during pregnancy and the risks of delivering a small-for-gestational-age or preterm infant. Scand J Work Environ Health, 21(6): 412-418.

Fourn, L., Ducic, S., Seguin, L. (1999). Factors associated with low birthweight: A multivariate analysis. Sante, 9(1): 7-11.

Frankish, C.J., Johnson J.L., Ratner P.A., Lovato C.Y. (1997). Relationship of organizational characteristics of Canadian workplaces to anti-smoking initiatives. Prev Med, 26(2): 248-256.

Fuente Fonnest, de la, I., Ellitsgaard, V. (1998). Hand symptoms and pregnancy. Ugeskr Laeger, 160(40): 5791-5794.

Gabbe, S.G., Turner, L.P. (1997). Reproductive hazards of the American lifestyle: Work during pregnancy. Mosby-Year Book, Inc., 826-832.

Gold, E.B., Tomich, E. (1994). Occupational hazards to fertility and pregnancy outcome. Occup Med, 9(3): 435-469.

Goulet, L., Theriault, G. (1987). Association between spontaneous abortion and ergonomic factors. Scand J Work Environ Health, 13(5): 399-403.

Hanke, W., Kalinka, J., Makowiec-Dabrowska, T., Sobala, W. (1999). Heavy physical work during pregnancy – A risk factor for small-for-gestational-age babies in Poland. American Journal of Industrial Medicine, 36, 200-205.

Hartikainen, A.L., Sorri, M., Anttonen, H., Tuimala, R., Laara, E. (1994). Effect of occupational noise on the course and outcome of pregnancy. Scand J Work Environ Health, 20, 444 – 450.

Hatch, M., Ji, B.T., Shu, X.O., Susser, M. (1997). Do standing, lifting, climbing or long hours of work during pregnancy have an effect on fetal growth? Epidemiology, 8(5): 530-536.

Health Canada, Health Protection Branch (1998). Looking at pesticides and pregnancy. http://www.hc-sc.gc.ca/hpb/lcdc /publicat/farmfam/vol6-1/ff6-lj_e.html.

Henriksen, T.B., Hedgegaard, M., Secher, N.J., Wilcox, A.J. (1995). Standing at work and preterm delivery. British Journal of Obstetrics and Gynaecology. 102, 198-206.

Homer, C.J., Sherman, A.J., Seigel, E. (1990). Work-related psychosocial stress and risk of preterm, low birthweight delivery. AJPH, 80, 173-177.

Hunt, P.E. (1992). Reproductive health issues. AAOHN JOURNAL, 40, 72-77.

Khattak, S., Moghtader, G., McMartin, K., Barrear, M., Kennedy, D., Koren, G. (1999). Pregnancy outcomes following gestational exposure to organic solvents: A prospective controlled study. JAMA, 281(12).

Kramer, D. (2000). A reduction in injuries, and a healthier workplace, can be achieved by improving both the physical and the psychosocial environment. Institute for Work and Health. http://www.iwh.on.ca/pages/Research/theme_2/theme2.htm.

Lalande, N.M., Hetu, R., Lambert, J. (1986). Is occupational noise exposure during pregnancy a risk factor of damage to the auditory system of the fetus? Am J Ind Med, 10(4): 427-435.

Landsbergis, P.A., Hatch, M.C. (1996). Psychosocial work stress and pregnancy-induced hypertension. Epidemiology, 7(4): 346-351.

Leuzzie, R.A., Scoles, K.S. (1996). Preconception counselling for the primary care physician. Medical Clinics of North America, 80(2): 337-374.

Lindbohm, M.L. (1999). Women's reproductive health: Some recent developments in occupational epidemiology. American Journal of Industrial Medicine, 36, 18-24.

Luke, B., Avni, M., Min, L., Misiunas, R. (1999). Work and pregnancy: The role of fatigue and the "second shift" on antenatal morbidity. Am J Obstet Gynecol, 181, 1172-1179.

Luke, B., Mamelle, N., Keith, L., Munoz, F., Minogue, J., Papiernik, E., Johnson, T.R. (1995). The association between occupational factors and preterm birth: A United States nurses' study. Research Committee of the Association of Women's Health, Obstetric, and Neonatal Nurses. Am J Obstet Gynecol. 173(3 Pt 1): 849-862.

Makowiec-Dabrowska, T., Siedlecka, J. (1996). Physical exertion at work and the course and outcome of pregnancy. Med Pr, 47(6): 629-649.

Malloy, G. (1984). Stress, pregnancy, and the workplace. Occupational Health and Nursing. September: 474-479.

Marcus, M., McChesney, R., Golden, A., Landrigan, P. (2000). Video display terminals and miscarriage. JAMWA, 55(2): 84-88.

Mares, P., Baran, P. (1989). Adverse effects of the work process in relation to pregnancy. Cesk Gynekol, 54(6): 401-406.

McMartin, K., Koren, G. (1999). Exposure to organic solvents. Does it adversely affect pregnancy? www.motherisk.org/publi/update/jul99.

Messing, K. (2000.) Ergonomic studies provide information about occupational exposure differences between women and men. JAMWA., 55(2): 72-75.

Messing, K. (1998). One Eyed Science. Philadelphia: Temple University Press.

Messing, K. (1997). Women's occupational health in Canada: A critical review and discussion of current issues. Women & Health, 25 (4).

Messing, K., Saurel-Cubizolles, M-J., Bourgine, M., Kaminski, M. (1993). Factors associated with dysmenorrhea among workers in French poultry slaughter houses and canneries. JOM, 35, 393-500.

Misner, S.T., Hewitt, J.B., Levin, P.F. (1999). Women and occupational health. Occupational Health Impacts. http:// www.hc-sc.ca/datapcb/datawhb/conference/papers/usa/english/occupat.htm.

Misra, D. P., Nguyen, R.H.N. (1999). Environmental tobacco smoke and low birth weight: A hazard in the workplace? Environmental Health Perspectives, 107, 897-904.

Mozurkewich, E.L., Luke, B., Avni, M., Wolf, F.M. (2000). Working conditions and adverse pregnancy outcome: A meta-analysis. Obstetrics and Gynecology, 95, 632-635.

Nakamura, H., Ohsa, W., Okazawa, T., Yoshida, M., Okada, A. (1996). Uterine circulatory dysfunction induced by whole body vibration and it's endocrine pathogenesis in the pregnant rat. Eur J Appl Physiol Occup Physiol, 72(4):292-296.

National Institute for Occupational Safety and Health (N.d.). NIOSH No. 96-132 & No. 99-104. http;//www.cdc.gov/niosh.

Nicholls, J.A., Grieve, D.W. (1992). Performance of physical tasks in pregnancy. Ergonomics, 35, 301-311.

Nicholson, P.J., D'Auria, D.A. (1999). Shiftwork, health, the working time regulations and health assessments. Occup Med, 49(3): 127-137.

Nurminen, T. (1998). Shiftwork and reproductive health. Scand J Work Environ Health, 24 suppl 3(9): 28-34.

Nurminen, T. (1995a). Female noise exposure, shift work, and reproduction. JOEM, 37, 945-950.

Nurminen, T. (1995b). Maternal pesticide exposure and pregnancy outcome. JOEM. 37, 935-940.

Okada, K. (1991). Effects of long-term corporate fitness program on employees' health. J Nutr Sci Vitaminol (Tokyo), 37, Suppl: S131-138.

Ontario Human Rights Commission (1999). Pregnancy – Before, During and After: Know Your Rights. http://www.ohrc.on.ca/english/publications/pregnancy99_eng.htm.

Ontario Women's Directorate (N.d.). Work and Family; A Fact Sheet.

Papiernik, E. (1993). Prevention of preterm labour and delivery. Baillieres Clin Obstet Gynaecol, 7(3): 499-521.

Paul, M. (1997). Occupational reproductive hazards. The Lancet, 349, 1385-1388.

Paul, M. (1993). Occupational & Reproductive Hazards. Williams & Wilkins.

Paul, M., Himmelstein, J. (1988). Reproductive hazards in the workplace: What the practitioner needs to know about chemical exposures. Obstet & Gynecol., 71, 921-938.

Peoples-Sheps, M.D., Siegel, E., Suchindran, C.M., Origasa, H., Ware, A., Barakat, A. (1991). Characteristics of maternal employment during pregnancy: Effects on low birth weight. American Journal of Public Health, 81, 1007-1012.

Polanyi, M., Eakin, J., Frank, J., Shannon, H., Sullivan, T. (1996). Creating healthier work environments: A critical review of the health impacts of workplace organizational change. Institute for Work and Health, Working Paper No. 39.

Richmond, R., Kehoe, L., Heather, N., Wodak, A. (2000). Evaluation of a workplace brief intervention for excessive alcohol consumption: the workscreen project. Prev Med, 30(1): 51-63.

Robson, L.S., Polanyi, M.F., Kerr, M.S., Shannon, H.S. (1998). How the Workplace Can Influence Employee Illness and Injury. Institute for Work and Health, Occasional Paper No. 8.

Romito, P. (1989). Women's paid and unpaid work and pregnancy outcome: a discussion of some open questions. Health Promotion, 4, 31-41.

Sarra, J. (1996). Protecting workers' reproductive health: Lessons from Quebec and other statutory regimes. University of Toronto Faculty of Law Review, 53, http://www.law-lib.utoronto.ca/law-review/utlr53-2/sarra.htm.

Saurel-Cubizolles, M.J. (1992). Daily commuting and preterm birth rate. Am J Obstet Gynecol, 167(2): 571-572.

Savitz, D.A., Whelan, E.A., Kleckner, R.C. (1989). Effect of parents' occupational exposures on risk of stillbirth, preterm delivery, and small-for-gestational-age infants. American Journal Epidemiology, 129, 1201-1218.

Schenker, M.B., Eaten, M., Green, R., Samuels, S. (1997). Self-reported stress and reproductive health of female lawyers. JOEM, 39(6): 556-568.

Seidel, H. (1993). Selected health risks caused by long term whole body vibration. Am J Ind Med, 23(4): 589-604.

Seidler, A., Raum, E., Arabin, B., Hellenbrand, W., Walter, U., Schwartz, F.W. (1999). Maternal occupational exposure to chemical substances and the risk of infants small-for-gestational-age. American Journal of Industrial Medicine, 36, 213-222.

Shortridge-McCauley, L.A. (1995). Reproductive hazards: An overview of exposures to health care workers. American Association of Occupational Health Nurses, 43, 614-621.

Schuurmans, N., et al. (1998). Healthy Beginnings: Guidelines for Care During Pregnancy and Childbirth. Society of Obstetricians and Gynaecologist of Canada.

Sohn, C., Kesternich, P., Fendel, H. (1989). The effect of body position on uterine blood flow in the 3d trimester of pregnancy. Ultraschall Med, 10(1): 10-14.

Stellman, J.M. (2000). Perspectives on women's occupational health. JAMWA 55(2): 69 -71.

Swanson, N., (2000). Working women and stress. JAMWA, 55(2): 76-79.

Tas, S., Lauwerys, R., Lison, D. (1996). Occupational hazards for the male reproductive system. Critical Reviews in Toxicology, 26, 261-307.

Taskinen, H.K., Olsen, J., Bach, B. (1995). Experiences in developing legislation protecting reproductive health. JOEM, 37, 974-979.

Teitelman, A.M., Welch, L.S., Hellenbrand, K.G., Bracken, M.B. (1990). Effect of maternal work activity on preterm birth and low birth weight. American Journal of Epidemiology, 131,104-113.

Tophoj, A., Mortensen, J.T. (1999). Pregnancy related and work related leave of pregnant women. Ugeskr Laeger, 161(36): 5009-5013.

Toppari, J., Larsen, J.C., Christiansen, P., Giwercman, A., Grandjean, P., Guillette, L.J.Jr., Jegou, B., Jensen, T.K., Jouannet, P., Keiding, N., Leffers, H., McLachlan, J.A., Meyer, O., Muller, J., Rajpert-De Meyts, E., Scheike, T., Sharpe, R., Sumpter, J., Skakkebaek, N.E. (1996). Male reproductive health and environmental xenoestrogens. Environ Health Perspect, 104 Suppl 4: 741-803.

Tuntiseranee, P., Geater, A., Chongsuvivatwong, V., Kor-anantakul, O. (1998). The effects of heavy maternal workload on fetal growth retardation and preterm delivery. A study among southern Thai women. J Occup Environ Med, 40(11): 1013-1021.

Turcotte, G. (1992). How pregnant workers see their work, its risks and the right to precautionary leave in Quebec. Women & Health, 18, 79-95.

Voices for Children (N.d). Work and Family-Friendly Initiatives fact sheet. www.voices4children.org/factsheet/background2-3.htm.

Walker, S.P., Higgins, J.R., Pemezel, M., Brennecke, S.P. (1999). Maternal work and pregnancy. Aust and NZ Journal of Obstetrics and Gynaecology, 39, 144-151.

Welch, L., Paul, M. (1998) Reproductive and developmental hazards. AAOHN February 46(2): 57 - 63.

Whorton, M.D. (1983). Adverse reproductive outcomes: The occupational health issue of the 1980s. AJPH, 73, 15-16.

Xu, X., Ding, M., Li, B., Christiani, D.C. (1994). Association of rotating shiftwork with preterm births and low birth weight among never smoking women textile workers in China. Occup Enviorn Med, 51, 470-474.

Youngkin, E., Davis, M.S. (1994). Women's Health and Primary Care Clinical Guide Appleton and Lang. Norwalk. Conn.

Zhang, H., Bracken, M.B. (1996). Tree-based, two-stage risk factor analysis for spontaneous abortion. Am J Epidemiol, 144(10): 989-996.

Zuckerbrot, J. (1989). Fear of the unknown, Chemical reproductive hazards. OHS Canada, 5 No3 May - June.