



Työterveyslaitos

Reproductive health and work, from research to protection

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Protection of reproductive health at work

- Legislation on special maternity leave and on protection of reproductive health at work in Finland in 1991
 - Compensation from the national sickness insurance
 - Protection of reproductive health at work taken into account in the work safety regulations
- European Council Directive (92/85/EEC of 19 October 1992) on the introduction of measures to encourage improvements in the safety and *health at work of pregnant workers and workers* who have recently given birth or are breastfeeding
- The Finnish regulations are harmonized with the directive

Legislation on special maternity leave (1224/2004) in Finland

- Concerns exposure to **chemical substances, radiation, infectious agents**
 - hazardous to the fetus or to the pregnancy
 - when no safe work can be found
- **Anesthetic gases**
- **Lead or lead compounds**
- **Mercury or its compounds**
- **Cytostatic drugs**
- **Carbon monoxide**
- **Organic solvent**
- **Pesticide (if reproductive toxicity reported)**
- **Chemicals toxic to reproduction, and carcinogenic and mutagenic chemicals (classified)**
- **Environmental tobacco smoke**
- **Ionizing radiation**
- **Pressure (e.g. diving)**
- **Underground mining**
- **Infectious diseases** : toxoplasmosis, listeriosis, Rubella, herpes, varicella, hepatitis B and C, cytomegalovirus infection, HIV

Maternal Exposure to Lead and Spontaneous Abortions

| | <u>B-Pb $\mu\text{mol/l}^*$</u> | <u>OR</u> | <u>95% CI</u> |
|-------------------------------------------------------------------------|--------------------------------------------|-----------|---------------|
| Monitored workers | 0.5-3.1 | 0.8 | 0.5-1.4 |
| Workers monitored within a year from pregnancy (Taskinen 1988) | ≥ 1.4 | 1.9 | 0.4-9.4 |

*) Reference value for the non-exposed in Finland: B-Pb 0.3 $\mu\text{mol/l}$

Adjusted odds ratio of spontaneous abortion for exposure to mercury, x-radiation and anesthetic gases among dental care personnel (Lindbohm et al, 2006)

| Agent | Cases | Controls | Odds ratio | 95% CI |
|----------------|-------|----------|------------|-----------|
| Mercury: low | 39 | 98 | 1.0 | 0.6 – 1.6 |
| moderate | 23 | 36 | 1.8 | 1.0 – 3.3 |
| high | 28 | 61 | 1.2 | 0.7 – 2.0 |
| X-radiation: | | | | |
| ≤10 times/week | 12 | 40 | 0.6 | 0.3 – 1.3 |
| >10 times/week | 10 | 17 | 1.3 | 0.6 – 3.1 |

Maternal exposure to antineoplastic agents and spontaneous abortion

| Study | RR or OR | 95% CI |
|---------------------------|----------|----------|
| Selevan et al 1985 | 2.3 | 1.2-4.4 |
| Stücker et al 1990 | 1.7 | 1.1-2.5 |
| Valanis et al 1997 | 1.5 | 1.2-1.8 |
| Skov et al 1992 | 0.74 | 0.4-1.38 |

Maternal exposure to organic solvents and spontaneous abortions

| Solvent (≥ 3 days/week) | Odds ratio | 95% CI |
|--------------------------------------|------------|------------|
| Aliphatic hydrocarbons | 1.0 | 0.4 - 2.5 |
| Aromatic | 2.7 | 1.3 - 5.6 |
| - xylene | 3.1 | 1.3 - 7.5 |
| - toluene | 4.7 | 1.4 - 15.9 |
| Halogenated hydrocarbons | 1.8 | 0.9 - 3.7 |
| Combined solvent exposure (index) | 2.3 | 1.1 - 4.3 |

(Taskinen ym. 1994)

Adjusted odds ratio of spontaneous abortion for exposure to solvents and disinfectants among dental care personnel (Lindbohm et al, 2006)

| Agent | Cases | Controls | Odds ratio | 95% CI |
|-------------------|-------|----------|------------|-----------|
| Solvents | 134 | 287 | 1.3 | 0.8 – 2.3 |
| Ethanol | 115 | 240 | 1.4 | 0.9 – 2.2 |
| Chloroform | 63 | 145 | 1.1 | 0.8 – 1.6 |
| Isopropanol | 54 | 116 | 1.1 | 0.7 – 1.7 |
| Disinfectants | 62 | 124 | 1.4 | 0.9 – 2.1 |
| low exposure | 24 | 46 | 1.4 | 0.8 – 2.5 |
| moderate exposure | 31 | 55 | 1.6 | 1.0 – 2.8 |
| high exposure | 7 | 23 | 0.7 | 0.3 – 1.8 |

Adjusted odds ratio of spontaneous abortion for exposure to acrylate compounds among dental care personnel (Lindbohm et al, 2006)

| Agent | Cases | Controls | Odds ratio | 95% CI |
|--------------------------------|-------|----------|------------|-----------|
| 2-hydroxyethylmethacrylate | | | | |
| ≤10 times a week | 11 | 22 | 1.5 | 0.7 - 3.5 |
| 11-40 times a week | 57 | 121 | 1.2 | 0.8 – 1.8 |
| >40 times a week | 31 | 70 | 1.3 | 0.8 – 2.2 |
| Polymethylmethacrylate dust | 92 | 192 | 1.3 | 0.9 – 1.9 |
| Triethyleneglycol dimethacryl. | | | | |
| ≤10 times a week | 50 | 111 | 1.2 | 0.8 – 1.9 |
| >10 times a week | 46 | 98 | 1.2 | 0.8 – 2.0 |
| Methyl methacrylate | | | | |
| <1 ppm | 63 | 140 | 1.1 | 0.7 – 1.6 |
| 1-20 ppm | 6 | 13 | 1.0 | 0.4 – 2.9 |

Parvovirus B19 in Foetal Deaths, an ongoing study (Riipinen et al.)

- **Background**
During the study years 73,468 live births and 313 intrauterine fetal deaths (UFDs) in Helsinki
- B19 epidemic in Finland, from 1992 to 1993
- **Our study**
PCR-identification of the viral DNA in paraffin-embedded tissues from 548 fetuses
- **Study periods**
7/1992-12/1995
1/2003-12/2005

| Tissues from | N |
|-----------------------|------------|
| Induced abortions | 247 |
| Spontaneous abortions | 125 |
| IUFD | 176 |
| All | 548 |

Parvovirus B19

An ongoing study

1. A register study on the risk of the infection to the pregnancies of kindergarten employees
2. IgG measurements from blood specimens collected from pregnant women during pregnancy
3. Identification of parvovirus B19 by PCR from the tissue specimens of intrauterine death cases (IUFD), miscarriages and induced abortions

Preliminary results

- The prevalence of B19 DNA-positive fetuses among IUFD was 2.3% (4/176)
- Low compared with other studies:
 - ~ 15 % (Tolvfenstam 2001, Norbeck 2002); ~ 7.5 % (Skjöldebrand-Sparre et al 2000)
- We found a five-fold amount of B19 DNA-positive fetuses during the epidemic period (2.7% vs. 0.5%).
- Only one mother of B19 DNA-positive fetus worked with children → the risk for B19 infection among day-care workers could not be established

B19 DNA-positive fetuses (Riipinen et al., 2007)


| | N | B19 DNA-positive | B19 DNA-positive (%) |
|---------------------------------|----------|-------------------------|-----------------------------|
| All | 548 | 5 | 0.9 |
| - IUFD | 176 | 4 | 2.3 |
| - Spontaneous abortions | 125 | 1 | 0.8 |
| - Induced abortions | 247 | 0 | 0 |
| - The B19-epidemic year | 110 | 3 | 2.7 |
| - The non-epidemic years | 438 | 2 | 0.5 |

Special maternity leaves in 1998-2004 in Finland (from 60 000 births/y)

| Year | Costs, € | Days/year | Women, No |
|-----------|---------------|-------------|-----------|
| 1992-1999 | about 212 005 | below 5 000 | 54-86 |
| 2000 | 517 090 | 12 288 | 171 |
| 2001 | 912 189 | 24 429 | 330 |
| 2002 | 1 540 358 | 39 008 | 478 |
| 2003 | 1 800 119 | 43 469 | 561 |
| 2004 | 1 599 546 | 31 155 | 645 |
| 2005 | 2 381 746 | 55 148 | 686 |
| 2006 | | | 681 |

Causes of Special Maternity Leave, 2006 (Total 610 accepted; 71 not accepted)

| <u>Exposure</u> | <u>Accepted</u> | Not accepted |
|---------------------------|-----------------|--------------|
| Anesthetic gases | 8 | 2 |
| Lead | 3 | 1 |
| Organic solvents | 61 | 7 |
| Carbon monoxide | 46 | 3 |
| Carcinogens | 19 | 0 |
| Env. tobacco smoke | 405 | 24 |
| Other chemicals | 28 | 16 |
| Radiation | 3 | 1 |
| Infectious agents | 37 | 17 |

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- Improved working conditions and increased awareness influence on the need and use of the special maternity leave
 - The exposure levels may be very different in various countries
 - The safety of the fetus and the safe, not discriminated employment of women are important goals

Thank you!

Examples of recommended limits of exposure during pregnancy (Finland)

| <u>Agent</u> | <u>Limit</u> |
|--------------------------------------------|----------------------------------------------------------------------------------|
| Anesthetic gases | Halothane and nitrous oxide: 10% of TLV; others (various fluranes) <TLV |
| Lead and (non-carcinogenic) lead compounds | B-Pb < 3 micromoles/L (comparable to the non-exposed) |
| Mercury and its compounds | U-Hg < 50 nmol/l B-Hg <25 nmol/l |
| Cytostatic drugs | Preparing the solutions and injections prohibited (accidental exposure possible) |
| Carbon monoxide | <9 ppm (10 mg/m ³) |
| Organic solvents | 10% of TLV |