

TRAINING FOR THE HEALTH SECTOR
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PREVENTING REPRODUCTIVE HEALTH PROBLEMS

(Draft for review)

Training Module 6
Children's Environmental Health
Public Health and the Environment
World Health Organization
www.who.int/ceh

November 2011

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<<NOTE TO USER: Please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation in the space indicated.>>

<<NOTE TO USER: This is a large set of slides from which the presenter should select the most relevant ones to use in a specific presentation. These slides cover many facets of the problem. Present only those slides that apply most directly to the local situation in the region or replace them with your own slides and local data.>>

<<NOTE TO USER: This module presents several examples of risk factors that affect reproductive health. You can find more detailed information in other modules of the training package that deal with specific risk factors, such as lead, mercury, pesticides, persistent organic pollutants, endocrine disruptors, occupational exposures; or disease outcomes, such as developmental origins of disease, reproductive effects, neurodevelopmental effects, immune effects, respiratory effects, and others.>>

<<NOTE TO USER: For more information on reproductive health, please visit the website of the Department of Reproductive Health and Research at WHO:
www.who.int/reproductivehealth/en/>>

LEARNING OBJECTIVES

- ❖ Understanding the importance of preventing environmental exposures to protect reproductive health
- ❖ Understand various methods of prevention in public health, including in the occupational setting, for the consumer, and in personal matters

<<READ SLIDE.>>

Refs:

•WHO. Department of Reproductive Health and Research, Partner Brief. Geneva, Switzerland, *World Health Organization*, 2009. WHO/RHR/09.02. Available at whqlibdoc.who.int/hq/2009/WHO_RHR_09.02_eng.pdf – accessed 15 June 2011

•WHO. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference. New York, United States of America, *World Health Organization*, 1946.

OUTLINE

- ❖ The importance of implementing preventive measures

- ❖ Methods of prevention
 - A. Occupational
 - B. Consumer / Policies
 - C. Personal

- ❖ Tools available from WHO

<<READ SLIDE.>>

Refs:

•WHO. Department of Reproductive Health and Research. Geneva, Switzerland, World Health Organization, 2009. (WHO/RHR/09.02). Available at whqlibdoc.who.int/hq/2009/WHO_RHR_09.02_eng.pdf – accessed July 2010

•WHO. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference. New York, USA, *World Health Organization*, 1946. Available at www.who.int/about/definition/en/print.html – accessed July 2010

METHODS OF PREVENTION

- A. Occupational
- B. Consumer/Policies
- C. Personal

Prevention is cost-effective and could have benefits that go well beyond health, and contribute to the overall health and well-being of communities



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Environmental issues have been included in the United Nations Millennium Declaration as well as several high level initiatives. However, the importance of preventive methods in various sectors is not always fully appreciated. The following slides will describes preventive methods for different exposure situations.

Refs:

- UN Millennium Development Goals. Available at www.un.org/millenniumgoals/bkgd.shtml accessed 20 June 2010.
- WHO. Preventing disease through healthy environments. Geneva, Switzerland, *World Health Organization*, 2006.

Image: WHO, Prüss-Üstün, A. Preventing disease through healthy environments. Geneva, Switzerland, World Health Organization, 2006.

A. OCCUPATIONAL EXPOSURES

- ❖ Prime venue of toxic environmental exposures
- ❖ Scant research that characterizes reproductive hazards
- ❖ A big percentage of working men and women are of reproductive age



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The occupational setting is a prime venue for exposure to environmentally hazardous contaminants, including synthetic chemicals, organic compounds, and metals. Occupational health agencies use field studies, exposure assessments, and laboratory biomonitoring to study prioritized reproductive toxicants that may be present in the workplace. However, it is impossible to assess the toxicity of all occupationally relevant chemicals due to their sheer volume, complex exposure environments in the workplace, and individual susceptibility to effects.

<<NOTE TO USER: For more information regarding occupational exposures to environmental contaminants, please see the educational training module: "Occupational Health and Children's Risks," available at: www.who.int/ceh/capacity/occupational.pdf.>>

Refs:

•Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC). Recommendations to U.S. EPA on Endocrine Disruptor Screening and Testing. Endocrine Disruptor Screening and Testing Advisory Committee. 1998. Available at www.epa.gov/scipoly/oscpendo/edsp/overview/finalrpt.htm - accessed 18 March 2010.

•Grajewski B et al. Occupational exposures and reproductive health: 2003 Teratology Society meeting symposium summary. *Birth Defects Res B Dev Reprod Toxicol*. 2005, 74:157–163.

The effect of shift work, and circadian rhythm disruption, on reproductive outcomes is poorly understood, although advances have been made in the development of metrics for measuring disruption of circadian rhythm in working populations. One such metric is the variability of 2-sulfoxymelatonin, the urinary metabolite of melatonin, which has been found to be correlated with travel by female flight attendants through multiple time zones

OCCUPATIONAL EXPOSURES AND REPRODUCTIVE HEALTH

Possible effects on future fathers

- ❖ Decreased sperm count
 - Estrogens, lead
- ❖ Decreased sexual drive
 - Chloroprene, stress
- ❖ Changes in genetic material (birth defects)
 - Radiation, pesticides

Possible effects on future mothers

- ❖ Menstrual disorders
 - Ionizing radiation, pesticides, fumonisins
- ❖ Reduced fertility
 - Arsenic, benzene, pesticides
- ❖ Changes in genetic material (birth defects, miscarriages)
 - Cadmium, mercury, pesticides

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Future parents can be exposed at their workplaces to many occupational health risks that can affect their ability to have children or the health of their future children. Both men and women can be affected by reproductive occupational health risks.

Exposures to some chemicals or to stressful conditions may cause both male and female workers to experience a decrease in their desire or ability to have sex. For example, some chemicals may have depressant effects, such as certain solvents, and thus can suppress the libido (sex drive).

Occupational exposures can also cause menstrual problems, which may prevent ovulation from taking place.

Stress, working on shifts, or exposure to certain organic solvents can disrupt the normal menstrual cycle, which in turn can affect fertility. Another possible effect of exposure to certain occupational hazards is their ability to cause direct damage to the germ cells (sperm and eggs). Radiation and certain chemicals can cause decreased fertility or even sterility.

Occupational risks can reduce the number of sperm to a level below the minimal necessary for fertilization.

Certain occupational hazards can cause mutations in genetic material that can be passed on to future generations. Such hazards are called mutagens. Genetic mutations can result in birth defects, stillbirth or miscarriage, depending on the type of damage caused.

Refs:

•International Labour Organization (ILO). Male and female reproductive hazards in the workplace. ILO.

Available at actrav.itcilo.org/actrav-english/telearn/osh/rep/prod.htm – accessed 10 June 2011

•US Navy Environmental Health Centre. Reproductive and developmental hazards: a guide for occupational health professionals. *US Navy Environmental Health Centre*, 2001, available at www-nehc.med.navy.mil/Downloads/Occmed/Reprodev2006.pdf - accessed 10 June 2011

MECHANISMS FOR PREVENTING OCCUPATIONAL EXPOSURES

Regulatory mechanisms:

- Encouraging “clean technologies”
- Implementing effective occupational exposure limits
 - For chemicals with threshold effects and carcinogenic endpoints
- Right-to-Know (US legal principle that individuals have the right to know the chemicals to which they may be exposed in their daily living)
- Industrial occupational regulations
 - Provisions of personal protective equipment (PPE) for workers

Individual mechanisms

- Nutritional supplementation
 - e.g. folate supplements for women
- Knowledge of workers’ rights
- Worker education on adherence to safety guidelines and personal protective equipment

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A study (Ormond et. al) found that although mothers exposed occupationally to endocrine disruptors faced an increased risk for fetal developmental disorders, folate supplementation during the first three months of pregnancy could significantly decrease the aforementioned risk. In the United States, the “Right to know” is the legal principle that individuals have the right to know the chemicals to which they may be exposed in their daily living. “Right to Know” US can address the community and the workplace “Right to Know”.

Note: PPE is Personal Protective Equipment

Refs:

•Ormond G et al. Endocrine Disruptors in the Workplace, Hair Spray, Folate Supplementation, and Risk of Hypospadias: Case–Control Study. *Environ Health Perspect.* 2009, 117:303-307.

Hypospadias is one of the most common urogenital congenital anomalies affecting baby boys. Prevalence estimates in Europe range from 4 to 24 per 10,000 births, depending on definition, with higher rates reported from the United States. Relatively little is known about potential risk factors, but a role for endocrine-disrupting chemicals (EDCs) has been proposed. Our goal was to elucidate the risk of hypospadias associated with occupational exposure of the mother to endocrine-disruptor chemicals, use of folate supplementation during pregnancy, and vegetarianism. We designed a case–control study of 471 hypospadias cases referred to surgeons and 490 randomly selected birth controls, born 1 January 1997–30 September 1998 in southeast England. Telephone interviews of mothers elicited information on folate supplementation during pregnancy and vegetarianism. We used a job exposure matrix to classify occupational exposure. Results In multiple logistic regression analysis, there were increased risks for self-reported occupational exposure to hair spray [exposed vs. nonexposed, odds ratio (OR) = 2.39; 95% confidence interval (CI), 1.40–4.17] and phthalate exposure obtained by a job exposure matrix (OR = 3.12; 95% CI, 1.04–11.46). There was a significantly reduced risk of hypospadias associated with folate use during the first 3 months of pregnancy (OR = 0.64; 95% CI, 0.44–0.93). Conclusions: Excess risks of hypospadias associated with occupational exposures to phthalates and hair spray suggest that antiandrogenic EDCs may play a role in hypospadias. Folate supplementation in early pregnancy may be protective.

•Damgård Nielsen G, Ovrebø S. Background, approaches and recent trends for setting health-based occupational exposure limits: A minireview. *Regul Toxicol Pharmacol.* 2008, 51(3): 253-269.

The setting of occupational exposure limits (OELs) are founded in occupational medicine and the predictive toxicological testing, resulting in exposure–response relationships. For compounds where a No-Observed-Adverse-Effect-Level (NOAEL) can be established, health-based OELs are set by dividing the NOAEL of the critical effect by an overall uncertainty factor. Possibly, the approach may also be used for carcinogens if the mechanism is epigenetic or the genetic effect is secondary to effect from reactions with proteins such as topoisomerase inhibitors, and mitotic and meiotic spindle poisons. Additionally, the NOAEL approach may also be used for compounds with weak genotoxic effect, playing no or only a minor role in the development of tumours. No health-based OEL can be set for direct-acting genotoxic compounds where the life-time risks may be estimated from the low-dose linear non-threshold extrapolation, allowing a politically based exposure level to be set. OELs are set by several agencies in the US and Europe, but also in-house in major chemical and pharmaceutical companies. The benchmark dose approach may in the future be used where it has advantage over the NOAEL approach. Also, more attention should be devoted to sensitive groups, toxicological mechanisms and interactions as most workplace exposures are mixtures.

RECOMMENDATIONS FOR INDUSTRY

- ❖ Increase screening of chemicals
 - Gap exists between the number of chemicals that are in commerce and the number that have been thoroughly tested
- ❖ Apply regulatory policies
 - Ensure worker protection via legislation
- ❖ Increase spectrum of population considered “exposed”
 - Not only women of childbearing age but also all working women, all working men, and all of their potential offspring
- ❖ New end points of reproductive health assessments
 - Female entry into menopause transition

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Due in part to the ever increasing number of chemicals that are created every year, effective screening methods should be employed to gauge safety before they are used. High cost of screening assays is the prime reason for the gap that exists between existing chemicals and screened chemicals.

Because the transition to menopause marks the beginning of a series of important hormonal change, occupational health agencies have suggested using this female endpoint in worker health assessments. A standard definition of the start of the menopausal transition would also allow important comparisons across occupational health studies.

Ref:

•Lisabeth L, Harlow S, Qaqish B. A new statistical approach demonstrated menstrual patterns during the menopausal transition did not vary by age at menopause. *J Clin Epidemiol.* 2004. 57: 484–496

RECOMMENDATIONS FOR WORKERS AND EMPLOYERS

- ❖ Pregnant women should not work without protection in occupational settings that put them at risk for exposure
 - ❖ Mining with mercury
 - ❖ Spraying crops with pesticides
- ❖ Open dialogue with employers about occupational safety and methods of preventing exposures
- ❖ Pay close attention to health status, do not ignore symptoms



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Image: WHO

EXAMPLE: PREVENTING PESTICIDE EXPOSURE

- ❖ Do not use pesticides unnecessarily
- ❖ Promote the use of safer pest control methods in agriculture and the protection of agricultural workers
- ❖ Do not participate in occupational pesticide application if pregnant or if you plan to be pregnant in near future
- ❖ Do not allow children to participate in occupations with pesticide exposure
- ❖ If employed in occupations with pesticide exposure, utilize personal protective equipment, if possible
- ❖ Change your clothes after occupational exposure to avoid take home exposure risks
- ❖ Avoid unnecessary use of pesticides around home environment; when pest control is needed use the safest possible method like bait traps
- ❖ Apply pesticides with methods that avoid drift into surrounding communities and contamination of food and drinking water supplies.

<<READ SLIDE.>>

<<NOTE TO USER: Please adapt this slide to your specific country or region.>>

Ref:

•Stillerman KP et al. Environmental exposures and adverse pregnancy outcomes: a review of the science. *Reproductive Sciences*, 2008, 15(7): 631-650.

FUTURE OCCUPATIONAL CHALLENGES

- ❖ Rise of nanotechnology
 - Reproductive risks have not been studied; *can some nanomaterials cross the placenta? Are some potentially developmental toxicants?*
 - Lack of data: need to investigate the potential reproductive health risks in occupational settings

- ❖ Multiplicative or synergistic exposures
 - Physical hazards in concert with chemical hazards (mixtures)
 - How to develop appropriate risk assessment paradigms if exposure to each chemical is below “safe level” but cumulative exposures are too great?

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Engineered nanomaterials are uniformly sized materials < 100 nm (1 nanometer = 10⁻⁹ meter)]. The potential toxicological hazards associated with the increasing commercial uses of nanotechnology are not well understood.

In terms of multiple exposures and synergistic effects of chemicals, greater research is needed on the specific mechanisms of toxicity of toxicants in order to understand what sort of risk assessment framework can be used. The effects of physical hazards in concert with chemical hazards will be very difficult to assess as exposures increase. Whole-body vibration can affect androgen levels just as chemical toxicants can (Cardinale and Pope 2003).

Ref:

- Cardinale M, Pope MH. The effects of whole body vibration on humans: dangerous or advantageous? *Acta Physiol Hung.* 2003, 90(3):195–206.
- Colvin V. The potential environmental impact of engineered nanomaterials. *Nat Biotechnol.* 2003, 21:1166–1170

More information:

- International Labour Organization. www.ilo.com
- WHO. Healthy workplaces: a model for action. For employers, workers, policy-makers and practitioners. *WHO.* 2011.
- WHO Occupational health homepage:www.who.int/occupational_health/healthy_workplaces/en/

B. CONSUMER PROTECTION FROM ENVIRONMENTAL EXPOSURES

Actions can be taken at multiple levels:

- Societal / policies
- Industry/business
- Individual



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SOCIETAL ACTIONS FOR CONSUMER PROTECTION

Need for a coordinated effort between researchers, elected officials, medical professionals, and business leaders to continue research into field of reproductive health and the environment:

1. Support better research on potential reproductive health toxicants, including long-term and multi-generational studies
2. Support policies that prevent exposure to environmental agents that have not been proven safe
3. Research on synergistic exposures and mixtures
4. Research to identify susceptible populations

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As a society, there is need for coordinated actions, international agreements, and strengthened domestic laws.

Refs:

- Stillerman, KP et al. Environmental Exposures and Adverse Pregnancy Outcomes: A Review of the Science. *Reproductive Sciences*, 2008, 15(7): 631-650.
- The Collaborative on Health and the Environment. Hormone Disruptors and Women's Health: Reasons for Concern. Available at www.healthandenvironment.org/articles/doc/5492 - accessed March 20, 2010.
- WHO. Preventing Disease Through Healthy Environments. Geneva, Switzerland, *World Health Organization*, 2006.

EXAMPLES OF INTERNATIONAL AGREEMENTS

- ❖ Stockholm Convention on Persistent Organic Pollutants (POPs)
 - Signed by 90 countries in 2001 to eliminate or reduce the use of persistent organic pollutants including DDT (dichlorodiphenyltrichloroethane), PCBs (polychlorinated biphenyls), dioxins
 - Provisions to add additional POPs to Convention

- ❖ Rotterdam Convention on Prior Informed Consent
 - Includes a number of the most toxic organophosphate pesticides and other very hazardous substances
 - Allows member nations the right to refuse import of harmful substances on the Prior Informed Consent list

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Organochlorine pesticides are highly lipophilic organic pollutants that persist in the environment, accumulate in the food chain and are regularly detected in humans. Dichlorodiphenyltrichloroethane (DDT) was banned in the US in the 1970s. Replacement pesticides for DDT are insecticides such as organophosphates.

Organophosphate pesticides are the most heavily used pesticide products in US agriculture.

Organophosphate pesticides inhibit the acetylcholinesterase in synaptic clefts, which then deregulates the metabolism of acetylcholine.

Acetylcholine is a neurotransmitter critical to skeletal-muscle motor neurons. Continued inhibition causes accumulation of acetylcholine at the neuronal junctions and results in continued stimulation and then suppression of the neurotransmission.

Ref:

•Stillerman, KP et al. Environmental Exposures and Adverse Pregnancy Outcomes: A Review of the Science. *Reproductive Sciences*, 2008, 15(7): 631-650.

Rotterdam Convention - www.pic.int/ - accessed 10 June 2011

Stockholm Convention - www.pops.int/ - accessed 10 June 2011

NATIONAL LEGISLATION

National legislation is needed to:

- Track the introduction and presence of chemicals and pesticides in society
- Provide authorities for import and export and obligations under international agreements
- Provide authority for provision of hazard and exposure information, registration and authorization uses of pesticides and industrial chemicals

<<READ SLIDE.>>

Refs:

•WHO. Preventing disease through healthy environments. Geneva, Switzerland, *World Health Organization*, 2006. Available at www.who.int/quantifying_ehimpacts/publications/preventingdisease/en/index.html - accessed 21 September 2011.

•Program on Reproductive Health and the Environment. Shaping our legacy: reproductive health and the environment. *University of California, San Francisco*. 2008.

ACTIONS BY INDUSTRY

- ❖ **WHY?**
 - *Corporate Responsibility!*
- ❖ **Manufacturers**
 - Switch to cleaner technologies
 - Provide clear information about hazards of products and necessary protections by workers and consumers
 - Provide worker protection and education
 - Assure safety of all products intended for use by children
- ❖ **Retailers**
 - Identify and market products that are safer for consumers
 - Facilitate consumer choice of safer products
 - Provide clear information about safe use of products

<<READ SLIDE.>>

Refs:

•National Public Health Partnership. Application of risk management principles in public health legislation. Washington DC, USA, *Department of Human Services*, 2000. Available at www.dhs.vic.gov.au/nphp/publications/legislation/riskmgtprep.pdf – accessed 15 June 2011

•WHO. Preventing disease through healthy environments. Geneva, Switzerland, *World Health Organization*, 2006.

C. PERSONAL METHODS OF PREVENTION

❖ Individuals can take specific actions to limit exposure

❖ Education is KEY to limiting personal exposure



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❖ **WHY?**

- Government policies and regulations may take time
- Long term persistence even after chemical ban

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Refs:

•National Public Health Partnership. Application of Risk Management Principles in Public Health Legislation. Washington DC, USA, *Department of Human Services*, 2000. Available at www.dhs.vic.gov.au/nphp/publications/legislation/riskmgtprep.pdf – accessed 15 June 2011

•The Collaborative on Health and the Environment. Hormone Disruptors and Women's Health: Reasons for Concern. Available at www.healthandenvironment.org/articles/doc/5492 - accessed March 20, 2010.

•WHO. Healthy Environments for Healthy Children. Key Messages for Action. *WHO*, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

Image: WHO

LIMITING PERSONAL EXPOSURE VIA FOOD

- ❖ Wash fruits and vegetables prior to consumption to reduce pesticide exposure
- ❖ If possible, buy organic or plant your own crops and do not use pesticides
- ❖ Reduce the amount of animal fat consumed
 - Contaminants may bioaccumulate in animal fats
- ❖ Pay special attention to food labels and local dietary warnings and advisories, especially for pregnant women and children

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<<NOTE TO USE: For more information regarding personal exposures via food sources, please see the module entitled, "Children and Food Safety," located at: <http://www.who.int/ceh/capacity/food.pdf>.>>

Refs:

- Joint FAO/WHO Expert Committee on Food Additives (JECFA). WHO Food Additive Series. Geneva, Switzerland, *World Health Organization*, 2008. Available at www.who.int/ipcs/publications/jecfa/monographs/en/index.html - accessed 15 June 2011
- National Resources Defense Council. Endocrine disruptors. Available at www.nrdc.org/health/effects/qendoc.asp - Accessed March 22, 2010.
- WHO. Healthy Environments for Healthy Children. Key Messages for Action. *WHO*, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

FISH CONSUMPTION

- ❖ Fish is a health promoting food that contains omega-3 fatty acids beneficial to fetal and child development and prevention of chronic disease
- ❖ However, fish bioaccumulate environmental contaminants
 - Polychlorinated biphenyls (PCBs)
 - Metals (mercury)

What you can do:

1. When pregnant or planning pregnancy, consume fish that are lower in risk for contamination – e.g. avoid seafood near the top of the food chain, such as shark
2. Diversify protein diet if possible
3. Pay attention to local advisories if available

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Refs:

- Barron, M.G. Bioaccumulation and bioconcentration in aquatic organisms. In: Hoffman DJ et al eds. *Handbook of Ecotoxicology*, Lewis, Boca Raton, FL, USA. 1995: 652–666.
- Joint FAO/WHO Expert Committee on Food Additives (JECFA). WHO Food Additive Series. Geneva, Switzerland, *World Health Organization*, 2008. Available at www.who.int/ipcs/publications/jecfa/monographs/en/index.html - accessed 15 June 2011

EXAMPLE OF FISH CONSUMPTION GUIDELINES

For diets based on fish that may have high levels of mercury:

- ❖ Determine amount, type and frequency of fish consumption and provide advice
- ❖ Encourage consumption of fish low in methylmercury, but:
 - Limit intake of larger, predatory fish
 - Greatly limit intake of marine mammals
 - Encourage consumption of "light" or "chunk light" tuna

The advice to families in developing countries, especially those with diets based on fish, is quite different. When possible, limit intake of large fish who eat other fish. Smaller and younger fish are likely to have lower mercury levels. By eating a variety of fish, exposure is also likely to be reduced.

<<READ SLIDE>>

<<READ SLIDE: Please replace with examples of your local advisories>>

Refs:

- WHO. Exposure to mercury: a major public health concern. Available at www.who.int/phe/news/Mercury-flyer.pdf - accessed 21 September 2011.
- Oken E et al. Maternal fish intake during pregnancy, blood mercury levels, and child cognition at age 3 years in a US cohort. *Am J Epidemiol.* 2008 May 15;167(10):1171-81.

EXAMPLE: BREATHING EASIER

Prevent airborne exposures to contaminants:

- ❖ Do not smoke and encourage others to keep your home smoke free
- ❖ Avoid open burning of trash and other materials
- ❖ Avoid burning biomass fuel inside your home or dwelling and keep the spaces well ventilated
- ❖ Walk or bike when possible, limit use of motor vehicles and motor vehicle idling
- ❖ Keep a clean home- indoor pollutants such as dust, mould, and pet dander may trigger asthma symptoms or allergies



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Refs:

•WHO. Healthy Environments for Healthy Children. Key Messages for Action. WHO, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

Image: WHO

HEALTH CARE PROVIDERS AND PREVENTION EFFORTS

Health care providers play a key role in:

- Identifying the problem
- Defining its determinants and characteristics
- Informing the community
- Educating colleagues and other professionals
- Raising the awareness of policy-makers
- Promoting the implementation of the appropriate measures
- Helping to evaluate the efficacy of preventive measures



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<< NOTE TO USER: mention success stories of prevention of toxic exposures and exposure to pollutants. Give examples that are pertinent to the area and/or your personal experience on the subject.>>

Health care providers play a key role in many aspects of the prevention of exposure. These are:

- *Identifying the problem.* What are the main toxic exposures? What are the main causes of acute poisonings? Are there any cases of chronic exposure to environmental pollutants? Is there a high incidence of diseases that may be linked to chemicals in the environment? Emergencies and poisons centres are able to provide statistical and epidemiological data on the subject.
- *What are the determinants and characteristics?* Are exposures acute or chronic? Where do they occur? When and how? Are there any predisposing factors? Which populations or groups are affected? Are they predominantly urban or rural?
- *Informing the community* – the workers, the families. A community exposed to chemicals and pollutants in the environment should be informed about the situation in a clear manner (*do not hide!...do not scare!*). Social workers and communications experts may provide valuable advice on how to communicate risks or potential threats to the community, and how its members may avoid them and protect their own.
- *Educating colleagues and other professionals.* It is especially important to educate those who should recognize and manage the effects of chemicals on health (e.g. nurses, physicians, midwives, primary health care workers). Those who will help in assessing environmental issues should also be educated.
- *Raising the awareness of policy-makers about the problems identified.* Policy-makers should be made aware of the risks communities face – poisonings and potential chronic exposures.
- *Promoting the implementation of the appropriate actions.* The implementation of the appropriate measures should be promoted in consultation with key partners including policy-makers, midwives, doctors, nurses, communities.
- *Evaluating the efficacy of preventive measures.* The efficacy of preventive measures should be evaluated and, again, the community should be informed of the findings!

Refs:

- Program on Reproductive Health and the Environment. Shaping our legacy: reproductive health and the environment. *University of California, San Francisco*. 2008.
- WHO. Healthy Environments for Healthy Children. Key Messages for Action. WHO, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

IF PREGNANT (TRADITIONAL ADVICE)

Many pregnancy/birth problems could be avoided through:

- **Family planning**
- **Balanced diet**
- **Management of maternal health problems**
- **Avoiding maternal infection**

Usual advice:

- ✓ **Folic acid in flour to prevent neural tube defects**
- ✓ **Iodine in salt to prevent congenital hypothyroidism**
- ✓ **Vit B₁₂ (methyl donor important for DNA and protein modification) around conception**
- ✓ **Rubella vaccination to prevent congenital rubella syndrome**

Doctors traditionally give advice to pregnant women that includes, among others, taking folic acid supplements, vitamins and getting rubella vaccinations (if not yet vaccinated).

Refs:

- Fleming TP et al. The embryo and its future. *Biology of Reproduction*, 2004, 71: 1046.
- The March of Dimes global report on birth defects, the hidden toll of dying and disabled children.
Available at www.marchofdimes.com/professionals/871_18587.asp – accessed May 2011.

HOW TO REDUCE EXPOSURE? Examples of advice for patients

- ❖ Don't smoke! Nor stay near smokers
- ❖ No alcohol during pregnancy
- ❖ No use of drugs
- ❖ Consult your doctor before taking medications
- ❖ Eat food without additives, without pesticides and preservatives
- ❖ Avoid fat in meat
- ❖ Avoid fish rich in persistent organic pollutants and mercury (bigger fish)
- ❖ Observe fish advisories on mercury
- ❖ Avoid microwaving plastics
- ❖ Don't use solvents – avoid paints
- ❖ Reduce the number of chemical cleaners at home



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Other advice that could consider environmental risk factors could include:

<<READ SLIDE>>

<< NOTE TO USER: Please adapt the advice to your own context/region.>>

TOOLS AND MECHANISMS

Promotion of collaborative research between industrialized and developing countries:

- To address reproductive health problems in their national and global contexts
- To plan and implement prevention and remediation strategies
- To put in place evidence-based public health policies at the country level
- To transfer technology and capacity building, and the build up of a network of trained scientists

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This is an example of the many tools from WHO available on environment and health. More research is needed in the area of reproductive health and environment. Coordinated collaborative research will yield useful answers. More information: www.who.int/reproductivehealth/en

<<READ SLIDE.>>

Ref:

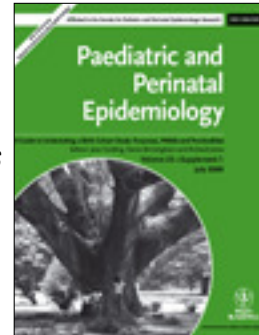
•WHO. Healthy Environments for Healthy Children. Key Messages for Action. *WHO*, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

TOOLS AND MECHANISMS

Longitudinal cohort studies on children's health and the environment

"A guide to undertaking a birth cohort study: Purposes, pitfalls and practicalities"

- Result of 4 international expert consultations
- *Provides practical recommendations for setting up birth cohorts, recognizes the challenges involved, and encourages coordination among studies*



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<<READ SLIDE.>>

A Guide to Undertaking a Birth Cohort Study: Purposes, Pitfalls and Practicalities has been developed as a resource for all those who wish to launch a longitudinal study to address the relationship between children's environments and their developmental and health outcomes. It is the result of four international consultations that brought together a multidisciplinary group of experts, including many cohort directors, from industrialized and developing countries. From these deliberations it was clear that longitudinal cohort studies are both important and feasible, not only in highly industrialized countries but also in low- and middle-income countries.

The Guide provides practical recommendations for setting up birth cohorts, recognizes the challenges involved, and encourages coordination among studies. As it draws from experiences from many cohorts and experts on children's health from Europe, North and South America, Asia, Australia, and Africa, it will ensure that such studies can be undertaken in all countries. It has been written to be understandable to all who are concerned with child health and the environment and may wish to find out more about the whys and wherefores of setting up and working with a longitudinal birth cohort. It is aimed at people from a wide variety of backgrounds, from parents to politicians, scientists to clinicians, non-governmental organizations (NGOs) to government officials, educationists to economists, psychologists to neuroscientists, obstetricians to pediatricians, and many more.

Notes from www.nationalchildrensstudy.gov – accessed 15 June 2011

Ref:

•Golding J, Birmingham K., and Jones R. Special Issue: A Guide to Undertaking a Birth Cohort Study: Purposes, Pitfalls and Practicalities. *Paediatric and Perinatal Epidemiology*. 2009, 23(s1):1-236. Available at onlinelibrary.wiley.com/doi/10.1111/ppe.2009.23.issue-s1/issuetoc – accessed 21 September 2011

TOOLS AND MECHANISMS

WHO Environmental Health Criteria (EHC) 237

Scientific principles that need to be considered when assessing the potential health risks in children and during key life stages from exposure to environmental agents during distinct developmental stages

Translating the science

Summary version (2011): www.who.int/ceh/

EHC 30, "Principles for Evaluating Health Risks to Progeny Associated with Exposure to Chemicals During Pregnancy" (IPCS, 1984)

EHC 59, "Principles for Evaluating Health Risks from Chemicals During Infancy and Early Childhood: The Need for a Special Approach" (IPCS, 1986a).

Available at: www.who.int/ipcs²⁷

<<READ SLIDE.>>

This is an example of the many publications from WHO available on environment in health. These publications look at special vulnerable stages when environmental exposures can have a maximum impact on certain developing organs and systems. For example, as cited in the reproductive health modules, exposure to diethylstilbestrol (DES) *in utero* can lead to reproductive problems in daughters and sons.

<<NOTE TO USER: For more information, please go to the occupational health training module or to www.who.int/ceh and www.who.int/reproductivehealth/en>>

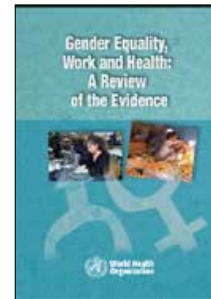
TOOLS AND MECHANISMS

Other examples of publications:

- Healthy beginnings: Guidance on safe maternity at work. International Labour Organization, 2004
- Gender equality, work and health: A review of the evidence. WHO, 2006

For more information and related publications:

- www.who.int/ceh
- www.who.int/reproductivehealth/en
- www.who.int/occupational_health/en/
- www.who.int/pmnch/en/
- www.ilo.org



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- International Labour Organization. Healthy beginnings: Guidance on safe maternity at work. International Labour Organization, 2004. Available at www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_PUBL_9221152383_EN/lang--en/index.htm - accessed 31 October 2011

In order for work to be decent, women workers need to be protected during maternity – protected from losing their jobs and protected from any risks to their health or that of their babies. This guide looks at maternity protection in the workplace, focusing on measures that can be taken to ensure a healthy beginning for both the mother and her child. The material in this guide sets out basic principles and, in an effort to be relevant to a maximum number of settings, provides a wide range of information on reproductive hazards and how to prevent harm. Annexes provide a choice of practical tools which will be helpful in identifying workplace risks and finding solutions.

- WHO. Gender equality, work and health: A review of the evidence. WHO, 2006. Available at www.who.int/occupational_health/publications/genderwork/en/index.html - accessed 31 October 2011

This publication documents the relationship between gender inequality and health and safety problems. It reviews gender issues in research, policies and programmes on work and health, and highlights some specific issues for women, including the types of jobs they do, as well as their need to reconcile the demands of work and family. Biological differences between women and men also are considered in relation to hazards they face in the workplace. Implications of the findings and recommendations for legislation and policy are discussed. Women will be more and more involved in the global workforce, in both formal and informal work. In ensuring economic survival for themselves and their families they employ a variety of strategies, some of which entail great danger for their health. This review highlights the necessity to strengthen and put in place more and better programmes and practices so as to ensure women's health and safety at work, while facilitating their access to economic and social equality.

<<NOTE TO USER: For more information, please go to the occupational health training module or to the websites mentioned in the slides.>>

TOOLS AND MECHANISMS

Environmental Health Units

- ❖ Educate the public about the impacts of environmental exposures on health
- ❖ Train health care providers and engage with the health community
- ❖ Provide consultative medical services
- ❖ Consult with government agencies to address environmental hazards through policies that take into account the most vulnerable populations

Environmental health units exist in many countries (for instance, there are over 10 in the Republic of Korea) and are reference centres on environmental health. Activities can include the training of health care providers, the ongoing education of the public and other sectors concerned about the protection of communities and families from environmental threats, the management of patients with known or suspected exposure to environmental stressors, and the diagnosis, management, and treatment of patients with illnesses that are derived from environmental stressors.

There are relatively low-cost ways to reduce the high expenditures associated with environmental exposures and environmentally-related diseases. Many interventions, such as teaching community members about safe household water storage and filtration, proper ventilation and cleaning of homes, can generate substantial benefits with relatively little investment. Additionally, these interventions can often be complementary to existing outreach programmes. Other interventions, such as helping a community improve hygiene measures and sanitation systems or assisting a local government with pollution-control policies, require more resources over a long time frame, but can then significantly reduce a community's future disease burden.

In the Republic of Korea, the Environmental Health Centre Network implemented by the Ministry of Environment has allowed individual centres to focus on research and management of diseases pertinent to the country's individual health concerns. Cooperating with these centres, the Ministry continuously makes efforts to promote preventive measures through evidence based policies.

<<NOTE TO USER: For more information on environmental centres, please see as guidance the publication on children's environmental health units available at: www.who.int/ceh/publications/childrensunit.pdf>>

TOOLS AND MECHANISMS

Examples of environmental questions for the medical history

WHERE DO YOU WORK?

- **What chemicals are used at work?**
- **Is there mould on the walls? Is it well-ventilated? Are there any odours?**
- **Has there been any recent painting or refurbishing?**
- **Do workers smoke at work? What do they smoke ? How much?**
- **Are pesticides used? How? Are there cockroaches? Rats?**
- **Are there animals (dogs, cats, birds) at the worksite?**
- **How often is the place cleaned? Which chemicals are used for cleaning?**

[These are also applicable to homes]

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Adding simple environmental questions when taking the medical history allows health care providers to incorporate into the clinical records a description of environmental conditions, behaviors and risk factors relevant to a worker's health. For example, the characteristics of the workplace; potential exposure to pesticides; proximity to waste sites, polluting industries or traffic. Eliciting these together with other relevant information improves the capacity to identify, assess and follow up potentially exposed workers at risk and respond with effective measures. The environmental records build the evidence base required for effective interventions and facilitate research. Overall, asking environmental questions provides an opportunity for closer interaction between the health professional, the worker and the community.

Refs:

•WHO. Healthy Environments for Healthy Children. Key Messages for Action. *WHO*, 2010. Available at www.who.int/ceh/publications/hehc_booklet/en/index.html accessed 10 June 2010

<<READ SLIDE.>>

<<NOTE TO USER: For more information on environmental questions, please see as guidance the training module: "Pediatric Environmental History," available at: www.who.int/ceh/capacity/training_modules/en/index.html>>

EXAMPLES OF INTERNATIONAL CALLS FOR ACTION

Asturias Declaration: A Call to Action (2011)

"A substantial percentage of all cancers are caused by environmental and occupational exposures. Pregnant women, fetuses, infants, children and workers are especially vulnerable. Many cancers caused by environmental and occupational exposures can be prevented."

www.who.int/phe/news/events/international_conference/Call_for_action_en.pdf

The Faroes Statement: Human Health Effects of Developmental Exposure to Chemicals in Our Environment (2007)

"The mother's chemical body burden will be shared with her foetus or neonate, and the child may, in some instances, be exposed to larger doses relative to the body weight... susceptibility to a wide range of adverse effects is increased during development, from preconception through adolescence, depending on the organ system... developmental exposures to environmental chemicals can lead to life-long functional deficits and disease."

www.wecf.eu/cms/download/2007/FarOesStatement.pdf

These are two examples of calls for further action in the prevention of environmental exposures during pregnancy. We can make a difference. We must act now.

<<READ SLIDE.>>

POINTS FOR DISCUSSION

<<NOTE TO USER: Add points for discussion according to the needs of your audience.>>

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