Non-Communicable Diseases and Environmental Determinants

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About this publication

This publication results from a cooperation of Women in Europe for a Common Future (WECF), Health and Environment Alliance (HEAL), SustainLabour and International POPs Elimination Network (IPEN), with the United Nations Environment Program (UNEP). WECF and HEAL represent the environmental NGOs and health NGOs (respectively) in the policy process on Environment and Health of WHO-Europe. WECF, SustainLabour and IPEN represent civil society, women and workers in the international policy processes on chemicals, in particular the Stockholm Convention, Basel Convention and Rotterdam Convention, and the Strategic Approach to Chemicals Management (SAICM) whose secretariats are hosted with UNEP. WECF, Umweltinstitut Munich, Japan Women's Watch and Social Eco Fund Kazakhstan have specific expertise in the area of radioactive contamination and its health impacts. This publication aims to provide latest knowledge and perspectives on the environmental detriments of non communicable diseases (NCDs) as a contribution to a number of ongoing international policy processes (including on global sustainable development goals) and as a response to the United Nations Conference on Sustainable Development 'Rio+20' in June 2012 and the World Health Organisation's NCD summit in September 2011.

Authors

Genon Jensen, HEAL
Alexandra Caterbow, Sascha Gabizon, WECF
Karin Wurzbacher, Umweltinstitut München
Yukido Oda, Japan Women's Watch,
Elina Doszhanova, Social Eco Fund Kazakhstan
Olga Speranskaya, Manny Calonzo, IPEN
Dolores Romano, Tatiana Santos, Maria Lopez Jacob, Laura Martin Murillo, Sustainlabour

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Introduction: NCDs – a leading cause of death worldwide

Genon Jensen, HEAL

This briefing paper aims to provide latest knowledge on Non Communicable Diseases from some of the leading experts and organisations from four perspectives: women's organisations, health sector, developing countries and trade unions. Each chapter identifies the links of NCDs with environmental pollution in these 4 areas and shares priorities for preventive policy action as well as sharing instructive case studies. The paper clearly demonstrates environmental factors as major determinants for NCDs, and the related challenge for sustainability; it outlines opportunities to prevent NCDs by addressing their environmental determinants with an emphasis on the framework provided by the Children's Environment and Health Action Plan for Europe (CEHAPE) and the Parma Declaration on Environment and Health in the European Region[1] to prevent disease arising from chemical, biological and physical environments.

This briefing is for decision-makers in the following fora or processes: the European Environment and Health Task Force (EEHTF) meeting, the WHO Regional Committee for Europe (WHO/RC), the UNECE Committee on Environmental Policy (UNECE/CEP), UNEP Global Major Groups and Stakeholders Forum (GMGSF) in 2013 and the SAICM Health Sector Strategy, the WHO post-2015 consultations on a new Global Goal on Health (to follow on the Millennium Development Goals) and on the development of Global Action Plan for the Prevention and Control of NCDs (2013 to 2020)[2].

NCDs are now the leading cause of preventable morbidity and related disability, and thus significantly affect the wellbeing of many individuals and workers' daily lives. In parallel, the burden of these diseases on those suffering and the associated health care costs continue to rise exponentially. In all OECD countries increase in health care costs have consistently outgrown GDP growth for the last 40 years, and often without a commensurate increase in positive health outcomes.

The ground-breaking UN Summit on Non-Communicable Diseases[3] in September 2011 in New York was prompted by recognition of the growing burden of cancer, cardiovascular disease, respiratory illnesses, and diabetes around the world, and the toll it was taking on families, healthcare systems and economies. These illnesses, also known as chronic, non-communicable diseases (NCDs) are the leading cause of death worldwide, resulting in an estimated 36 million deaths annually and hitting developing countries the hardest (where 80% of deaths occur).

The good news is that NCDs are mainly preventable. Thus the NCD summit offered the ideal opportunity to identify multi-sectorial priorities for action and rightly focused on tackling four of the main risk factors: tobacco, poor diets, alcohol and lack of physical activity and heart conditions. Since then an assessment of the global burden of disease carried out by 450 experts including the World Health Organization confirmed in December 2012 that air pollution is a top level risk for public health.

A recent systematic review of the burden of disease attributable to chemicals estimated that 8.3 per cent of the total or 4.9 million deaths and 86 million disability-adjusted life years (5.7 per cent of the total) were due to environmental exposure to, and unsound management of, selected chemicals in 2004.[4] Many experts believe this is a conservative estimate since many daily multiple exposures are not taken into account, and it only includes those chemicals where data is available.

Putting the environmental factors of chronic disease on the agenda of policy-makers is an achievement of civil society. For example, a group of more than 100 leading international scientists, health professionals and civil society stakeholders wrote to the heads of the UN and World Health Organization pointing to strong evidence that documents the role that environmental factors play in causing chronic diseases, and urging them to include in their strategy for disease prevention the reduction of people's exposure to environmental contaminants, particularly in low and middle income countries. But it did not prompt enough of a response.[5]

Although the Summit Resolution recognises that a paradigm shift is imperative in dealing with NCD challenges and that these are strongly influenced by environmental, social and economic factors, the text itself does not place priority on policy actions related to these sectors which could then be taken up in NCD national action plans. Regional initiatives on environmental prevention of NCDs are mentioned including the 2008 Libreville Declaration on Health and Environment in Africa and the 2010 Parma Declaration on Environment and Health in the European Region.

Although the environment and the wider sustainable development agenda do not figure prominently, governments have pledged to "encourage the development of multisectoral public policies that create equitable health-promoting environments that empower individuals, families and communicates to make healthy choices and lead healthy lives." The resolution also encourages development of multisectoral plans to promote health education and health literacy in schools, through public awareness raising campaigns.

This inclusion of environment, although weak, does offer a framework to integrate environmental health concerns into the global and European NCD framework, that is, if governments have the political will and if civil society stakeholders continue to highlight the health and economic evidence and existing best practices.

Global regulatory frameworks for chemicals

Chemicals have been under international scrutiny for some time now with several international agreements to reduce the health effects from chemicals and to ensure sound chemicals management:

- Basel, Rotterdam, Stockholm Convention plus the Mercury Treaty
- SAICM process
- Gothenburg Protocol on air pollutants

While these processes are driven by health concerns, the link to NCDs is not explicitly made and could be developed further.

EU context: leader in environmental prevention

Chronic, non-communicable diseases are a major challenge for the European Union (EU), making up 86 per cent of the total burden of disease in the World Health Organization European region. The good news is that addressing environmental exposures can improve health, and reduce associated health care costs.

EU Health ministers have repeatedly looked at the threats of chronic diseases and measures to take in recent years within the Social Policy Health and Consumer Affairs Council. Official Council conclusions have been adopted on chronic diseases and innovation in December 2010, on prevention, on early diagnosis and treatment of chronic respiratory diseases in children in December 2011 and on Healthy Ageing across the Lifecycle in December 2012[6]. However, these conclusions did not mention the role of environmental factors in chronic diseases. It has been the European Parliament who prominently put environmental prevention of chronic diseases on the EU policy spotlight in 2012 through an own-initiative report and resolution.

A European Parliament resolution on NCDs[7] immediately prior to the Summit underlined that the environment should be considered the fifth risk factor and called for environmental policy measures to be on the agenda, including measures to reduce people's exposure to harmful chemicals, particularly endocrine disrupting chemicals. Reducing chronic diseases such as cancer or asthma must include reducing environmental exposures, such as hazardous chemicals and air pollution.

For example, parliamentarians strongly urged countries to comply with current EU air quality standards, and strengthen them by basing them on WHO guidelines, and advocated for a bold EU-wide goal to reduce preventable NCD deaths, such as a WHO goal of a 25 per cent reduction in national mortality rates by 2025 as compared with 2010 rates.

As a result of the advocacy work of civil society[8] and the Parliament resolution, the then Health Commissioner John Dalli acknowledged environmental factors in his statement at the Summit. At present however, the EU has not taken up a greater focus on the environmental dimension of chronic disease in its work on NCDs (this is evident, for example, in the plans for the financing of actions under the EU health programme 2014 onwards).

The EU must help spread the message that environmental policy can be used to prevent disease and halt the increase in health costs.

"NCDs are also now the leading cause of preventable morbidity and related disability"

New emerging policy issues – Endocrine-disrupting chemicals (EDCs)

Proper regulation of endocrine disrupting chemicals (EDCs) remains a complex issue that has yet to be effectively managed, and EDCs have been recently agreed as a global issue to tackle urgently by many countries. Endocrine disruptors are chemicals that interfere with the human body's hormone system. Scientific studies have linked EDCs to many different health conditions, including hormone-related cancers – such as those of the breast, prostate and testes, – as well as other diseases such as obesity, diabetes, neuro-developmental and neurodegenerative diseases, precocious puberty, and reproductive problems, including low semen quality. The SAICM Conference agreed to implement cooperative actions on endocrine disrupting chemicals (EDCs) with the objective of increasing awareness and understanding among policymakers and other stakeholders. The participating organizations of the Inter-Organization Programme for the Sound Management of Chemicals were invited, within their respective mandates, to lead and facilitate the cooperative actions on EDCs in an open, transparent and inclusive manner, including the development of a workplan.

References

[1] Parma Declaration on Environment and Health March 2010www.euro.who.int/__data/assets/pdf_file/0011/78608/E93618.pdf

[2] http://www.who.int/nmh/events/2012/ncd_action_plan/en/

[3] Political declaration at UN Summit on NCDs September 2011http://www.who.int/nmh/events/un_ncd_summit2011/political_declaration_en.pdf

[4] Annette Prüss-Ustün et al, "Knowns and unknowns on burden of disease due to chemicals: a systematic review", Environmental Health, vol. 10, No. 9 (2010) www.ehjournal.net/content/10/1/9

[5] Open letter 5 Sep 2011 www.envhealth.org/resources/letters/article/to-ban-ki-moon-united-nations

[6] Council conclusions on chronic diseases Dec 2010 http://register.consilium.europa.eu/pdf/en/10/st16/st16559.en10.pdf ; Council conclusions on prevention, early diagnosis and treatment of chronic respiratory diseases in children, Dec 2011 http://register.consilium.europa.eu/pdf/en/11/st16/st16709.en11.pdf ; Council conclusions on Healthy Ageing across the Lifecycle, Dec 2012 http://register.consilium.europa.eu/pdf/en/12/st16/st16665.en12.pdf

[7] EP Resolution on chronic disease www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P7-TA-2011-0390&language=EN&ring=B7-2011-0489

[8] HEAL open letter to Health Commissioner Sep 2011 www.env-health.org/resources/letters/article/to-eu-health-commissioner-john HEAL Chronic disease fact sheet www.envhealth.org/resources/publications/article/heal-fact-sheet-chronic-disease

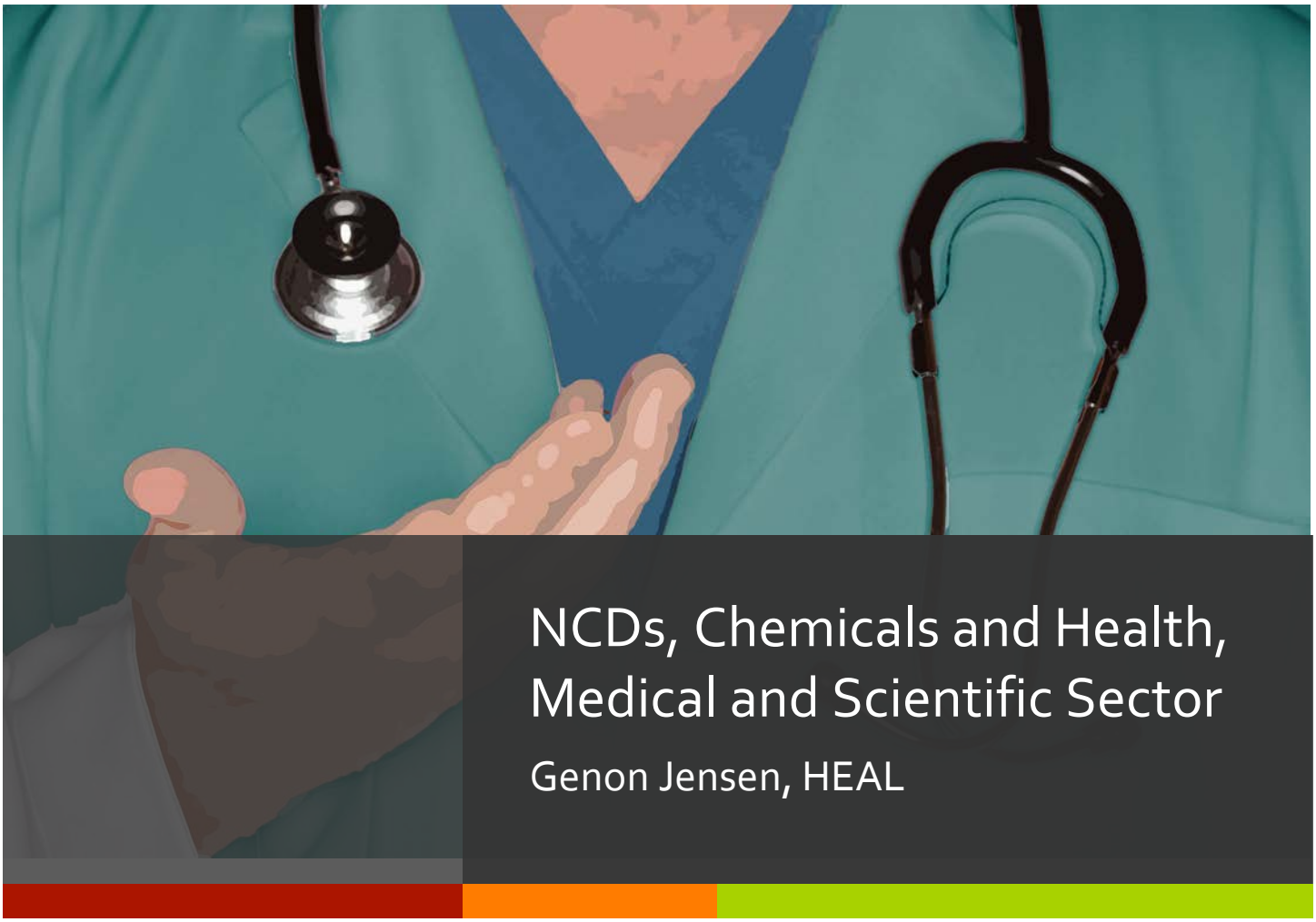
Parma Declaration

The Parma Declaration is the outcome of a WHO European ministerial policy process and a valuable tool to move policy-makers from talk to action. The Declaration spells out five specific, time-bound targets, by which the countries commit to achieving improvements in children's environmental health. One of the most important outcomes from this conference was that countries of Eastern Europe, Caucasus and Central Asia (EECCA) recognised in the declaration that asbestos is carcinogenic. In more than 15 countries from the EECCA region and South-Eastern European region, asbestos is the most common building material. Citizens and building workers are not informed that chrysotile asbestos is a potent carcinogen, and that there is no safe exposure level. Governments of the EECCA countries agreed to develop by 2015 national plans to eliminate asbestos-related diseases in cooperation with WHO and ILO.

Secondly, the Parma Declaration also sets 2015 as the date by which a healthy indoor air environment needs to be achieved in any settings for children. Governments can take measures to reduce traffic near schools as outdoor air pollution is the main source of indoor air pollution. Healthy indoor air is an important target as it means that guidelines for purchase of school furniture and electronics need to be developed to ensure that these products no longer emit carcinogenic substances such as formaldehyde or phthalates (plastic softeners) some which are toxic to reproduction. Also the frequent use of pesticides in and around schools and playgrounds would need to be halted to meet this target. Governments could also require mandatory substitution of hazardous substances in paints, carpets and furniture (common sources of harmful air emissions).

Thirdly, governments aim to eliminate children's and pregnant women's exposures to harmful substances by 2015. Governments commit to acting on identified risks of exposure to carcinogens, mutagens and reproductive toxicants, such as endocrine disrupting chemicals.

Fourthly, the Parma Declaration states that by 2020 children should have healthy and safe environments in which to walk and bike to school and more green spaces to play and exercise.
Thousands of schools in rural areas of the EECCA region do not have indoor, hygienic toilets, and often lack safe drinking water. In the EU countries, vandalism and unhygienic situations in school toilets are also a real problem. By 2015, all countries commit to achieving safe water and sanitation in schools and other children settings.



NCDs, Chemicals and Health, Medical and Scientific Sector

Genon Jensen, HEAL

Actors and groups within the health sector have been active on the NCDs agenda led by the NCD Alliance and focused on the four main risk factors defined by WHO: alcohol, unhealthy diets, physical inactivity, and tobacco use. While environmental prevention of NCDs has been fairly absent from UN processes, a growing number of health, medical and scientific associations are actively making this link in environmental policy areas such as air quality, chemicals, including mercury, climate and energy. These associations have been putting forth the health arguments and engaging in policy debates. For example, through their paper on 10 guiding principles[1] to dealing with "an invisible killer," the European Respiratory Society (ERS) advocates for stronger air quality legislation to improve public health, as the current EU standards are still below WHO guidelines and do not adequately protect health. The respiratory health experts say that exposure to poor outdoor air quality reduces the average European's life expectancy by 8.6 months.

In the EU, compartmentalisation between environment ministries and health ministries was partly overcome by an Action Plan which brought together the key actors in the years 2003-2010 but is now on the shelf. At the European level, this process is ongoing under the WHO Environment and Health regime and via the Parma Declaration and Commitment to Act, which introduces time-bound goals to protect children's health from environmental threats by 2015. The EU 7th Environmental Action Programme, being debated in the European Parliament and Council, has a dedicated health and environment chapter, and ample opportunities for chronic disease prevention. It is expected to be adopted in 2013.

This section will focus on NCDs and chemicals, the perspectives of the health and medical sector and those of scientific expert networks.

At the global level, the Strategic Approach to International Chemicals Management (SAICM) has provided an excellent forum for further discussion and engagement of the health sector through the Health Sector Strategy, which was adopted at the third session of the International Conference on Chemicals Management (ICCM3) in 2012. The Strategy summarises the key roles and responsibilities for the health sector in sound chemicals management as follows: (i) preventing and managing chemical emergencies; (ii) gathering clinical and research evidence about chemical risks and informing decision makers and the public; (iii) working with other sectors to advocate action on chemicals and safer alternatives; (iv) raising awareness of chemicals safety with special emphasis on protecting vulnerable populations; (v) assessing the impact of chemicals management policies through monitoring and evaluation;

and (vi) sharing knowledge and participating in international mechanisms to solve chemicals-related problems.
The WHO was requested, in collaboration with the SAICM secretariat, to report on how the strategy is being implemented at SAICM conference sessions, commencing with the fourth session, provisionally set for 2015.
Advances have also been made on linking one of the NCDs, cancer, to environmental prevention with a breakthrough meeting of the WHO in Asturias, Spain in 2010. For the first time, international experts agreed unanimously to put environmental and occupational factors in the primary prevention of cancer definitively on the agenda. The Asturias Declaration says: "Prevention of the environmental and occupational exposures that cause cancer must be an integral component of cancer control worldwide." [2] Civil society, including experts from leading NGOs, medical, scientific and cancer groups helped build this consensus by highlighting the evidence that harmful chemicals play a role in cancer causation[3].

At the European level, as representative of the health community on the European Environment and Health Task Force (EEHTF), the Health and Environment Alliance (HEAL) coordinated efforts from respiratory doctors, public health and cancer and asthma groups to publish a fact sheet on Chronic Diseases and the Environment. European health networks raised awareness and provided evidence on how EU environmental policy has contributed to combating rising rates of chronic disease, which resulted in a strong European Parliament resolution calling for environmental factors to be considered at the UN special summit on NCDs.

Paradigm shift in science: why low-level exposure and timing matter more than ever

When it comes to chemicals, scientists are ringing the alarm bell: we are moving away from the Paracelsus statement that "it's the dose that makes the poison" to acknowledging the evidence that "the timing also makes the poison". More and more studies show the irreversible effects of exposure during critical developmental stages of the human body, especially in the pre-natal stage and early life years.

The Problem

For the health sector, NCDs are a huge public health threat and challenge. Not only will actors from the health sector be on the front line, the healthcare systems and public health programmes they use will suffer from the growing burden on increased incidences of heart attacks, asthma, cancer and diabetes. Some of the key issues facing the health, medical and scientific communities are the need to increase their involvement in policy discussions and decisions while simultaneously working to reduce people's exposure to environmental contaminants to prevent ill health, particularly with regard to vulnerable groups.[4] An ongoing challenge is to ensure that the significant new science on: low dose effects, additive effects from multiple concurrent exposures, environmentally-induced genetic changes including trans-generational impacts, and the time lag before manifestation of disease, is taken up by policy makers. Incorporating this environmental health science into policy and clinical frameworks to ensure public action protects the health of current generations and those to come.

Another issue of concern directly related to some of the diseases considered to be NCDs is how to deal with endocrine disrupting chemicals (EDCs), which for the most part has not yet been taken up by the wider public health community working on NCDs. This could change quickly given the landmark UNEP WHO State of the Science report in February 2013 which clearly highlights the evidence on the links that EDCs have with many chronic diseases and the need to take action on current knowledge. In April 2013, 20 scientists from 11 countries published a consensus statement on the state of the science that recognizes potential harm of endocrine disrupting chemicals. It states that "the increase in non-communicable diseases in humans and wildlife over the past 40 years indicates an important role of the environment in disease aetiology. EDCs are an important component of the environmental influences on disease, along with nutrition and other factors. Thus, reducing exposures to EDCs could have an important impact on actual disease prevention."[5]

Best practice

The following section will highlight some examples of how the health message, economic case and engagement of trusted and authoritative health leaders have made a difference in promoting the protection of public health and wildlife through their work on the contribution of chemicals to disease.

Experts call early-life prevention of non-communicable diseases and environmental prevention key:
For the first time in January 2013, the leading international health journal, The Lancet, featured the need to address early-life and toxic exposures to metals, chemicals and air pollution in the prevention of non-communicable disease[6]. The commentary on the early-life prevention of non-communicable diseases is signed by a team of leading international health and scientific experts - including the World Heart Federation and the International Diabetes Association - who took part in the

3rd Prenatal Programming and Toxicity (PPTOX) conference[7] in Paris in May 2012. It says that much more attention should be given to "early-life interventions, optimisation of nutrition, and reduction of toxic exposures to curtail the increasing prevalence of non-communicable disease (NCDs)". The new science of epigenetics offers insight into mechanisms of early life predisposition to adult disease risk. It states: "An increasing amount of evidence suggests that developmental exposure to nutritional imbalance or environmental contaminants including metals, pesticides, persistent organic pollutants, and chemicals in drinking water … can affect epigenetic changes, thus suggesting a mechanism for their effects on adult health. Similarly, prenatal exposure to air pollutants has been associated with epigenetic changes and subsequent effects on children's respiratory health."
Policy recommendations include the integration of NCD prevention with the attainment of the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) could leverage major worldwide investments in health and development.

Scientific and medical consensus statements on chemicals and EDCs

Scores of scientists and medical professional associations have developed declarations and consensus statements over the years. One key statement, the 2007 Prague Declaration[8], already signalled that for some chemicals, such as those known to mimic oestrogen or block androgen hormone action, scientific uncertainty should not delay action to reduce exposures and was signed by 125 leading scientists. A list of some key consensus statements from the international and European scientific committee as well as policy statements from global and regional health and medical associations is available on the Chemicals Health Monitor website (http://www.chemicalshealthmonitor.org/).

Conclusions and Recommendations

Environmental prevention needs to be integrated in the NCD Action Plans, particularly in relation to reducing involuntary chemicals exposures such as air pollution, chemicals in products and food and water, and used in food processing and agricultural processes. Early life exposure is an urgent area for intervention.

Strengthened engagement by the health sector is critical to prevention of harmful chemicals impacts on human health, particularly given the projected growth of the chemical industry and the increasing weight of evidence on harm from low levels, at critical periods of development and for vulnerable groups such as children.

EDCs given more urgent action given the global consensus, increasing weight of evidence and scientific consensus on the long term implications.

Health, economic, and social costs from hazardous chemicals, heavy metals and radiation must be more prominent in discussions on policy options and cost benefit analysis.

References

[1] ERS 10 principles website source http://erj.ersjournals.com/content/39/3/525.full
[2] WHO Asturias Declaration – Environmental and Occupational Determinants of Cancer http://www.who.int/phe/news/events/international_conference/Call_for_action_en.pdf
[3] HEAL Cancer Prevention briefing paper http://www.env-health.org/IMG/pdf/20110315_HEAL_Briefing_on_environmental_cancer_prevention_FINAL.pdf - Position paper http://www.env-health.org/IMG/pdf/20110411_Heal_Position_Paper_Final-2.pdf
[4] Find out more about health sector priorities SAICM/OEWG.1/15 page 7
[5] Environmental Health Perspectives 121:a107-a107 (2013). http://dx.doi.org/10.1289/ehp.1306695
[6] Full article: Early-life prevention of non-communicable diseases, The Lancet, Volume 381, Issue 9860, Pages 3 - 4, 5 January 2013 http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2812%2961609-2/fulltext - Authors of the Comment are led by John M Balbus, National Institute of Environmental Health Sciences, USA; Robert Barouki, Université Descartes, Paris, France; Philippe Grandjean, University of Odense, Denmark; Maria Neira, World Health Organization, and some leading representatives of health and environment NGOs, including Genon Jensen, Executive Director of HEAL.
[7] White Paper - Developmental Origins of Non-Communicable Disease: Implications for Research and Public Health 2012 http://www.ehjournal.net/content/11/1/42
[8] Prague Declaration on Endocrine Disruption: Full text http://www.ehponline.org/docs/2007/10517/suppl.pdf - Published as a part the Mini-Monograph http://www.ehponline.org/members/2007/10517/10517.html: Introduction: Endocrine Disruptors—Exposure Assessment, Novel End Points, and Low-Dose and Mixture Effects (Andreas Kortenkamp); Environmental Health Perspectives Volume 115, Number S-1, December 2007

Best practice

Doctors and health professionals as environmental watchdogs

Raising awareness for greater health participation in REACH chemicals law*:*
The International Society of Doctors for the Environment teamed up with CHEM Trust and HEAL in 2007 to produce briefings on the public health implications put forward by the Regulation on Registration, Evaluation, Authorization and Restriction of chemicals (REACH), which includes evidence on the links of chemicals to some chronic diseases such as cancer and diabetes[9]. Prior to REACH's adoption, the Standing Committee of European Doctors (CPME) represents 2 million medical doctors across Europe adopted a policy statement highlighting the links between chemicals and diseases, and hosted an effective press conference in the European Parliament.[10] CPME latest position on environmental issues, highlights priorities such as endocrine disruptors, nanomaterials, combined effects of chemicals, harmful chemicals in products, outdoor air pollution, indoor air pollution, water pollution, noise, climate change, and nuclear radiation.[11]

US physicians call for reducing public exposure to EDCs:
In November 2009, the American Medical Association (AMA) passed a resolution that calls for the AMA to work with the US government to enact new federal policies to decrease the public's exposure to endocrine disrupting chemicals. Both the World Federation of Public Health Associations (WFPHA) and the World Medical Association have adopted resolutions and statements on Safer Chemicals and on Sound Management of Chemicals. [12]

French National Academy of Medicine raises awareness on EDCs and BPA in baby bottles to help pave way for EU ban[13]:
In 2011, the French National Academy of Medicine released a report which recognises that EDCs are contributing to the rising incidence of some hormone-dependent cancers. The report's findings were covered in one of the leading French newspapers, Le Monde, which highlighted the Academy's concerns on the cancer risk from EDCs present in the environment and food. For thirty years, the academy noted, the incidence of prostate cancer has increased 5.2 times, while breast cancer incidence has doubled. Similarly, the incidence of testicular cancer has nearly tripled in young men since 1975. The Academy noted, that "there is a convergent beam of sufficient data in rodents showing a carcinogenic effect of BPA at doses well below the permitted daily doses in humans. [14]

Endocrine paediatric doctor wins award for his work on chemicals and early puberty in girls:
Professor Charles Sultan received the prestigious André Prader award from the European Society for Paediatric Endocrinology (ESPE) in 2012 for his and his team's work at the University Hospital of Montpellier that specializes in paediatric endocrinology. The doctors, led by Professor Sultan, have shown a link between pesticide exposure and risk of birth defects. Professor Sultan's work goes beyond clinical research and he often provides expert testimony in French at international expert committees and public events[15]. He has also appeared in many investigative TV programme and films on environmental pollution and early puberty in young girls.[16]

Health professionals: US chemical safety laws need to be reformed:
Many health professional organizations from across the country have expressed concern with the inadequate health protections afforded by current law. The American Medical Association, National Medical Association, American Academy of Pediatrics, American Nurses Association, and American Public Health Association have called on the U.S. Congress to fundamentally restructure TSCA such that it better protects public health and the environment.[17]

Cancer groups tackle environmental prevention at the source

Belgian cancer group advocates for cancer prevention to start with strong chemicals policy:
A new study of the Flemish Cancer League (Vlaamse Liga tegen Kanker – VLK) analyses the implications of chemicals policy on cancer incidence. It stresses the importance of strong EU legislation to reduce exposure to hazardous chemicals which will have effects at local and national levels. The report, entitled 'A critical view on the policies regarding cancer-related chemicals in our living environment', by the League recognises the importance of the role played by chemicals policy in preventing cancer incidence. It analyses laws on industrial chemicals, pesticides (agricultural use) and biocides (non-agricultural pesticides), and their implementation in European, Belgian and Flemish chemicals policies and cancer prevention.[18]

US President Panel on Cancer – environment grossly underestimated:
In its 2008-2009 Annual Report, the President´s Cancer Panel—appointed by President George W. Bush—summarized its investigation on evidence linking chemicals to various kinds of cancer, and concluded that, despite remaining uncertainties, we know enough to act. According to the Panel, "the true burden of environmentally induced cancer is grossly underestimated."[19]

References Best practice

[9] REACH Public Briefing: What will the new EU chemicals legislation deliver for public health? http://www.env-health.org/resources/publications/article/reach-public-briefing-what-will Available in The briefing is available in English, Italiano, Français, Deutsch, Slovenščina, Česky, and Magyar.
[10] Standing Committee of European Doctors adopted Health and Environment (REACH) policy 2005 http://cpme.dyndns.org:591/adopted/CPME_AD_Brd_030905_100_EN.pdf
[11] CMPE Position paper June 1 2012 http://cpme.dyndns.org:591/adopted/2012/CPME_AD_EC_01062012_107_Final_EN.pdf
[12] World Federation of Public Health Associations Resolution http://www.wfpha.org/tl_files/doc/resolutions/positionpapers/enrivonment/SaferChemicalsPolicies.pdf
World Medical Association statement http://www.wma.net/en/30publications/10policies/e17/index.html
[13] Chemical Health Monitor article http://www.chemicalshealthmonitor.org/spip.php?article505
[14] Le Monde, November 11, 2012
[15] HEAL website http://www.env-health.org/news/latest-news/article/heal-speaks-at-french-senate-on
[16] HEAL website Last updated on 14 November 2011 http://www.env-health.org/news/members-news/article/leading-pesticide-researcher
[17] Safer chemicals, healthy families - Chemicals and our Health, page 4 http://www.saferchemicals.org/
[18] HEAL article http://www.env-health.org/news/latest-news/article/preventing-cancer-incidence-starts
[19] CHE website http://www.healthandenvironment.org/cancerpanel

NCDs, Chemicals and Women

Alexandra Caterbow, Sascha Gabizon
WECF

The issue of women and NCDs has been highlighted in several international policy processes, because with annually 18 million NCD related death being female, women are severely affected by NCDs. At the UN NCD Summit in 2011 however, the issue of harmful chemicals as one of the possible causes of NCDs, was not given priority, and was not highlighted as a key indicator for NCDs. It is important to give the chemicals aspect more weight in the discussion on NCDs and women for several reasons: Firstly, recent studies state that NCDs can often be linked to chemical exposure during pregnancy and early life development of a child. Secondly, women are exposed and affected differently than men. And thirdly, due to gender-roles, women are often the main decision-makers for their families' daily food and other purchase decisions, and therefore crucial to eliminating chemical pollution entering into our bodies via food, lungs and skin.

Description of problem

NCDs and women

NCDs cause 60 per cent of all deaths worldwide and 18 out of 35 million annual deaths related to NCDs are women[1]. NCDs are the biggest threat to women's health globally, and these diseases are on the rise. The WHO estimates that around 1.7 million women will be diagnosed with breast cancer in 2020, which is a 26 per cent increase from current levels[2]. In 2010, 143 million women were diagnosed with diabetes, and by 2030 this number is expected to rise to 222 million[3]. These are only two out of many examples showing the urgency and importance of addressing NCDs from a women's perspective.

NCDs, chemicals and women

New evidence shows that in addition to the known risk factors for NCDs, exposure to chemicals play an important role in the development of NCDs[4]. Women and children are the most vulnerable group as severe damage can occur during prenatal and early life. Recent research shows that, for example, women working in the plastics industry have almost twice the risk of developing breast-cancer, similarly for women working as pesticide sprayers[5]. Certain chemicals can disrupt normal signalling pathways or mimic hormone signalling during foetal development, which may lead to an increased risk of developing NCDs later in life. It is also known that these negative effects can occur even when exposed to low levels of chemicals and during critical windows of development[6]. One group of chemicals to which these effects apply are endocrine disrupting chemicals (EDCs). So far there are around 900 chemicals characterized as EDCs. The combined effect of exposure to many EDCs may be additive (or perhaps even synergistic), so that exposure to several different chemicals at low dose levels, – which by themselves might not be seen to cause

adverse effects, – may result in adverse effects from cumulative exposure. Therefore, this "cocktail effect" of chemical mixtures in our bodies can magnify the effects of exposure to EDCs at low doses. For example, there is considerable evidence that links breast cancer to our polluted environment and chemicals used in everyday products and workplaces. They include industrial chemicals, pesticides, dyes, chlorinated solvents, drinking water disinfectants by-products, pharmaceuticals and hormones. EDCs also include chemicals such as parabens and phthalates, dioxins, furans, phenols and alkylphenols, polyaromatic hydrocarbons (PAHs), styrene, metals and phytoestrogens, many of which we are exposed to daily in our food and the (indoor and outdoor) air. These chemicals' names may mean little to the consumers, but they nonetheless unknowingly carry them in their bodies. Up to 280 synthetic chemicals have been detected in umbilical cord blood and as many as 300 in human fat tissue. In laboratory tests 250 chemicals were identified which mimic or interfere with oestrogen.

Pregnant women and the health of their children

All research shows that the placenta does not provide a defence against harmful chemicals, as previously thought.[7] Persistent and bio-accumulative chemicals remain in the human body long after exposure and can be passed from mother to baby, in utero and via breast milk, and further cross the blood brain barrier to affect a child's central nervous system and its development. Children exposed to EDCs are more likely to develop health problems later in life such as cancer, infertility, or diabetes, even at very low levels and during certain windows of prenatal development.[8] EDCs can also cause multigenerational harm. A prominent example for this is DES, a drug given to pregnant women from the 1940s to 70s. Studies show that many DES-victim daughters (grandchildren of the DES users) experience infertility and cancer in their reproductive organs and breasts. Animal studies show that the granddaughters of women who took DES are also at risk for ovarian and uterine cancers. In fact, prenatal development is one of the most susceptible stages to health risks caused by chemical exposure.[9]

Chemicals in products

Harmful chemicals are everywhere. Thousands of chemicals are used to enhance the production process, increase performance or lower the price of goods. They are added not only to food and food packaging, but also to everyday articles such as clothes, mobile phones, glue, carpeting, furniture, cosmetics, toys, and detergents. Chemicals greatly pollute the air, from burning wood, coal or gas (cooking), from pesticides, perfumes, car fumes, and other pollutants that are a result of human activity. They enter our bodies and our blood through our eyes, nose, lungs, mouth, and skin.

For example, cosmetics can contain ingredients, which have been linked to breast cancer, asthma and allergies, and reproductive disorders. The skin is the largest human organ, and the body absorbs the ingredients in cosmetics through it. Women may use up to 26 different products daily. There are over 5000 different ingredients used in cosmetics. In the EU alone, five billion products are sold every year to 380 million consumers, meaning high potential exposure. Cosmetics are only one product group containing hazardous chemicals. Other product groups of everyday use include toys, textiles, furniture, and detergents. Peoples right to a safe and sustainable livelihood and future are being affected by exposure to toxic chemicals e.g. in the workplace, schools, agricultural areas and the home. This exposure can cause serious and irreversible damage such as cancer, birth defects, impaired development, negative impacts in the immune system, neurotoxicity and metabolic impairment. Fundamental changes are needed in order to change the unsustainable patterns of consumption, production, resource extraction and disposal that dominate the world economic system; and "fundamental changes are needed in the way that societies manage chemicals"[10], including their design, use and "end of life". The large majority of the pesticides and industrial chemicals currently in production and use have still not been adequately tested for their impact on human health and the environment. The precautionary principal and "no data – no market" principle should be applied to these chemicals, and in particular those areas of emerging concerns (and which have thus far not been sufficiently addressed as they challenged the central dogma of toxicology) such as endocrine disruption, epigenetics[11], the impacts of chemical mixtures and continuous low-dose exposure to chemicals.

Promoting best practices

We can find best practices in all aspects of issues on chemicals. In politics, countries like France and Denmark are frontrunners banning phthalates from products and work in stronger policies to protect their citizens from EDCs. Some companies produce articles without hazardous chemicals and use safe non-chemical alternatives. Civil society organisations work on awareness-raising campaigns with consumers, women and children, as well as advocating for strengthened policies and legislation. An example of international policy advocacy by different sectors is the addition of EDCs to the work of the UN multi-stakeholder process on chemicals through the Strategic Approach on International Chemicals Management (SAICM).

At the last conference (ICCM3) of the UNEP-led SAICM, governments unanimously decided to make EDCs a new SAICM emerging policy issue, and it was thus elevated as a priority for global action. This is the first time EDCs have been elevated to the global level and the first time

that the global community recognized by consensus, "*potential adverse effects of endocrine disruptors on human health and the environment*" and "*…the need to protect humans, and ecosystems and their constituent parts that are especially vulnerable*."

The actions recommended by the conference are to be enacted from 2012 – 2015. They include the provision of up-to-date information and scientific expert advice to relevant stakeholders for the purpose of identifying or recommending potential measures that could contribute to reductions in exposures to or the effects of endocrine-disrupting chemicals. The provision focuses in particular on vulnerable populations, awareness raising at all levels, international support for activities to build capacities in countries (in particular developing countries and countries with economies in transition), for generating information and for assessing issues related to endocrine-disrupting chemicals. The provision focuses on these topics in order to support decision-making, the prioritization of actions to reduce risks, and the development of case studies and advice on translation of research results into control action. Although these decisions are not legally binding, they give EDCs more global attention.

The measures taken by some governments to inform and protect women from harmful chemicals are not sufficient. Strong legislation is needed in all countries, including phasing-out and safe replacements of hazardous chemicals, including EDCs and nanomaterials.

"Women need to be protected from hazardous chemicals."

References

[1] WHO (2005): Preventing Chronic Diseases: A Vital Investment: WHO Global Report, Geneva

[2] WHO (2002): The world health report 2002 – Reducing Risks, Promoting Healthy Life, Geneva

[3] NCD Alliance: Non-communicable diseases: A Priority for Women`s Health and Development

[4] Barouki et al: Developmental origins of non-communicable disease: Implications for research and public health. Environmental Health 2012, 11:42

[5] Robert DeMatteo, Margaret Keith, James Brophy, et al: Chemical Exposures Of Women Workers In The Plastics Industry With Particular Reference To Breast Cancer And Reproductive Hazards. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 2012, 427 - 448

[6] see: http://www.endocrinedisruption.com/prenatal.criticalwindows.references.php

[7] Barrett Julia et al: Girl, disrupted. Hormone Disruptors and Women`s Reproductive Health, 2009

[8] For more information see: WHO: Possible developmental early effects of endocrine disrupters on child health. 2012. Barrett Julia et al : Girl, disrupted. 2009. ChemTrust : Review of the science linking chemical exposures to the human risk of obesity and diabetes, 2012. www.tedex.org. Gies Andreas, Soto Ana : Bisphenol A : contestet science, divergent safety evaluations, EEA Report: Late lessons from early warnings, 2013.

[9] Crain DA, Janssen SJ, Edwards TM, Heindel J, Ho S, Hunt P, et al. Female reproductive disorders: the roles of endocrine disrupting compounds and developmental timing. Fertil Steril 2008;90:911–940.

[10] Para 7 Dubai Declaration on International Chemicals Management, Strategic Approach to International Chemicals Management Dubai, 2006 http://www.saicm.org

[11] Epigenetics is the study of heritable alterations in gene expression caused by mechanisms other than changes in DNA sequence. An epigenetic trait is a stably inherited phenotype resulting from changes in a chromosome without alterations in the DNA sequence. www.sciencedaily.com/releases/2009/04/090401181447.htm

Recommendations

Science and research
Support better research on harmful chemicals and address knowledge gaps, such as the low dose effect, mixture effects, impacts during critical windows of development, effects of hormone disruptors and other toxins on women's health and trans generational effects. It is necessary to improve health tracking and disease registration systems, to support long-term studies, to encourage interdisciplinary collaboration, to continue with human biomonitoring programmes, and necessary for policy makers and risk assessment procedures to consider independent peer reviewed studies, including non-GLP ones.

Core principles

Right to know: Sufficient information to allow chemical users and consumers to make informed choices must be publicly available. Governments should make information available about harmful chemicals present in consumer and industrial goods and on how citizens and workers can protect themselves from them.

Polluter Pays: The cost of inaction on chemicals is not fully quantified but substantial. The WHO[12] conservatively estimates that industrial and agricultural chemicals and acute chemical poisonings are responsible for 1.2 million deaths per year and at least 1.7 per cent of the global burden of disease. The significant costs that these deaths and disease place on individuals, communities and nations (particularly their poor and most vulnerable) are not borne by the chemical producers or shared down the production supply chains. Instead, they impose an unacceptable burden on developing and transition countries. When chemicals are produced or used in a country, it is an obligation of that government to ensure that human health and the environment are not harmed as a result of chemical exposure or chemical accidents. The costs governments incur in fulfilling this obligation are economic externalities that arise as a result of economic decisions by industry to manufacture and to use chemicals.[13] Without internalization, the costs the governments incur for sound chemicals management amount to a subsidy of the private sector.

No data - no market: Only chemicals of which comprehensive sets of data and information is made available to regulators and to users can be sold.

Substitution: Hazardous chemicals should be replaced by safe substitutes or non-chemical alternatives.

Precautionary Principle[14]: Manufacturers, importers and regulators have to make sure in advance that the chemicals they produce, market or use do not adversely affect human health or the environment.

Global phase out
A global phase-out of hazardous chemicals including highly hazardous pesticides, persistent bio-accumulative toxins (PBTs), very persistent and very bio-accumulative substances (vPvBs), genotoxins, carcinogens, chemicals affecting reproduction, the immune and nervous systems, endocrine disruptors, substances that undergo long-range transport, toxic metals such as mercury, cadmium and lead and hazardous nanomaterials should be achieved. It is the best way to reduce exposure of humans and the environment. In the meantime labelling of harmful products, especially those used by and around women and children, should be applied along the full life cycle of those products.

Awareness-raising
Women, parents, and professionals in the health and education sector, should be widely informed about harmful chemicals in their environment (air, soil, water, products) and how they can avoid them. If necessary, they should be trained for example, through dedicated parts of the curricula, information campaigns, internet, publications and similar dissemination tools.

References

[12] A. Pruess-Ustun, C. Vickers, P. Haefliger, and R. Bertollini, "Knowns and Unknowns on the Burden of Disease due to Chemicals: A Systematic Review", Environmental Health, 10: 9, 2011

[13] Externalized costs include legacy issues such as obsolete stockpiles, and contaminated sites as well as children whose development has been impaired as a result of pre-natal and post-natal chemical exposure; others whose health has been injured as a result of chemical exposure; those providing health care services to such people when the injured are not able to pay for the services; property owners or users whose property value or utility decreases as a result of chemical contamination; fishers, hunters, small farmers, and others whose livelihoods are impaired by chemical contamination; indigenous peoples whose way of life has been undermined through contamination of their traditional foods; people whose water supply is contaminated; and others. Externalities of modern agriculture can include depletion of water, soil, and biodiversity; pollution by pesticides and fertilizers; and the resulting economic and social costs to communities.

Best practice

Non-governmental organizations advocate for safe toys internationally

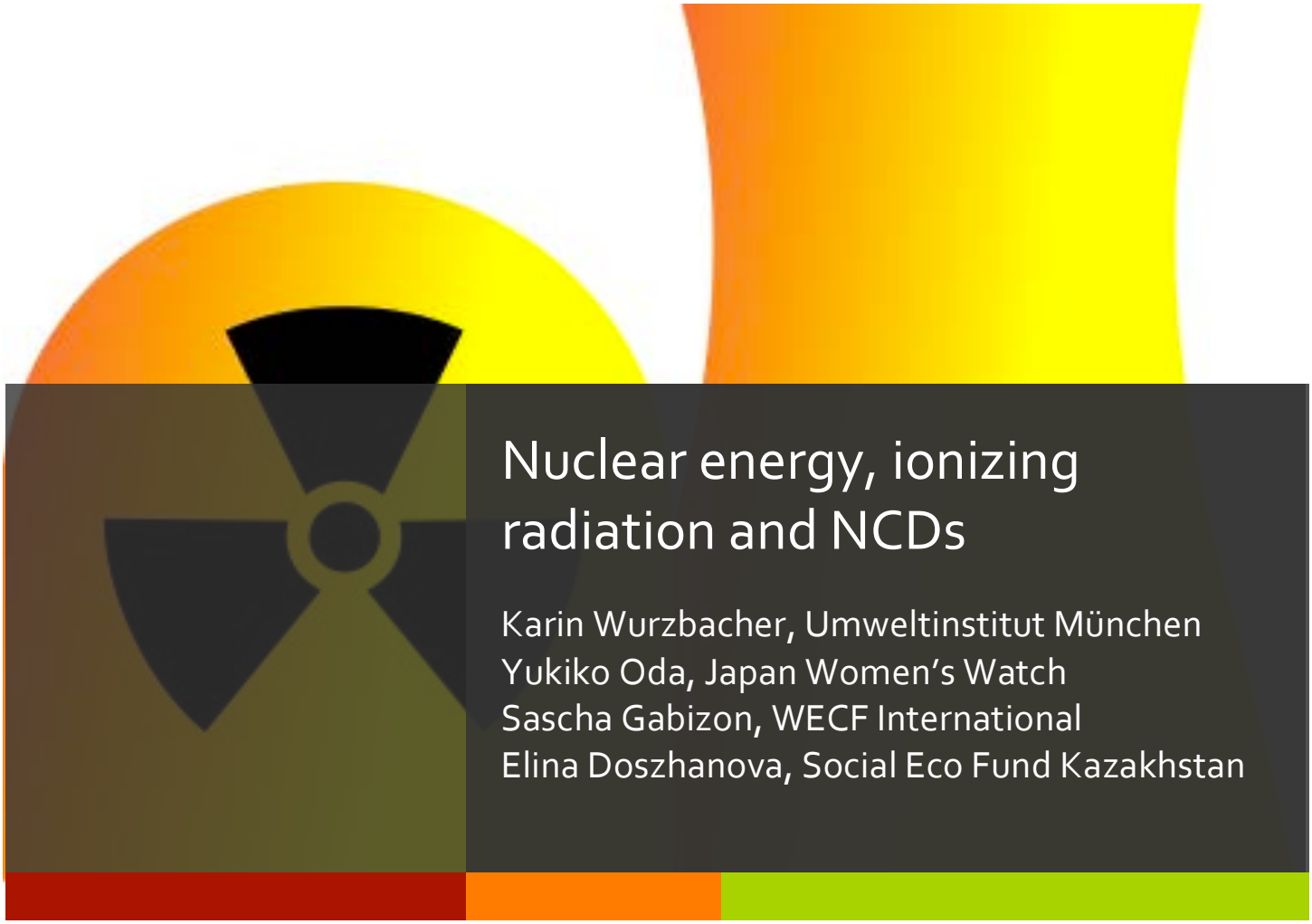
The International **Safe Toys Coalition** aims to protect children's health by striving for a world free of toxic and unsafe toys. The coalition was created by Women International for a Common Future (WICF/WECF) and Eco Accord, alongside a group of international health and environment non-governmental organisations, who formed a new working group to ensure safe toys for the healthy future of children. The "Safe Toys Coalition" aims to protect children's health by striving for a world free of toxic and unsafe toys. They address decision-makers, producers, retailers and the public on national, regional and international levels and help consumers to make informed decisions about the products they buy.
www.safetoyscoalition.org

The **Toxic Metals in Children Toys** Project was launched in six Eastern European, Caucasus and Central Asian (EECCA) countries in April 2012 . The Project participants include International POPs Elimination Network – IPEN, Eco-Accord (Russia), Armenian Women for Health and Healthy Environment, MAMA-86 (Ukraine), the Centre of Environmental Solutions (Belarus), Independent Environmental Expertise (Kyrgyzstan), and Greenwomen (Kazakhstan). The Project goal was to generate new data and raise awareness about toxic metals in children's products. From November 27 to December 9, 2012, extensive testing for 6 toxic chemicals was conducted on children's toys purchased in Armenia, Belarus, Russia, Kazakhstan, Kyrgyzstan and Ukraine. Using a compact x-ray fluorescence analyser (XRF), levels of lead, mercury, cadmium, antimony, arsenic and chromium were measured in 569 toys. The Project demonstrated hazardous levels of the above toxic components in toys. For example, 104 products (18 per cent) surpassed the limit for lead, 18 products (3 per cent) exceeded the limit for mercury, 45 products (8 per cent) were higher than the regulatory limit for arsenic, and 75 products (13 per cent) were higher than the limit for antimony. Seventy-five products (13 per cent) contained more than two or more toxic metals, increasing the potential for harm. All data generated during XRF testing of toys is posted online (www.ipen.org/toxicproducts) which includes analysis of the relevant regulations in the target EECCA countries, and recommendations from project partners to achieve safety of children's products.

The WECF **Balkan Toys Project** aims to inform consumers, policy makers, trade and industry in the former Yugoslav Republic of Macedonia (with Journalists for Human Rights, JHR), Serbia (with Resource Centre Lescovac) and Albania (with the Women's Movement for Integral Development LGZHI) about hazardous chemicals in everyday products, especially toys. Detailed inventories about the existing regulation were published and information campaigns for consumers have been started. In Albania the network "Albanian Safe Toys Coalition" was founded by LGZHI, and has immediately influenced the adoption of two new laws regulating the consumer product safety and market surveillance in Albania. In Macedonia JHR has developed a "Protocol for Standardization of Ecosafe Nurseries" which is already used in kindergartens. The campaign will be continued through information websites in the target countries
http://www.wecf.eu/english/about-wecf/issues-projects/projects/consumersafety-balkans.php

What governments do

Some governments recently took measures to inform and protect people from exposure to harmful chemicals. One example is the awareness-raising and information campaign in **Denmark**, informing pregnant women about hazardous chemicals and their potential impact on the health of their unborn babies (http://www.mst.dk/English/Chemicals/consumers_consumer_products/information_campaigns/Good_Chemistry_pregnant/).
In **Austria** pregnant women can find information via an online brochure, too. (http://www.lebensministerium.at/publikationen/umwelt/gefaehrliche_stoffe/gesunder_start.html)
In December 2013, **France** passed a bill banning Bisphenol A, a known endocrine disruptor, in food contact materials, to be implemented by 1st January 2015 for all direct food contact materials, including pacifiers and teething rings, and by January 2013 for food contact materials for children under the age of three years. In the meantime, a warning label for pregnant women indicating the presence of Bisphenol A (BPA) in the mentioned products will make it possible for people to reduce their exposure. Moreover, by 1st January 2015, the law also bans the use of DEHP, a reprotoxic phthalate, in infusion tubes used in neonatology departments and by pregnant and breastfeeding women.



Nuclear energy, ionizing radiation and NCDs

Karin Wurzbacher, Umweltinstitut München
Yukiko Oda, Japan Women's Watch
Sascha Gabizon, WECF International
Elina Doszhanova, Social Eco Fund Kazakhstan

Health damage from ionizing radiation

Nuclear energy presents a highly significant health and environmental risk. Human health is impacted negatively by exposure to nuclear materials at all stages of the nuclear cycle, from the mining of uranium, through to the production of products (e.g. weapons), the generation of nuclear power and the storage of nuclear waste.

Ionizing radiation is able to damage chemical structures of human cells. When cells or their DNA are damaged, the natural cellular process tries to repair the damaged areas. The mutated cell may die, or if successfully repaired and survives, the mutated DNA can accumulate in the body through subsequent cell divisions that can potentially lead to cancer.

Low levels of radiation and health damage

The way in which radiation affects health is dependent on several factors relating to exposure, the type and intensity of radiation, as well as the length of stay in radiated areas. The level of exposure relates to the proximity to the source of radiation and to weather conditions (such as rain and wind). After nuclear accidents most health effects appear a number of years later, often in the next generation. In fact, the lower the levels of radiation a person is exposed to, the longer the latency period, and the later the disease is likely to be detected.

Ionizing radiation has both direct and indirect health effects, which are known as 'deterministic' and 'stochastic' effects respectively. For deterministic effects there is a direct link between cause and effect. For example, in Chernobyl, 28 power plant workers died after massive exposure to radiation (0.8-16 Gy). Stochastic (or chance) effects entail a latent response in which the probability of developing a disease, such as cancer, cataracts, heart or vascular disease, increases later in life. However, the origin of the disease is difficult to trace back to radiation, because these diseases can also have other causes. The largest stochastic effect in Chernobyl was the dramatic increase in thyroid cancer in the area surrounding the power plant.

Reproductive health damage from radiation

Equally dangerous impacts include non-carcinogenic diseases. For example, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimates that between 30,000 and 207,500 children have been born with genetic mutations due to nuclear radiation from the Chernobyl disaster.

One specific consequence of radiation is its effect on reproductive health. After Chernobyl a lower fertility rate was observed in affected areas, while the number of stillbirths increased dramatically. Additionally in remote

areas of Poland, there were fewer live births in 1986 compared to previous years. In the Chernobyl region there were also indications of many miscarriages (natural aborted pregnancies), and the number of miscarriages in Western Europe also increased as a result of the Chernobyl disaster.

Women and Children's greater health risk

It is notable that women and children suffer greater health damage from radiation. For example, cancer incidence and death as a result of exposure to radiation is higher for women as it is for men.[1]
The NAS[2] report 2011 finds that harm to women (cancer) is 50% higher than the comparable harm to men from radiation doses that fall within the legal limit to the public over a lifetime. The risk depends on both sex and age at exposure, with higher risks for females and for those exposed at younger ages. The excess risks appear to be higher in populations of women treated for benign breast conditions, suggesting that these women may be at an elevated risk of radiation-induced breast cancer. Radiation sensitivity depends on age and gender, and is especially high for the unborn child and female organs. The higher sensitivity of women is a result of, among others, hormones and cell growth in certain tissue, for example in breasts.

The latest research clearly shows that current radiation protection is insufficient to protect the unborn child effectively. Radiobiological research focuses mainly on malformations that may occur during the organ formation in weeks three to seven[3]; mental retardation, which usually occurs during week eight to 15 or in a weaker form in weeks 16 to 25[4]; and cancer in children, especially leukaemia, which may occur anytime during the pregnancy and is induced by low radiation doses[5].

Children are especially at risk from radiation, because there is more cell division during childhood growth and development. Dividing cells are more susceptible to mutation than resting cells. Furthermore, cells only acquire the ability to recognize and repair damaged cells during childhood — embryos do not yet have this function. In addition, growing children assimilate more nutrition into the body than is released, therefore substances which are contaminated will be more readily incorporated. For example, the thyroid gland of growing children quickly takes up iodide. UNSCEAR suspects that the consumption of radioactive iodide in milk is responsible for the high number of thyroid cancer cases diagnosed between 1991 and 2005 in children who were younger than 18 years when the Chernobyl disaster occurred.
In an epidemiological investigation, the KiKK study focuses on childhood cancer in the proximity of nuclear power plants.

Mandated by the Federal Office for Radiation Protection, the KiKK study is conducted by the German Childhood Cancer Registry and is the most extensive study on these types of cancer cases. A main conclusion of the study is that the risk of developing leukaemia increases in relation to one's proximity to a nuclear power plant.

Radiation harm includes not only cancer and leukaemia, but reduced immunity and fertility, increases in other diseases including heart disease, and birth defects including heart defects and other mutations. For example, radioactive contamination of pregnant women in Chelyabinsk, Russia, has resulted in mutations of chromosomes, which have been transmitted through three or four generations.[6]

Reproductive health risk from radiation exposure is different for men and women. Men's reproductive health must also be affected radiation but there is a need for more gender based research in this area.

Nuclear industry workers and health risk

The effect of low exposure is doubly underestimated. Recent studies confirm increased cancer development in nuclear plant workers. The life span working doses, that are permitted within the current threshold limits, lead to increased cancer rates (ICPR 2007)[7]. Increasingly workers in nuclear power-plants are hired on a casual basis from subcontractors, most of them are men and difficult to trace, so that the health impacts from radiation are not registered.

Radon and health risk

Lung cancer risk also increases in response to exposure to radioactive radon gas in houses, which exists in many areas in the world but far too often inhabitants are not informed, nor aware of the risks. Radon is also often found in regions where uranium is mined. The risk from radon increases by roughly 8% per 100 Bq/m^3. An increase of between 100 and 200 Bq/m^3 shows additional cancer illnesses (ICPR 2007).

Uranium and health risk

Uranium mines also pose a health risk for workers and surrounding communities, and can impact trans-boundary pollution. Although uranium mining releases less radiation than a nuclear accident, small doses of radiation can still affect health in the long run. The danger is magnified in cases where safety measures are inadequate (e.g. there are underground mines with a lack of ventilation, radioactive raw metals, high amounts of uranium in drinking water, and open mining dumps).

"Radiation risks can be, and should be reduced."

A study in Kazakhstan showed that the frequency of chromosomal anomalies in uranium miners was positively correlated with the duration of exposure.

Radioactive waste and health risk

Another large risk exists in relation to the storage of radioactive waste and slurry. In the production of yellowcake (yellow uranium concentrate), waste by-products called tailings are left over. Consisting of heavy metals, arsenic and other chemicals, tailings still retain 85% of the original radioactivity. When improperly covered, the surface of the tailings dries up, and uranium- and arsenic-laced dust can be blown across the landscape. Additionally, radon gas, a decomposition product, is released from reprocessing facilities and radioactive waste dumps in significant quantities. As explained above, long exposure to radon gas can increase the risk of developing lung cancer and other types of cancer.

Use of depleted uranium by military – inacceptable health risk

Military operations using depleted uranium (DU), which is a by-product of enriched uranium production, also have significant impacts. Uranium itself is a toxic heavy metal, which accumulates in the bones and can induce a variety of diseases such as cancer, genetic disorders, and the disruption of function in the kidney, liver, and lungs. DU induces both chemotoxic and radiotoxic effects on the body. The former predominantly disrupts liver and kidney functions, while the latter can induce chromosomal and genetic disorders, for example, chromosome breakage. People mainly affected by this are soldiers and civilians in war zones. Projectiles that do not reach their target stay in the ground where the effects are unknown. In addition, after the use of uranium munitions in military operations, radioactive DU particles are released into the air and water. These particles affect people directly, but also enter into the food chain and bio-accumulate in animals and people. The exact effect on human health is uncertain.

Lack of radiation protection

Regulations and institutions mandated to deal with radiation protection are weak. In most countries, radiation protection regulation is based on the recommendations of the International Commission for Radiation Protection (ICRP). Unfortunately, the ICRP is too slow when it comes to updating its recommendations in relation to new scientific evidence concerning radiation health damage. Also, a 50-year old agreement between the World Health Organisation (WHO) and the International Atomic Energy Agency (IAEA), which has turned into a lobby group for the nuclear industry, means that there is now a lack of international guidelines on the protection of health from radiation.[8]

In general, the ICRP bases its recommendations on the dose reduction factor DDREF (dose and dose-rate effectiveness factor). The factor (DDREF = 2) halves the risk per unit dose at low doses or low dose rates. Unfortunately, the use of dose reduction factor DDREF is not based on scientific findings and not based on observed data of cancer induction. The rate of cancer induction at low doses and low dose rates is estimated by extrapolation from observations at high doses. A simple extrapolation estimate is provided by the widely adopted no-threshold "linearity hypothesis", according to which the risk is proportional to the radiation dose. Only linearity allows averaging the dose, which is widely practised in radiation protection.

For example, the ICRP has only provided an estimation of the slow-burn stochastic radiation risk of induced cancer and leukaemia (and it has not even provided this for other diseases). New data on atomic bomb survivors, on the population exposed by the accident in Chernobyl, and on patients who received therapeutic exposures, has led to reconsideration of possible impacts, such as radiation-induced cardiovascular disease and circulatory disease. It is also known that the threshold dose of radiation-induced eye cataracts is now considered to be about 10-times lower than formerly estimated; it may now be recognised as a malignant stochastic effect of radiation exposure.

Women's rights and radiation protection

It is critical that women have equal protection under the law. In all countries, regulation of radiation and nuclear activity ignores the disproportionately greater harm experienced by both women and children.[9] Current radiation protection fails to take into account the fact that women have a 50% higher risk from radiation then men. Instead, an 'average' sensitivity is calculated which is considered equally applicable to men and women. In reality this means that women are being afforded less protection than men. A more sensible approach would be to differentiate between men, women and children within the calculation.

Women should have equal protection under the law, and regulation should be strengthened to protect those most at risk from ionizing radiation: women and children.

Women's right to know about the health risks they are faced with when exposed to ionizing radiation and how to protect themselves from this harm, should also be implemented.

It is wrong to argue — as some regulators do — that if women were subject to different threshold limits they would be discriminated against in their profession. The right to equal opportunity would be breached. This is absurd. Correctly interpreted equal rights can only be achieved through better protection of women. Women are being discriminated against if the variation in radiation sensitivity is *not* included in radiation protection.

Conclusions

Energy policies decisions, especially on nuclear energy, should take into account the costs and risks in the entire process from mining to final disposal. Externalities have to be included. Women and the developing child have a high risk of developing cancer from exposure to radiation. Considering the lessons-learned from nuclear accidents it has become evident that nuclear energy can not respect the human right to life and to a healthy environment, not for todays generations nor for future generations. Women play vital role in all these areas. Women's voices need to be equally reflected in energy policy decisions.

Radiation risks resulting from unsustainable economic and political activities can be and should be reduced. It is vital for legislators to realize that there is no 'safe' level of radiation. It harms people and all living beings for centuries, and no short-term economic or political benefits can justify the sacrifice of life and health. Therefore, a global phase-out of nuclear energy and prevention of nuclear arms proliferation is the only acceptable path to true sustainable development of the global community. The following recommendations have to be implemented by governments immediately.

Recommendations

- Strengthen radiation protection legislation, taking into consideration the higher radio-sensitivity of the developing child and of women, and the likelihood of other non-malign illnesses being caused by chronic radiation exposure.
- Revise the threshold dose limits in line with current radiobiological knowledge especially in relation to radiation-induced cancers.
- Abolish the scientifically unproven dose-reduction-factor DDREF in low-dose ranges as used by ICRP. Instead adopt a linear dose-response-relationship (until the scientific knowledge brings new evidence).
- Implement women's right to know about the health risks associated with women's exposure to ionizing radiation and how they might protect themselves from this harm.
- Regulate the nuclear energy sector to increase protecting of workers in particular interim workers from subcontracting companies.
- Provide full information on costs, including externalities of the entire nuclear energy cycle, the costs of decommissioning nuclear power plants and long-term safe storage of nuclear waste, as a basis for energy policy decisions.
- Hold nuclear polluters accountable, ensure full redress and damage payment to affected populations, apply the precautionary principle, abolish legislation which frees nuclear industry from insurance payments for accidents and ensure equal participation of women and men in decision making.

Sources:

http://www.ippnw.de/commonFiles/pdfs/Atomenergie Gesundheitliche_Folgen_Tschernobyl.pdf
http://www.genanet.de/gesundheit.html#c3741
http://www.strahlentelex.de/Strahlenfolgen.htm#Säuglingssterblichkeit
http://www.gesundheitberlin.de/download/Otto.pdf
http://www.atomkraftwerk.biz/radioaktiv.html

References

[1] Biological Effects of Ionizing Radiation (BEIR) VII, Phase 2 report, "Health Risks from Exposure to Low Levels of Ionizing Radiation," published by the National Academy Press in 2006, Washington, D.C.
[2] Mary Olson, NIRS Briefing Paper October 2011 - www.nirs.org/radiation/radhealth/radiationwomen.pdf
[3] Körblein A. 2001. Malformation in Bavaria Following the Chernobyl Accident. 3rd Inter. Conf. Health Effects of the Chernobyl Accident: Results of the 15-year Follow-Up Studies. Abstracts. Intern. Journal of Radiation Medicine, 4 - 6 June 2001, Kiev, Ukraine. Special Issue, Vol.3, No. 1-2, 2001. Pg 66
[4] Douglas A., Eglund L., Palme M., Chernobyl´s Subclinical Legacy: Prenatal Exposure to Radioactive Fallout and School Outcomes in Sweden, Preprint: Chemistry World, August 11, 2007
[5] see footnotes 13
[6] Tomsk research quoted in WECF factsheet on nuclear industry and health: www.wecf.eu/english/publications/index.php
[7] ICPR recommendations presented 19th of June 2007 in Berlin, Germany. The International Commission for Radiation Protection (ICRP) presented new basic recommendations and the latest academic research results into radiation induced cancer and connections to radiation sensitivity.
[8] Appeal by Health Professionals for the Independence of WHO, launched in 2007, http://www.cwhn.ca/en/node/40679
[9] The background for some recommendations include calculations of the different radiation effects on women and children but the final 'allowable' doses to the public do not incorporate this information.

Case studies

Perinatal mortality due to Chernobyl and above ground nuclear tests

A number of academic research projects have shown that the effects of low-level radiation on a foetus can be terminal. After the accident in Chernobyl, Germany witnessed a highly significant correlation between exposure of pregnant women to caesium and perinatal mortality seven months later[10]. A local connection between caesium soil exposure in Bavarian districts and increase in rates of perinatal mortality in 1987 was reported[11]. In one particular area of Bavaria, where there was a 0.5 mSv per year increased background radiation, the infant mortality was significantly higher (15.7 %) than in the rest of Bavaria[12]. As a consequence of above-ground nuclear tests, West Germany also showed a marked increase in perinatal mortality around the year 1970, against an otherwise steady downwards trend. The deviation from the trend correlates with the calculated strontium concentration in the pregnant women[13].

Increased child leukemia near nuclear power plants

The cancer rate in children under five living within 5 km of German nuclear power plants is highly significant at 60%[14], and the leukaemia rates are also significantly high at 120%[15]. The risk increases significantly in relation to proximity to the site. These are the results of a case-control-study, the so-called German KiKK-study (Children near Nuclear Plants study: **K**inderkrebs in der Umgebung von **K**ern**K**raftwerken = Childhood Cancer in the Vicinity of Nuclear Power Plants)[16]. This study pinpointed the distance of individual case-homes from each of the 16 German nuclear power plants, meaning that it was better able to classify exposure than former ecological studies, which used approximate distances. When using the weaker ecological approach with the same data, one finds only a non-significant increase[17]. in leukaemia, in comparison to the highly significant 120 % increase in risk found in the superior case-control analysis. Subsequent studies from other European countries suggest that children living near nuclear sites are at no greater risk than other children. The combined analysis of data from Great Britain, France, Switzerland and Germany yields a highly significant 44 % increase of leukaemia risk in young children within 5 km of nuclear power plants and a significant increase of risk with proximity to the site[18].

Nuclear waste in Central Asia

Nuclear Waste and uranium tailings: Inadequate storage of nuclear waste is a particularly prevalent problem in Central Asia. In Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan, more than 812 tons of radioactive waste is stored in open and closed uranium mines. These tailings should be cleaned up, but are not as it is extremely costly. Tailings are often found in the immediate vicinity of residential areas and some are even used as playgrounds, pastures or farmland. Unfortunately, people living in poverty are seen to scavenging for scrap metal in uranium tailing areas. The metal is radioactive but is then sold and used by people who are not aware of the health risks, which they are bringing into their lives. Unfortunately, the Kazakh government has ambitious plans to increase mining of uranium and nuclear power plants construction, thus further increasing the health risk and damage to livelihoods of people living in the proximity to these nuclear sites.

Women and men scavenging radioactive metal in uranium mine tailing in Central Asia
Photo courtesy of CARNet

Contamination from weapons testing in Central Asia

During the Soviet period, Kazakhstan's steppes with rural indigenous population were used as the nuclear weapons test site - the Semipalatinsk Polygon. The cumulative dose of radioactive fallout is estimated as equivalent of 2500 bombs dropped on Hiroshima by the US Army. In fact, the real levels of radiation are not known till present days as most of the data was classified as secret and cannot be retrieved up to date. As this catastrophic legacy of the Soviet Union continues, the victims of radiation in the second generation suffer even more than the first generation victims. The mutated DNA structures carry on from one generation to another. Shockingly, a recent study in the villages around the Polygon area shows that in addition to high rates of deaths from cancer, thyroid problems, and other diseases high levels of suicide cases among young men are reported by the villagers. Recently there were attempts by the Kazakh government to proclaim the lands of the former Polygon again suitable for agriculture and inhabitation. Luckily, this initiative was stopped by civil society organisations. The current radiation and problems continue and will be borne by future generations for ages to come.

References

[10] Körblein A., Küchenhoff H., Perinatal Mortality in Germany Following the Chernobyl Accident. Radiation and Environmental Biophysics (1997) 63: 3-7
[11] Scherb H., Weigelt E., Brüske-Hohlfeld I., Regression Analysis of Time Trends in Perinatal Mortality in Germany 1980–1993. Environmental Health Perspectives (2000), 108: 159-165
[12] Körblein A., Hoffmann W., Background Radiation and Cancer Mortality in Bavaria: An Ecological Analysis. Archives of Environmental & Occupational Health (2006) 61: 109-114
[13] Körblein A., Perinatal Mortality in West Germany Following Atmospheric Nuclear Weapons Tests. Archives of Environmental Health (2004) 59: 604-60914
[14] Spix C., Schmiedel S., Kaatsch P. et al., Case-Control Study on Childhood Cancer in the Vicinity of Nuclear Plants in Germany 1980 – 2003. European Journal of Cancer (2008) 44: 275-284
[15] Kaatsch P., Spix C., Jung I., Blettner M., Leukaemia in Young Children Living in the Vicinity of German Nuclear Power Plants. International Journal of Cancer (2008) 122: 721-726
[16] Kaatsch P., Spix C., Jung I., Bletttner M., Childhood Leukaemia in the Vicinity of Nuclear Power Plants in Germany. Deutsches Ärzteblatt International (2008 Oct.) 105(42): 725-732 and also footnote 7
[17] See foonote 9.
[18] Körblein A., Fairlie I., Letter to the Editor: French Geocap Study Confirms Increased Leukemia Risks in Young Children Near Nuclear Power Plants. International Journal of Cancer (2012 Apr 11) doi: 10.1002/ijc.27585

NCDs and Chemicals Pollution: Challenges in Developing Countries

Manny C. Calonzo, Olga Speranskaya, IPEN

NCDs and Chemical and Environmental Exposures

According to the World Health Organisation (WHO), unintentional poisonings kill an estimated 355,000 people globally each year. Two-thirds of these deaths occur in developing countries where " such poisonings are associated strongly with excessive exposure to, and inappropriate use of, toxic chemicals" [1]. These chemicals enter the environment from industrial processes, mining, waste management including e-waste, and unsustainable forms of agriculture[2,3,4,5].

Breathing dirty air, drinking tainted water and ingesting unhealthy food, without any iota of doubt, are contributing to the global rise of non-communicable diseases (NCDs), particularly in developing countries and economies in transition, which, in the words of a health minister from a small island developing state (SIDS), are (avoidable) "illnesses (that) cost much more to treat, with punishing results for the victims and their families."[6]

Indeed cancers, cardiovascular diseases, chronic respiratory diseases, diabetes and mental health disorders have risen as a result of unhealthy consumption and lifestyle patterns and the degradation of the environment due to unsustainable resource exploitation, synthetic chemicals-driven agriculture and the proliferation of toxic chemicals and substances in processes, products and wastes in urban and rural settings, as well as the marine ecosystems.

As noted in the Dubai Declaration on International Chemicals Management, "the environment worldwide continues to suffer from air, water and land contamination, impairing the health and welfare of millions."[7]

As pointed out by the WHO, as much as 24 per cent of global disease is caused by environmental exposures which can be averted, and more than 33 per cent of disease in children under the age of five is caused by environmental exposures.[8]

WHO in 2008 also reported that 800,000 out of 1.3 million annual premature deaths worldwide occurred in Asia due to outdoor air pollution that analysts linked with the growing energy consumption and vehicular emissions in the region.[9]

A 2012 white paper by R. Barouki et al found that "many of the major diseases – and dysfunctions – that have increased substantially in prevalence over the last 40 years seem to be related in part to developmental factors associated with either nutritional imbalance or exposures to environmental chemicals."[10]

"The conditions that are affected by nutritional or environmental chemical exposures during development include the patho-physiologies, diseases, and syndromes that constitute major public health problems across

the globe: obesity, diabetes, hypertension, cardiovascular disease, asthma and allergy, immune and autoimmune diseases, neurodevelopmental and neurodegenerative diseases, precocious puberty, infertility, some cancer types, osteoporosis, depression, schizophrenia and sarcopenia," the authors of the study said.

Realizing that NCDs and almost every disease of concern can be traced to polluted air, water and food, it is imperative for governments, the industry and the civil society to pursue holistic solutions to prevent and reduce, if not eliminate, the environmental causes of such preventable illnesses.

In the run-up to Rio+20, IPEN, WECF and hundreds of global, national and local non-government organizations (NGOs) and civil society organizations (CSOs) collaborated "to create greater awareness of the increasing amounts of toxic chemicals in the environment, our food, communities and children, linking chemical safety and sustainable development."[11]
Through a "Common Statement for a Toxics-Free Future," concerned NGOs and CSOs from all corners of the globe "recognized that diseases such as cancer, heart disease, reproductive and developmental disorders, asthma, autism, diabetes, degenerative diseases and mental health illnesses have been shown to have links to the pollution of air, water, soil and food, as well as toxic consumer products and wastes."

"We stress that peoples' right to green livelihood and a sustainable future are being affected by exposure to toxic chemicals in the workplace, schools, agricultural areas and in the home, and that this may cause serious and irreversible damage such as cancer, birth defects, impaired development, negative impacts in the immune system, neurotoxicity and metabolic impairment," the statement said.

"We stress with concern that persistent and bio-accumulative chemicals remain in the human body long after exposure and can be passed from mother to baby, in utero and via breast milk, and further cross the blood brain barrier to affect a child's central nervous system and its development," the NGOs and CSOs further noted.

Echoing this link between a healthy environment and good human health, government leaders in their Rio+20 'The Future We Want" statement said "that reducing inter-alia air, water and chemical pollution leads to positive effects on health" as they "acknowledge(d) that the global burden and threat of NCDs constitutes one of the major challenges for sustainable development in the 21st century."[12]

NCDs and Chemicals Exposures

To illustrate this relationship between NCDs and environmental factors such as chemical exposures, a few examples are presented below with respect to the management of municipal solid waste and electronic waste (e-waste).

Municipal Solid Waste Management

The report "Respect for Recyclers: Protecting the Climate through Zero Waste"[13] rightly noted that municipal waste recycling in developing countries is mostly done by the informal waste sector, particularly by the waste pickers.
Despite the climate, energy, environmental and livelihood benefits, informal waste recycling is fraught with occupational health and safety risks due to their proximity to pre-separated discards, which often include infectious and toxic materials, and the hazardous conditions through which valuable recyclables and their components are physically retrieved.
As noted by the National Solid Waste Management Commission of the Philippines, "there is high level of exposure due to the manual handling of the waste and the lack of protective gear/equipment," adding that such "risks come from direct contact with waste such as broken glass, human/faecal matters, materials with toxic substances, containers with residues from chemicals, pesticides, needles and bandages from hospitals/clinics and smoke and toxic fumes from open burning of waste."[14] Respiratory ailments, eye and skin infections and physical injuries are some of the most common health problems affecting the informal waste sector in the country.

Origin of Risk Factor	Examples of Source of Possible Risk
Composition of waste	Toxic, allergenic and infectious components including gases, dust, leachate, sharps, broken glass
Nature of organic decomposing waste	Gaseous emissions, bioaerosols, dust, leachate, and fine particle sizes, and their change in ability to cause a toxic, allergenic or infectious health response
Handling of waste	Working in traffic, shoveling, lifting, equipment vibrations, accidents
Processing of waste	Odor, noise, vibrations, accidents, air and water emissions, residuals, explosions, fires
Disposal of wastes	Odor, noise, vibration, stability of waste piles, air and water emissions, explosions, fires

Table 1: Risk causing factors related to solid waste: origin and examples (Cointreau, undated)[15]

"Long-term exposure to pesticides can increase the risk of developmental and reproductive disorders, immune-system disruption, endocrine disruption, impaired nervous-system function, and development of certain cancers."

The health cost of waste picking, according to a three-country comparative study of solid waste policies and practices in India, Cambodia and the Philippines, includes recyclers' "exposure to a cocktail of toxic fumes and other chemicals in the dump and from open burning,"[16] on top of their exposure to pathogens that abound in mixed waste. The study identified diarrhea, fevers and respiratory ailments as commonly experienced by waste pickers in the three countries.

"Waste pickers burn PVC coated copper wires in order to extract copper, which sells at a high price. They find that cutting it can result in sharp cuts on their fingers and hands. However, burning copper wires results in the production of dioxins, (which) are known to have some negative effects on reproduction, the immune system and may cause birth defects as well as cancers."[17]

Aside from dioxins, burning solid wastes also result in the discharge of other pollutants of major health concern such as carbon monoxide, hydrogen sulfide, nitrogen oxide and particulate matter. According to the report, "carbon monoxide may cause asphyxiation; nitrogen oxide, increased respiratory tract infections and asthma and impairs immune responses. Hydrogen sulfide may cause asphyxiation while lower exposure levels may cause chronic kidney and liver disease and injury to the brain. Exposure to high levels of particulate matter may also lead to pneumonia, asthma, loss of lung function and a bevy of respiratory, cardiovascular and cancer-related deaths."[18]

E-Waste Management

Recent studies on e-waste management and disposal, particularly in Africa and Asia, described how the crisis associated with the unregulated e-waste recycling has exacted a heavy toll on public health and the environment. After obtaining air samples at Taizhou, a giant e-waste dismantling complex employing over 60,000 people in Zhejiang, China, researchers were able to link the uncontrolled handling and processing of e-waste to adverse effects on human health. Dr Fangxing Yang of Zhejiang University who co-authored the study released in 2011 said that "both inflammatory response and oxidative stress may lead to DNA damage, which could induce oncogenesis, or even cancer. Of course, inflammatory response and oxidative stress are also associated with other diseases, such as cardiovascular diseases."[19]

The report "Where are WEee in Africa," published by the Basel Convention Secretariat, noted: "Emissions from informal recycling activities are problematic in these countries and their impacts on human health and the environment are evident.

The major environmental and human health impacts from recycling practices in West Africa come mainly from the processes of dismantling, material recovery and final disposal."[20] E-waste workers in Benin, Ghana, Ivory Coast, Liberia and Nigeria faced a number of health risks ranging from cuts, spinal injuries to respiratory illnesses, the report said. "Recycling activities often take place on unfortified ground where harmful substances released during dismantling are directly discharged to the soil. Burning copper cables and wires, as well as monitors and TV casings, creates an accumulation of ash and partially burned materials at the burning sites. Insulating foam from dismantled refrigerators, primarily CFC-containing polyurethane, or old car tires are often used as the main fuels for the fires (Prakash et al. 2010), contributing to acute chemical hazards and long-term contamination at the burning sites, as well as emitting ozone-depleting substances and greenhouse gases into the atmosphere,"[21] the report further said.
Other studies cited in the said report described the horrendous health and environmental effects of informal e-waste recycling activities, particularly in Ghana:

- A sampling campaign carried out by the Greenpeace Research Laboratories in Accra, Ghana, at the main informal recycling sites (Agbogbloshie and Korforidua) revealed that copper, lead, tin and zinc concentrations in soil and ash samples are over one hundred times higher than typical background levels (Brigden et al. 2008).
- Increased levels of polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) found in breast milk samples in Accra, Ghana, were also linked to informal e-waste recycling activities (Asante et al. 2011).
- Based on site inspections at the four main informal burning sites in the Greater Accra Region, it was estimated that approximately 625 tonnes of cables were burnt per year. About 10-20 per cent of these cables were associated with e-waste, while the rest originated mainly from old vehicles (Prakash et al. 2010).

Pesticide management

According to UNEP, WHO and FAO, unsound pesticides management poses significant and often unacceptable risks to human health and the environment. "Of particular concern in developing countries are the use of Highly Hazardous Pesticides (HHPs), the presence of unsafeguarded obsolete stocks of pesticides and the overall poor management of pesticides products from their point of entry in the country to their end of life" [22].

Surveys have shown that the highly hazardous pesticides are in widespread use, in unsafe conditions exposing and poisoning people and the environment, particularly the vulnerable groups. As it is stated in UNEP's Global Chemicals Outlook, the estimated costs of poisonings from pesticides in sub-Saharan Africa now exceeds the total annual overseas development aid given to the region for basic health services, excluding HIV/AIDS. Between 2005 and 2020, the accumulated cost of illness and injury linked to pesticides in small-scale farming in sub-Saharan Africa could reach USD $90 billion.

HHPs emerged as an issue at the third session of the International Conference on Chemicals Management (ICCM3) in September 2012 when Kenya along with 20 countries, IPEN, Pesticides Action Network (PAN), International Trade Union Confederation (ITUC) and others proposed a resolution calling for their elimination, substitution, and addition to the FAO Code of Conduct, a move that drew the support of many countries in the plenary. Although it was not passed, several key stakeholders urged inter-sessional work on the topic and concerns over HHPs will be documented in the meeting report.

Acute exposure to pesticides can lead to death or serious illness[23]. Long-term exposure to pesticides can increase the risk of developmental and reproductive disorders, immune-system disruption, endocrine disruption, impaired nervous-system function, and development of certain cancers.

The most serious problems are associated with adverse health impacts of pesticides on child development[24,25]. The latter problem was, in particular, studied by Greenpeace in India[26]. The research demonstrated retardation of intellectual development of children in rural areas where pesticides are applied intensively. The study covered 18 villages in six states of the country. Development parameters of children under study were compared with relevant parameters of the control group of children of the same age group who were not affected by pesticide exposure. Children of the control group demonstrated 87 per cent better development vs. their counterparts of the study group. The Greenpeace report particularly emphasised that children of the study group did not work in agriculture but attended schools and kindergartens; nevertheless, they were exposed to pesticides in the air, water and soils. In many households, empty pesticide packages are used for domestic needs, while pesticide-impregnated dry cotton branches are used as a domestic fuel.

There are some available statistical data on a high incidence of children diseases in Azerbaijan (respiratory diseases, nervous, gastric-intestine, immune disorders, among others), associated with pesticide contamination of breast milk, groundwater sources of drinking water, air, soil and some food products[27]. Rural residents, who cultivate cotton, greenhouse vegetables, grapes, vegetables, and tobacco for example are the most heavily affected.

The study of children's health in Armenia[28], revealed that pesticides' application has adverse effects on children's health in rural regions of the country. Traces of organic chlorine pollutants were found in 85 - 97 per cent of samples of breast milk of Armenian women. According to the latest data (2000 – 2002), the fraction of organochlorine pesticides used in the republic was 6 per cent of total amount of applied plant protectants. Social and hygienic monitoring of rural population of Armenia established (positive) correlations between levels of pesticide use and prevalence of diseases.

Over-supply of pesticides and poor stock management results in the accumulation of obsolete stocks. The global stockpile of obsolete pesticides is estimated to be 500,000 tons[30]. Most of these chemical stores are found in poor, agricultural communities where uninformed farmers use the toxic chemicals on local crops or in their gardens. Toxic substances are often buried in ditches and stored in dilapidated buildings. Governments lack the capacity, financial resources and political will to locate, quantify, monitor, identify, and finally eliminate the toxic chemicals, and many stockpiles are not recorded as part of the national inventories. Although many Persistent Organic Pollutants (POPs), such as the pesticide DDT, are no longer in production, they continue to poison people and the environment in invisible ways due to their persistent and bio-accumulative properties, and their ability to travel long distances from their original sources. The situation is made worse by improper storage of obsolete chemicals and broken containers, which leak chemicals into the soil, contaminating water supplies and crops.

Recommendations

The "Common Statement for a Toxics-Free Future" includes several action points, which, if earnestly carried out, can dramatically help in improving the environmental quality and in preventing and reducing incidents of NCDs. Among other things, the statement emphasized the need to "support the demands and struggles of workers, women and children, indigenous peoples, peasant farmers, consumers and communities affected by toxic chemicals in their exercise of their rights for a healthy environment, worker protection, right to know, fair compensation, medical treatment and environmental justice." Some of the other recommendations are as follows:

Work to achieve a global phase-out of hazardous, unmanageable chemicals including highly hazardous pesticides, persistent bioaccumulative toxins (PBTs), very persistent and very bioaccumulative substances (vPvBs), genotoxins, carcinogens, chemicals affecting reproduction, the immune and nervous systems, endocrine disruptors, substances that undergo long-range transport, toxic metals such as mercury, cadmium and lead and hazardous nanomaterials. A global phase out is essential in order to avoid banned and restricted chemicals from one country being sold or dumped in another, particularly in those countries that do not have the capacity to enforce sound management of chemicals.

Support full chemical and material ingredient transparency and information access throughout supply chains and with the public.

Noting the threats posed to consumers globally from unregulated toxic product ingredients, we support and promote the implementation of precautionary, cradle to cradle, life cycle approaches to product design as well as green procurement policies, preferably with third party certification, so that toxic chemicals do not find their way into consumer products and the ensuing wastes; and we call for mandatory labelling of hazardous substances in products and in the workplace, ensuring the protection of all people and the environment.
Recognize that to achieve a sustainable future in which everyone can have access to safe, nutritious food, a profound transformation of agriculture to biodiversity-based ecological agriculture is fundamental.

Support clear criteria and policies that encourage investments in a sustainable chemical industry to help phase out the production of unsustainable

References

[1] The world health report 2003 – shaping the future. Geneva, World Health Organization, 2003.
[2] http://www.who.int/heli/risks/toxics/chemicals/en/index.html
[3] Human development report – consumption for human development. New York/Oxford, United Nations Development Programme, 1998.
[4] Toxics and poverty: the impact of toxic substances on the poor in developing countries. Washington, DC, World Bank, 2002.
[5] Yáñez L et al. Overview of human health and chemical mixtures: problems facing developing countries. Environmental Health Perspectives, 2002, 110(6):901–909.
[6] http://www.jis.gov.jm/news/leads/32836
[7] http://www.saicm.org/images/saicm_documents/saicm%20texts/Joint%20UNEP%20-%20WHO%20letter%20FINAL%20Feb%2008.pdf
[8] http://www.who.int/mediacentre/news/releases/2006/pr32/en/index.html
[9] http://www.nytimes.com/2012/12/06/world/asia/asian-cities-air-quality-getting-worse-experts-warn.html?_r=0
[10] http://www.ehjournal.net/content/11/1/42
[11] http://ipen.org/toxics-free-2012/common-statement/
[12] http://www.diplomatie.gouv.fr/en/IMG/pdf/The_Future_We_Want_-_Final_document_19_6_2012.pdf
[13] http://www.noburn.org/downloads/Respect%20for%20Recyclers%20%28English%29_1.pdf
[14] http://www.rrcap.ait.asia/projects/awmap/Final%20IS%20Report%2007152009%20%20(NSWMC)_.pdf?docid=2637
[15] http://previous.wiego.org/occupational_groups/waste_collectors/Wilson_Velis_Cheeseman_Informal_Sector_Waste.pdf
[16] http://www.chintan-india.org/documents/research_and_reports/chintan_study_informal_formal.pdf
[17] Ibid
[18] Ibid
[19] http://www.iop.org/news/11/may/page_51103.html
[20] http://journalistsresource.org/wp-content/uploads/2012/03/UN-E-Waste.pdf
[21] Ibid
[22] http://www.acpmeas.info/publications/ACP_MEZs_Newsletter_Vol4_Issue2.pdf
[23] Public health impact of pesticides used in agriculture. Geneva, World Health Organization, 1990.
[24] Food and Agriculture Organization of the United Nations/United Nations Environment Programme/World Health Organization. Childhood pesticide poisoning: information for advocacy and action. Geneva, United Nations Environment Programme, 2004.
[25] http://www.activistpost.com/2011/01/face-of-poisoned-man.html
[26] http://www.greenpeace.org/india/en/news/pesticides-exposure-hinders-me/
[27] http://www.ipen.org/ipenweb/documents/work%20documents/pestisidestockpiles_russion.pdf
[28] http://www.recetox.muni.cz/coe/sources/workshop_1_rba_pts/VI24-Tadevosyan.pdf
[29] http://www.ipen.org/ipepweb1/library/ipep_pdf_reports/3arm%20armenia%20country%20situation%20report%20english%20summary.pdf
[30] http://www.acpmeas.info/publications/ACP_MEAs_Newsletter_Vol4_Issue2.pdf

chemicals; to support green design and green chemistry; to fully assess using a life cycle approach all new technologies prior to their entering the market, and to protect developing and transition countries from unfair health, environmental and economic burdens.

Stress that a sustainable and responsible chemical industry must have the goal of eliminating all pollution and pay the true cost of its products throughout their life cycles. Cost internalization mechanisms and fiscal reforms, which truly reflect ecological values can assist in this and help provide the resources needed for the development of sound chemicals management policy, assessment, monitoring and practices.

Recognize that to achieve a sustainable future, a profound transformation of the chemical industry is fundamental and where the protection of workers, indigenous peoples, community health and the environment are not sacrificed to profit.

Commit to the principles that underpin the toxics-free future mission: precaution, right to know, no data – no market, substitution and elimination of hazardous substances, polluter pays and extended producer responsibility.

Non Communicable Occupational Diseases

Dolores Romano, Tatiana Santos,
Maria Lopez Jacob, Laura Martin Murillo
Sustainlabour

The working environment is a decisive factor for the health of people, their families and communities. Although adequate working conditions are a source of health and well-being, many risks of suffering injuries and illnesses also arise in the workplace, most of which fall under the category of Non Communicable Diseases (NDCs).

Several workplace environmental factors give rise to most of the health-related problems that affect workers, thus jeopardizing their lives and their well-being, threatening their working capacity and causing productivity issues in the companies where they work. These factors include the exposure to ionizing radiation or electromagnetic fields, exposure to biological agents or exposure to chemical substances with hazardous properties.

The main chemical substances related to NCDs, for which the elimination of the exposure at workplaces should be a priority are carcinogens, endocrine disruptors, mutagens, reprotoxics, neurotoxics and allergens. It is estimated that around 30,000 different chemicals (from the roughly 150,000 existing in the market) are used in workplaces worldwide but barely 1 in 100 has been thoroughly tested for health and environmental effects. Occupational exposure to particles including nanoparticles and ultrafine particles, diesel exhaust and man-made mineral fibres, allergenic and sensitizing agents (such as epoxy resins and isocyanates) and the combined exposure to chemicals, have been identified as emerging risks related to occupational NCD by the European Agency for Safety and Health at Work[1].

Many workers are exposed to these environmental factors day after day, throughout their working lives. Despite the efforts and progress on workplace risk prevention made over the past decades, the International Labour Organisation (ILO)[2] estimates that some 2.3 million women and men around the world succumb to work-related accidents or diseases every year; this corresponds to over 6,000 deaths every single day. Work-related diseases cause the most fatalities in the sector. Worldwide, there are around 340 million occupational accidents and 160 million victims of work-related illnesses annually. Hazardous substances alone are estimated to cause 651,279 deaths per year[3]. It should be noted that the figures represent a large underestimation since in many countries the majority of incidents are not reported, and in those countries where a system does exist, certain groups (such as those in the informal economy, domestic workers, immigrant workers) encounter significant barriers to reporting them.

All occupational NCD share the same main characteristic, they all are preventable through appropriate prevention measures.

The problem

Workers from all sectors are exposed to hazardous chemicals at their workplaces. Of particular concern is the exposure of workers in areas were chemical use is rapidly increasing; these areas include electronics, textiles, construction, services - cleaning, maintenance, hairdressing - and agriculture[4, 5].

There are about 40 identified occupational diseases[6,7] caused by exposure to almost 6,000 different chemical agents[8]. However it is worth highlighting that many work-related diseases are not included in the European list of occupational diseases, due to, among other reasons, the unspecific nature of many health disorders. Most common occupational diseases are allergies and cancer.

There are 11,091 identified sensitizers[9]. 88 per cent of recognised occupational skin disease cases and 36-89 per cent of recognised occupational respiratory disease cases are related to chemical exposure[10]. The number of occupational diseases caused by chemical sensitizers that could be avoided each year in Europe are estimated to be 40,000 cases for asthma, 10,000 cases for Chronic Obstructive Pulmonary Diseases (COPD) and 40,000 cases for dermatitis, using a working population figure of 200 million for EU[11].

On the other hand**,** more than 2,000 substances[12] cause 32,500 cancer deaths (3.5 per cent of total cancer deaths in the EU) are estimated as resulting from occupational exposure to chemicals, mainly to known or suspected carcinogens[13]. The estimated economic burden of cancer in Europe exceeds 124 billion Euros[14].

If these are the data and estimations related to the EU alone, it is not difficult to imagine the enormous global dimension of the problem, in places where information, laws and enforcement related to public health and occupational health and safety policies and regulations are weaker.

It is estimated that exposure to pesticides cause more than 7 million acute and chronic illnesses and 40,000 deaths per year among agricultural workers[15,16]. Cancer, neurological, endocrine, respiratory, renal system or reproduction disorders are some of the health problems associated with occupational exposure to pesticides. These estimates do not include the children of farm workers, severely affected by exposure to pesticides. Newborns with diagnosis of cryptorchidism and/or hypospadias and other malformations have been commonly found in intensive agricultural areas[17].

Exposure to hazardous pesticides related to NCDs is of special concern in the case of rural workers from poor areas and agricultural child labour (70 million children worldwide[18]), due to the increased biological susceptibility of the young.
Exposure to hazardous chemicals during waste treatment and construction, such as in crystalline silica products, has also been identified as emerging risks.

Nanotechnology has also been identified as an emerging risk by a number of experts[19,20,21]. Since commercial applications began in the early 2000s, nanotechnology is expanding exponentially in different industrial sectors such as pharmaceuticals, electronics and chemicals, meaning that that the number of workers exposed to nanomaterials has risen sharply in recent years. Nanoproduct inventories show over 2,500 nano-enabled products[22] currently available in the global market and by 2012, there was $263 billion worth of such products.[23]. However, there is great lack of transparency about the presence of these substances in the market, the production volumes, the main uses, exposure and toxic effects.

For every 200 Euros invested in the world to research the application of nanomaterials or nanotechnology industry, only 1 euro is devoted to study its risks to health and the environment. Hence, the impact of nanomaterials on health and safety at work is hard to predict. Animal studies suggest that some nanoparticles can cross the different protection barriers (blood brain/placenta barrier), spread throughout the body and accumulate in different organs. For example, some carbon nanotubes (CNTs) are known to behave like asbestos. The reported toxic effects in animals and the physico-chemical characteristics of nanomaterials are good reasons for adopting a precautionary approach.

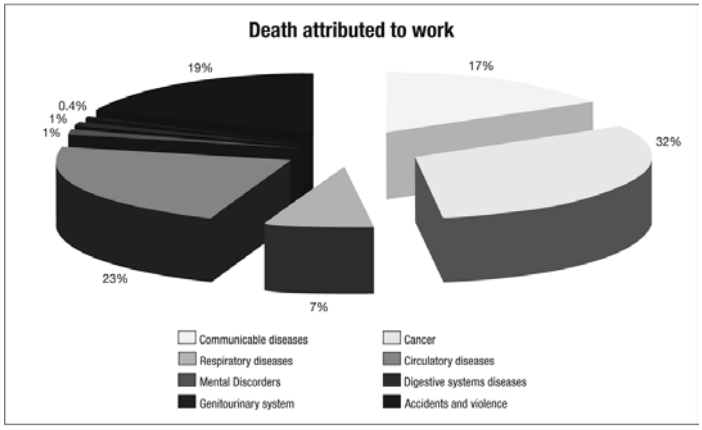
Certain groups are more vulnerable to suffer from work-related NCDs such as women, young and elderly workers, workers with chronic health problems, unqualified workers, workers in small, medium and micro companies, those working in the informal economy, those subject to more shifts, migrant workers or those living in low-income areas. In general, they are subject to worse working conditions, have a higher risk of suffering health impairments and have less access to health services and health promotion plans at work.

Most known NCDs originating in the workplace related to exposure to hazardous chemicals are chronic respiratory diseases, multiple site cancers, dermal pathologies, circulatory diseases and neurological disorders.

The ILO ranks occupational cancer as the top work-related cause of death worldwide, accounting for 760,000 fatalities each year, almost a third of all deaths linked to workplace factors, more than circulatory disease, infections or accidents[24]. Lung cancer and mesotheliomas account for 50 per cent of the fatalities.

In general, statistics do not include reproductive health problems suffered by workers and their children due to prenatal exposure at the workplace, however, millions of workers are exposed to reprotoxicants and endocrine disrupters. A British study found that 102 (29 per cent) job titles were classified as possibly (17 per cent) or probably (12 per cent) exposed to one or several endocrine disruptors[25]. Prenatal exposure to endocrine disrupters has been related to NCD such as cancer, reproductive disorders, diabetes or obesity.

Figure 1. Main causes of occupational fatalities worldwide.



Source: ILO SafeWork.

Chemical risk management in businesses around the world is inadequate. Not only the information available to companies about the risks of handling chemical products is very poor, but their perception of chemical risks is insufficient, risk assessment is inadequate and their chemicals management approach does not respect the principles of prevention. Workers also lack the training and information to handle chemicals and to understand the risks of the substances to which they are exposed.

References

[1] Expert forecast on emerging chemical risks related to occupational safety and health. European Agency for Safety and Health at Work, 2009. ISBN 978-92-9191-171-4. Available at: https://osha.europa.eu/en/publications/reports/TE3008390ENC_chemical_risks
[2] http://www.ilo.org/global/lang--en/index.htm
[3] ILO World Statistics. Available at: http://www.ilo.org/public/english/region/eurpro/moscow/areas/safety/statistic.htm
[4] European Occupational, Health and Safety Agency (EU-OSHA). Available at: https://osha.europa.eu/en
[5] UNEP Global Chemicals Outlook. Towards Sound Management of Chemicals. UNEP: Geneva, United Nations Environment Programme: Nairobi, 2012
[6] ILO List of Occupational Diseases (revised 2010). Available at: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_125137.pdf
[7] Commission Recommendation of 19 September 2003 concerning the European schedule of occupational diseases (Text with EEA relevance) (notified under document number C(2003) 3297). Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003H0670:EN:HTML
[8] Risctox database on hazardous substances. Instituto Sindical de Trabajo Ambiente y Salud (ISTAS). Available at: http://www.istas.net/risctox/index.asp
[9] According to the annex VI of the Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures. Risctox database: http://www.istas.net/risctox/index.asp
[10] Reaching, the workplace, Tony Musu, ETUI, 2006. http://hesa.etui.org/uk/publications/files/REACH-EN.pdf
[11] The impact of REACH on occupational health with a focus on skin and respiratory diseases. Simon Pickvance, Jon Karnon, Jean Peters, Karen El-Arifi. School of Health and Related Research University of Sheffield, UK. Final report, September 2005, prepared for the European Trade Union Institute for Research, Education and Health & Safety.
[12] Risctox database: http://www.istas.net/risctox/index.asp
[13] European Commission Environment Directorate-General. "Assessment of the Impact of the New Chemicals Policy on Occupational Health". Available at:http://ec.europa.eu/environment/chemicals/reach/background/docs/finrep_occ_health.pdf
[14] European Society for Medical Oncology. ESMO 2012 Program. Available at: http://www.esmo.org/no_cache/view-news.html?tx_ttnews[tt_news]=1617&tx_ttnews[backPid]=585&cHash=8afba3ebb0
[15] Blondell J. Epidemiology of pesticide poisonings in the United States, with special reference to occupational cases. Occ Med State of the Art Reviews 1997; 12:209-220.
[16] http://www.ifpri.org/sites/default/files/publications/focus13_08.pdf
[17] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2174399/
[18] http://www.ilo.org/ipec/areas/Agriculture/lang--en/index.htm
[19] European Environmental Agency. "Late lessons from early warnings: science, precaution, innovation". Available at: http://www.eea.europa.eu/publications/late-lessons-2
[20] Scientific Committee on Emerging and Newly Identified Health Risks; SCENIHR. "Risk Assessment of Products of Nanotechnologies". Available at: http://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_023.pdf
[21] Strategic Approach to Internationals Chemicals Management (SAICM). "Emerging policy issues: Nanotechnology and manufactured nanomaterials (resolution II/4 E)". Available at: http://www.saicm.org/index.php?option=com_content&view=article&id=397:emerging-policy-issues-nanotechnology-and-manufactured-nanomaterials-resolution-ii-4-e&catid=89:iccm-2
[22] Cosmetics, food, sport equipment, medical appliances, textiles, electronic devices, household products, building materials, chemicals intermediary, etc.
[23] http://www.centerforfoodsafety.org/wp-content/uploads/2012/10/NANO-EXPOSED_FINAL.pdf
[24] ILO. Safety in numbers. Pointers for a global safety culture at work. International Labour Organization: Geneva, 2003
Best practice
[25] Brouwers M M et al. Occupational exposure to potential endocrine disruptors: further development of a job exposure matrix. Occup Environ Med 2009;66:607–614. doi:10.1136/oem.2008.042184
[26] https://osha.europa.eu/en
[27] http://www.substitution-cmr.fr/index.php?id=22
[28] http://www.afsset.fr/index.php?pageid=779
[29] Zero occupational Cancer Campaign. http://www.cancerceroeneltrabajo.ccoo.es/cancercero/menu.do?Accion_Sindical:Materiales_de_campana
[30] Substitution Support Portal (Subsport). Kooperationsstelle Hamburg IFE GmbH (KOOP), Instituto Sindical de Trabajo Ambiente y Salud (ISTAS), International Chemical Secretariat (ChemSec), Grontmij A/S, Copenhagen. Available at: http://www.subsport.eu/
[31] Chemical Hazard and Alternatives Toolbox. Blue Green Alliance, IUE-CWA. Available at: http://www.chemhat.org
[32] Risctox database on hazardous substances. Instituto Sindical de Trabajo Ambiente y Salud (ISTAS). Available at: http://www.istas.net/risctox/index.asp

Recommendations

Elimination and substitution of hazardous substances at workplaces should be effectively promoted.

Prevention of the exposure to environmental factors at workplaces should be integrated in the NCD Action Plans, particularly in relation to reducing exposure to chemicals of high concern (carcinogens, endocrine disruptors, mutagens, reprotoxics, neurotoxics and allergens).

Special attention should be given to preventing exposure by most vulnerable groups of workers, including agricultural child labour, women, young and elderly workers, workers with chronic health problems, unqualified workers, workers in Small and Medium Enterprises (SMEs) and micro companies, those working in the informal economy, those subject to more shifts, migrant workers and rural workers from poor areas.

Prevention of prenatal exposure to endocrine disrupters at workplaces should be given urgent action.

Information systems to provide information and increase traceability on occupational exposure to environmental factors related to NCD should be developed.

Reproductive health effects should be included in occupational diseases statistics.

Medical surveillance, monitoring of occupational NCD and report of results should be strengthened.

Enhanced information, knowledge sharing and awareness campaigns, specially directed to most vulnerable groups and to sectors with the highest exposure to chemicals should be developed.

Risk assessments, risk reduction measures, information on environment, health and safety research as well as safety data sheets should be also specific for nanomaterials and endocrine disrupters.

It is essential to create specific models and programmes in order to promote an integral action on workplace Risk Prevention and Health Promotion among companies.

Health services in the workplace require international guidelines for action and training comprising the necessary elements for the sound management of chemical substances to develop health promotion programmes connected to the reality of working conditions and the workers.

It is vital to make progress concerning cooperation of health resources in the workplace with public health and between the different administrations involved in promoting workers´ health. The situation originating from inequalities and access barriers to health services in the workplace may benefit from existing joint programmes assisting the most vulnerable groups of workers. Integrating workplace risk prevention policies within public health policies and vice versa may generate greater possibilities for development and effectiveness.

Proposal for an adequate regulatory framework developed that properly addresses the protection of workers from the risks derived from the use and exposure to manufactured nanomaterials and endocrine disrupting substances in the workplace.

The law-making process that helps minimize workplace risks in developed countries should be extended to the rest of the world with a special focus on compliance.

Best practices must be encouraged and their results disseminated regarding effectiveness in reducing illnesses and improving working conditions and well-being.

It is necessary to have greater evidence of the link between NCDs and working conditions. Also of importance is to encourage research on preventative intervention strategies and their effectiveness.

Best practice

Many governmental, industrial and trade union organizations have developed activities to prevent the exposure to occupational environmental factors related to NCD.

EU OSHA best practices
(https://osha.europa.eu/en)

The European Agency for Safety and Health at work has published several compilations of best practices to prevent the exposure to dangerous substances that can be consulted at their website[26].

French portal for substitution of carcinogens, mutagens and reproductive toxins (CMRs)[27]

The French Agency health, food safety, environment and work (ANSES)[28], has developed a tool to support the substitution of CMR substances.

Trade Union Zero Cancer Campaign[29]
(http://www.cancerceroeneltrabajo.ccoo.es/)

The Spanish Trade Union "Comisiones Obreras" is developing a national campaign to prevent occupational cancer. It encompasses activities at the workplace through the intervention of health and safety representatives as well as policy actions and the creation of an alliance of organizations working to prevent occupational cancer. The campaign offers workers representatives a wide range of tools for campaigning.

Subsport[30]
(http://www.subsport.eu)

Subsport is an internet portal that constitutes a state-of-the-art resource on safer alternatives to the use of hazardous chemicals. It provides information on alternative substances and technologies, tools and guidance for alternatives assessment and for substitution management. The portal is intended to support companies in fulfilling substitution requirements. In addition, the project aims to create a network of experts and stakeholders who are active in substitution.

CHEMHAT[31] (http://www.chemhat.org) and RISCTOX[32] (http://www.istas.net/risctox/index.asp)

Chemhat and RISCTOX are databases developed by trade union organizations (US based IUE-CWA and Blue Green Alliance and European based ISTAS and ETUI) to help workers understand the risks related to the substances they are exposed to.

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