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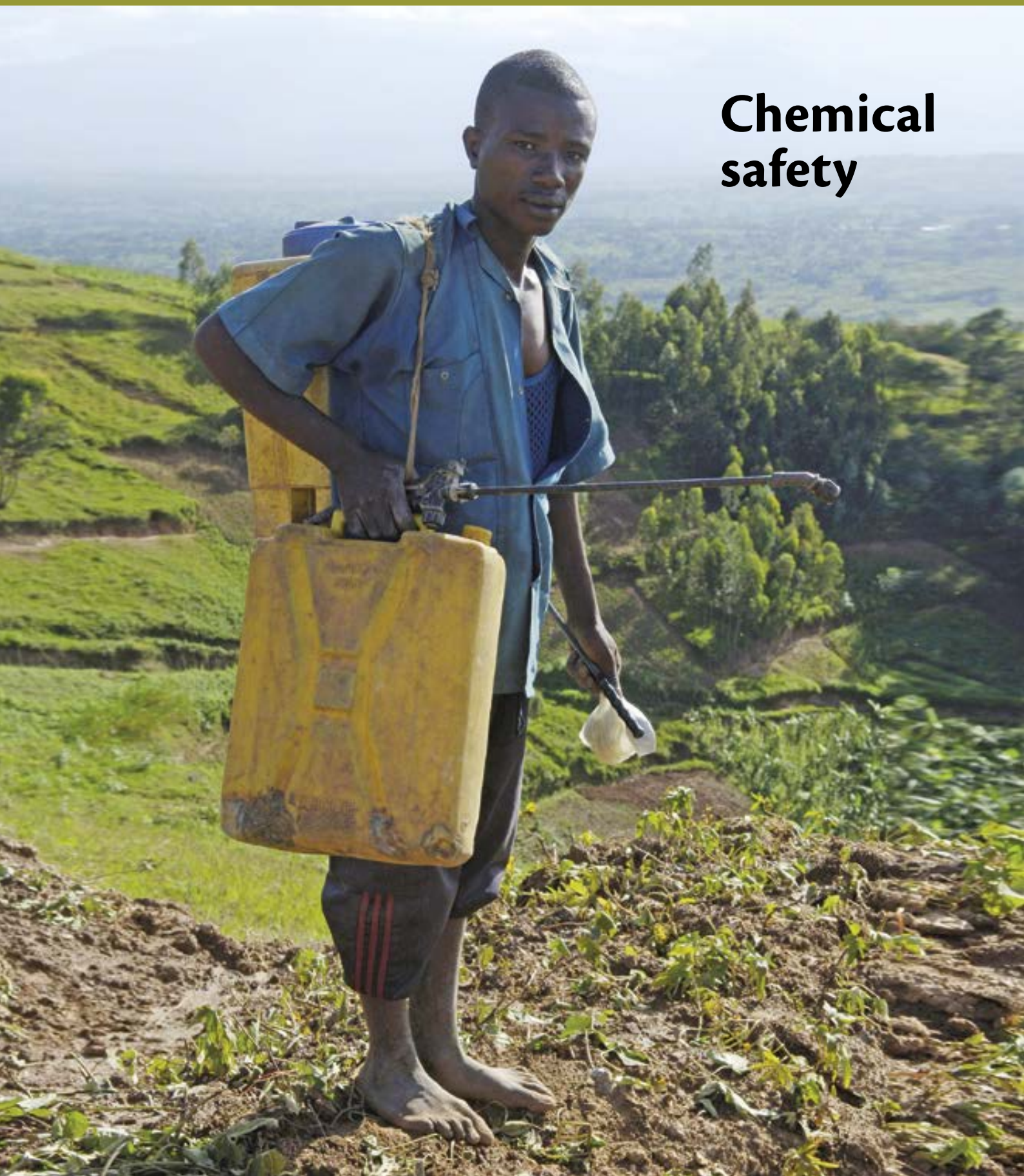

Chemical safety

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Finnish Institute of Occupational Health

Contents

The dilemma of our time

Industrialization and technology have revolutionized life globally. These advances have been accompanied by an increase in the number of new chemicals commonly used. These include both exotic new substances used in high-tech industries, and common materials such as chlorine, cleaning agents and solvents. These chemicals can exist in many forms such as dust, fumes, fibres, powders, liquids, gases, vapours, and mists. They are used in almost every workplace of every economic sector, both formal and informal, and in both small, medium-sized enterprises (SMEs) and large enterprises, which include those in the agricultural, construction and demolition, mining and quarry, food, engineering, metal, paint, plastics, pharmaceutical, pottery, printing , and textile industries, to name a few.

There is a logical dilemma concerning chemicals that cannot be solved: despite having hundreds of different uses and benefits, they can and do cause health and environmental problems. A chemical that is used to bring about a positive end result can have a detrimental health effect on the worker during its production or use. Chemicals can be hazardous or harmful at any stage of their life-cycle; they may pose a physical hazard by being flammable or explosive; and they may have an adverse effect on the environment if used, stored or disposed incorrectly. As much as their harmful effects are recognized, chemicals and their benefits continue to be considered essential to life; an indispensable commodity in our daily lives. Hence we are bound to talking of chemical safety rather than chemical bans.

Although their importance in industrial processes is acknowledged; the disturbing fact is that not much is known about many of the chemicals on the market. A great number have not been thoroughly evaluated for potential risks to human health, which can range from mild skin irritation to cancer; the latency period of the effects, which can be immediate or many years after the exposure; or the effects of short exposure versus longer-term exposure. Nevertheless, chemicals continue to be integral components of industrial processes; generated by work processes, and generated as waste or residue during work processes. The potential health and safety issues in every phase of a chemical's life-cycle warrant equal attention if we are to control workers' exposure to them, and to limit their emission into the environment.

Although chemical exposures can be significantly reduced through environmental and occupational management, these toxic exposures continue to cause a disease burden of unknown magnitude. A review by Prüss-Üstün et al. (2011) concluded that "based on estimations available to date, the global burden of disease attributed to environmental exposure and management of selected chemicals amounts to at least 4.9 million deaths per year. This represents 8.3% of the total of deaths and 5.7% of the total diseases in DALYs worldwide. 54% of this burden (counted in DALYs) is borne by children under the age of 15 years." Worldwide it is estimated that chemical exposure at work alone is responsible for about 4% of all deaths from cancer.

With these alarming figures, we must acknowledge the complexity that comes with assessing chemical safety, and the need to determine the critical biological processes and pathways, the effects of interaction, and basic toxicology or pharmacology. It is also essential that we prevent occupational diseases, even those due to chemicals that are important to the advancement of life. We must ensure that there are concerted efforts to reduce risks from toxic chemical exposure by taking into account the entire life-cycle of the chemicals, by ensuring safety during manufacturing, workplace safety, transport safety, and consumer and environmental protection.

Intensive management of chemicals and information are needed, especially in developing countries in Africa where there is an upsurge of SMEs for economic growth and diversification. Most chemicals used in these countries are important and some are banned or restricted in their countries of origin due to the serious harm they can cause to people and the environment. Many of the chemical-related occupational injuries and illnesses and harmful effects on the environment are neither detected nor managed due to the still underdeveloped systems of regulation, monitoring and reporting.

Our hope hangs on the "2020 goal" set in 2002 at the World Summit on Sustainable Development, to ensure that chemicals will be produced and used worldwide in ways that minimize significant adverse impacts on the environment and human health. The momentum of this continued with the adoption of the Strategic Approach to International Chemicals Management (SAICM) by the International Conference on Chemical Management at its first session in February 2006. SAICM aims to make governments and relevant sectors of agriculture, environment, health, and labour address chemical safety more effectively through National Chemicals Management Systems that include specified elements.

It is at this juncture that efforts that involve initiatives at the global level such as the SAICM, Inter-Organisation Programme for Sound Management of Chemicals (IOMC), the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), International Chemical Safety Cards (ICSC); and initiatives at regional, national and enterprise levels should be combined, so that chemical safety can be realized now and not in the distant future. All efforts should be co-ordinated and harmonized to ensure that the enrichment of our lives does not come at the cost of our health, our safety and the condemnation of our environment.

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The WHO Chemical Risk Assessment Network

WHO has established a network of institutions to work collaboratively on chemical risk assessment issues and enhance global efforts to assess risks to human health from exposure to chemicals.

The production and use of chemicals continues to increase worldwide and manufacturing and trade of finished products has become more globalized; production has also shifted from industrialized to less developed countries. Therefore, to protect human health around the world and contribute to the improvement of health in developing nations, it is important to enhance efforts globally and share expertise to assess and manage the risks associated with exposure to these chemicals in the environment, food, products and occupational settings, as principled in the Strategic Approach to International Chemicals Management (SAICM – www.saicm.org). Further highlighting the need for organizations to work more closely together to mutually and maximally benefit from activities of risk assessment and research programmes are the increasing pressures on regulatory agencies to accelerate the rate of assessment of chemicals and the rapidly expanding nature and quantity of data available to support chemical risk assessment.

The burden of disease which is attributable to exposure to chemicals is estimated by WHO to be significant, and is likely to be underestimated using the data currently available (1). WHO has been working for many years towards strengthening collaboration between institutions globally who are engaged in chemical risk assessment. To further this aim and to promote the objectives of SAICM, WHO convened two meetings on Global Collaboration in Chemical Risk Assessment (in March 2010 and March 2012). These meetings endorsed the establishment of a WHO Network to strengthen global collaboration in chemical risk assessment.

The WHO Chemical Risk Assessment Network was launched in 2013 and is a voluntary collaborative initiative to facilitate interaction between institutions working on chemical risk assessment. The overall goal of the Network is to improve chemical risk assessment globally through facilitating sustainable interaction between institutions on chemical risk assessment issues and activities. The Network participants are institutions (not individuals) who work towards the Network objectives.

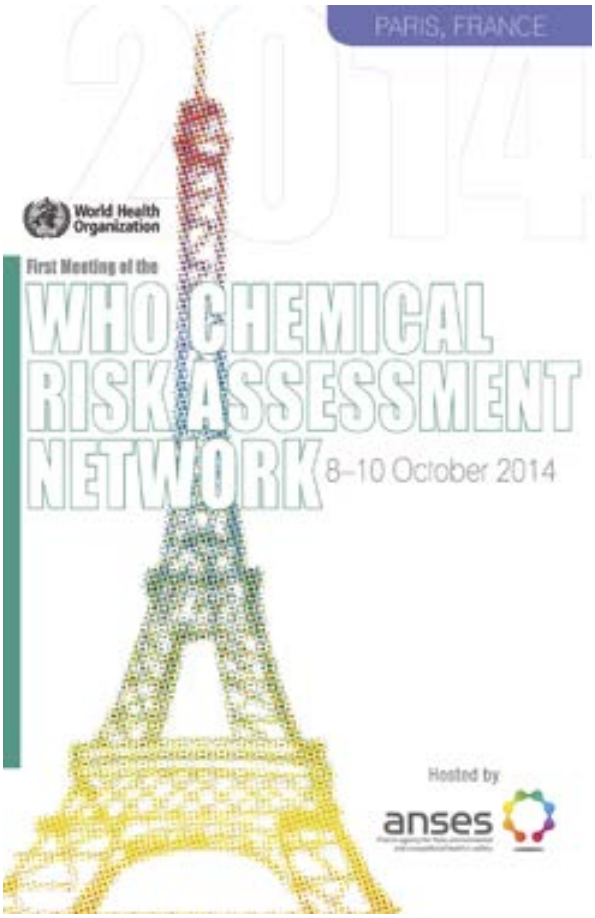
The Network is global in nature, and is expected to address exposure to chemicals through all pathways and routes of exposure, including in environmental media (air, water, soil) and food, through use of consumer products and in occupational settings. A number of objectives have been identified for the Network (see Box) and the Network will be project oriented, with a range of potential products including reports, guidance documentation, training sessions or materials, tools, databases, etc.

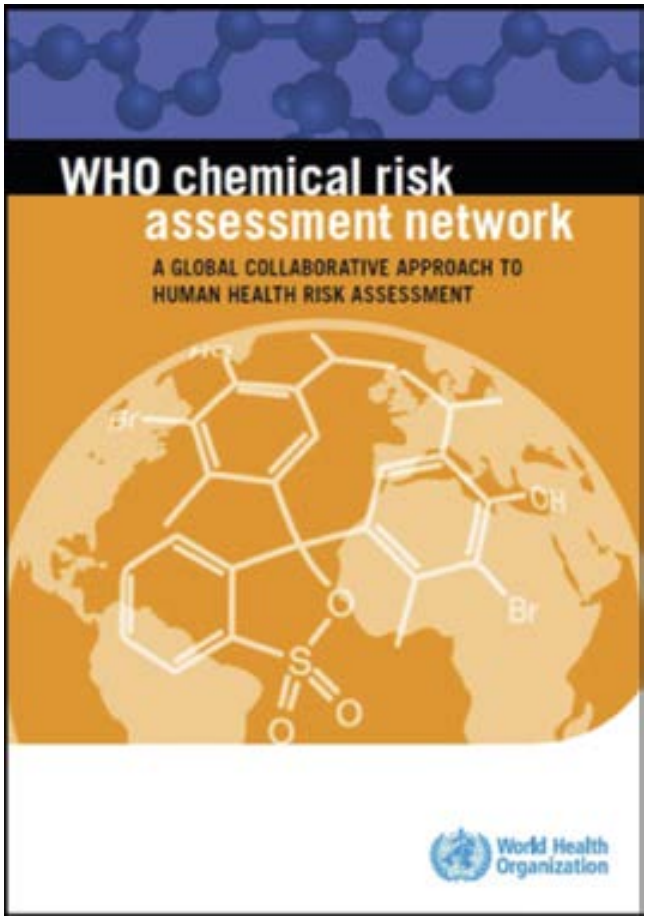
Network Objectives

a) Provide a forum for scientific and technical exchange
b) Facilitate and contribute to capacity building
c) Promote best practices and the harmonization of methodologies
d) Assist in the identification of research needs and promote the application of new science in risk assessment practice
e) Assist in the identification of emerging risks to human health from chemicals
f) Share information about work programmes to avoid duplication of effort
g) Upon request, assist WHO in the development of training and other materials in support of the above.

Initial activities underway or recently completed under the umbrella of the Network include the development of an online database of risk assessment training courses [www.risktraindb.org], a review of research needs identified in WHO chemical risk assessment publications (2) and development of WHO guidance on characterizing uncertainties and variability in human assessment [Harmonization Project Document 11].

The activities of the Network complement existing WHO activities on sound management of chemicals, including the International Chemical Safety Cards – a source of essential health and safety information on chemicals published (in partnership with ILO) in a concise format which is particularly aimed at use in the oc-





cupational sector.

Network Participants are institutions engaged in chemical risk assessment activities from the following sectors:-

a) Government and public health institutions
b) Intergovernmental organizations
c) Professional societies
d) WHO Collaborating Centres
e) Non-governmental organizations in official relations with WHO
f) Other non-profit entities with relevant expertise.

The first face to face meeting of the WHO Chemical Risk Assessment Network was held 8 to 10 October 2014, hosted by the French Agency for Food, Environmental and Occupational Health and Safety (ANSES) at Maisons-Alfort, Paris, France. The meeting was attended by 55 chemical risk assessment institutions from 29 countries.

Themes addressed included: directions in the science of risk assessment; priorities for development of risk assessment methodologies; means to scale up capacity building; and means to coordinate work among institutions on topics of common interest. Technical issues discussed included: use of biomonitoring information in chemical risk assessment; identification of emerging risks; evaluating and expressing uncertainty; and implementation of systematic review approaches in chemical risk assessment. A number of project proposals, for implementation by Network participants, were discussed and further developed at the meeting.

The Network continues to invite contributions from institutions interested in undertaking work towards the Network objectives – the terms of reference are published on the Network web site. Further information about the Network and updates on project implementation are also published on the web site and in a Network Newsletter.

Web links

http://www.who.int/ipcs/network/en/
https://www.risktraindb.org/
http://www.who.int/ipcs/publications/icsc/en/
http://www.ilo.org/icsc

Contact

www.who.int/ipcs (International Programme on Chemical Safety web site)
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Pius W. Makhonge
Kenya

Situation of chemical safety in small-scale enterprises in Kenya

Introduction

In Kenya, workers are exposed to chemicals in various activities, namely farming, manufacturing, building, and maintenance work. Farmers use chemical substances for animal and crop protection. Animal zero grazing has become fashionable: this is when small-scale farmers keep a few cows for milk production and spray the animal regularly. Another growing trend is small-scale greenhouses, in which farmers grow vegetables and tomatoes, and spray chemicals on a weekly basis for good crop performance.

In the building industry, paints, solvents, glues, wood preservatives, tar, and insecticides are commonly used, and in garages and workshops, gasoline, kerosene, paint solvents, and lubricating oils are used daily.

In spite of their usefulness, chemicals are known to cause bodily injury. In 2003, ILO claimed that about 400 000 deaths are caused by exposure to chemicals annually. Records on non-fatal injuries due to chemicals are scanty, but the figures are estimated to be several times higher than those of deaths. Similar records for Kenya are not available.

The underlying causes of past major chemical accidents around the world, including the 1984 Bhopal disaster in India and the Flixborough disaster in England, have been flaws in safety management systems at the organizational level.

In small-scale workplace activities, the same flaws exist at an even higher scale and are responsible for workers' exposure to chemicals.

As Kenya moves towards a newly industrialized middle-income country under its 2030 vision, more chemicals will be used in small-scale workplaces, hence the need for a clear strategy to minimize the chemical exposures.

Exposures

At workplaces, chemical exposures commonly occur during mixing, blending, grinding, carrying, transporting, storage, sifting, spraying, and painting activities. The major routes of chemical entry into the body are by inhalation of airborne materials and skin contact. In some few cases, exposures occur through ingestion arising from poor personal hygiene. The health effects can be acute (short-term) or chronic (long-term). The acute effects range from minor burns, irritation of the skin, irritation of the upper and lower respiratory tract, and oxygen starvation, to immediate death. These are quickly observed and recognized. However, chronic effects usually develop slowly, the exposures occur day after day, month after month, year after year, and serious health effects or death transpire a long time after the exposure. Therefore the danger is not easily recognized.

Legal framework

In Kenya, a legal framework exists for chemical safety at workplaces in the Occupational Safety and Health Act, 2007 and the Hazardous Substances Rules of Legal Notice No. 59 of 2007.

The Occupational Safety and Health Act, 2007 has the following provisions for the protection of workers against chemical exposures:

- Every manufacturer, importer, or supplier of any substance for use at work must carry out testing and research on substances.
- Every manufacturer and importer, supplier or distributor of chemical substances must provide safety information by way of material safety data sheets and leaflets,
- Every employer must ensure the availability of the information, warning signs and labels at work stations and also provide workers with adequate training on chemical safety
- Every occupier (person or organization responsible for the workplace) must undertake chemical risk assessments to ensure that the risks are identified and adequate control measures are put in place.

The Hazardous Substances Rules of Legal Notice No. 59 of 2007, which is subsidiary legislation under the Occupational Safety and Health Act, makes provisions for the workplace measurement of chemical substances and also for the regular health surveillance of exposed workers by approved medical practitioners.

In spite of the elaborate legal requirements and guidelines available in the country, a visit to small workplaces where chemicals are handled will show that unsafe practices are still rampant.

Commonly observed unsafe practices

Some of the commonly observed unsafe practices in the handling of chemical substances include the following:

- In automobile workshops, mechanics often siphon

Photo by © International Labour Organization / M. Crozet

gasoline from fuel tanks and even clean tools and spare parts with gasoline using their bare hands. The mechanics' overalls are rarely washed and are spotted with oil.
- The owners of small-scale greenhouses often mix and spray pesticides without personal protective equipment (PPE). Where PPEs are used, they are not cleaned immediately after spraying.
- Painters mix paints with solvents and paint without gloves or breathing masks.
- Detergents are often used without suitable gloves.
- Labels and accompanying leaflets are usually removed and disposed of in the process of opening the bottle or container.

Some challenges

- The unsafe practices mentioned above seem to be mainly the result of poor understanding of the health effects of chemicals.
- Agriculture extension services for farmers exist at the local level, but the guidance focuses more on the efficacy of the chemicals and very little or not at all on their safety.
- County occupational safety and health inspection services are manned by one officer in most cases, hence there is very limited capacity to reach small-scale enterprises.
- The supply outlets focus on the selling of the chemicals and do not give any safety guidance on the safe use of chemical substances, perhaps due to their limited knowledge on chemical safety.
- Although the law requires that material safety data sheets (MSDS) are made available, suppliers do not usually give them to buyers at the outlets. Even if the MSDS were available, knowledge on how to properly use the information is lacking.
- PPE is a significant method of protection against chemical exposures. However, more is involved than just selecting and providing PPE. The user must know how to use it properly, and to maintain and clean it following the right procedures. This knowledge is lacking.
- Because the exposures are of a chronic nature, there are no immediate signs of sickness, hence the exposed workers do not recognize exposure as a problem.

Suggestions for improving chemical safety

The starting point in workers' protection against the effects of chemicals at all levels is the understanding of how the chemicals enter the bodies and the resulting health effects. Understanding can be achieved through appropriate training and sensitization of distributors, suppliers, agricultural extension officers, employers and workers. Training of suppliers and distributors is vital as it ensures that information is transferred to the users, i.e. farmers or others who use the chemicals. As regards chemicals for agricultural use, agriculture extension officers are best placed to transfer the information, as they regularly meet the farmers.

Training and sensitization sessions should be co-ordinated by County Occupational Safety and Health Officers, funded by the existing Occupational Safety and Health Fund managed by the Director of Occupational Safety and Health Services.

Other recommendations include:
- Simple chemical safety materials, which can be prepared by the Occupational Safety and Health Services and distributed to small-scale workshops and farms directly or through their group organizations.
- MSDS, which should be a procurement requirement for those procuring chemicals and should be verified on delivery.
- Suppliers of small greenhouses providing free chemical safety sensitization services on a continuous basis.
- A simplified version of the existing code of practice on PPE, drawn up by the Director of Occupational Safety and Health Services, providing guidance on the selection, choice, use and maintenance of PPE in the handling of chemicals.
- Mainstreaming occupational health and safety in technical and agricultural courses, which could improve the safety culture of technicians and extension officers.

Conclusion

It is possible to improve the safe handling of chemical substances provided there is a concerted effort on the part of all involved in the supply chain.

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Literature

- Occupational Safety and Health Act 2007 (Kenya)
- The Factories and Other Places of Work (Hazardous Substances) rules, 2007
- ILO Chemicals Convention C170

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Tanzania

Characterization and potential health risks of pesticides registered and used in Tanzania

Background and introduction

The economy of the United Republic of Tanzania mainly depends on agriculture, which accounted for 28% of its GDP, provided 85% of exports, and employed about 80% of the total workforce in 2012 (1). Pesticides are indispensable chemicals for the control of pests and diseases of significance for agriculture, public health and livestock. They are used in agriculture in order to realize economic benefits and are also used to combat livestock diseases which include ticks, tsetse flies, manges and fleas. In the health sector, pesticides are used to combat various human diseases such as malaria, elephantiasis and other diseases of public health significance.

The benefits that accrue from the use of pesticides are an integral part of judicial management practices. Based on potential toxic and residual characteristics, and compounded by diverse applications, pesticides may cause significant human and animal health effects, and pollute our natural environment.

The United Republic of Tanzania's pesticide legislation is Plant Protection Act No. 13 of 1997, articulated by the Plant Protection Regulations of 1999 (2). The pesticide legislation sets requirements for each life-cycle phase of pesticides (manufacturing/formulation, registration, importation, sale and distribution, use, transportation and disposal), and aims to mitigate the adverse effects of pesticides. According to the National Law, all pesticide dealers in Tanzania, including distributors of pesticides, must be licensed before they are granted operational permits (Photo 1).

Despite elaborate pesticide legislation, the situational analysis carried out revealed weaknesses and gaps in pesticide control and management. These included inadequate capacities and poorly co-ordinated mechanisms

Photo by Elikana E Lekei

Photo 1. A licensed pesticide retail shop, indicating pesticide distribution in the market.

in the areas of regulatory enforcement, risk assessment and risk management, health surveillance and biological monitoring, intersectoral collaboration and networking, and pesticide data generation and management (3).

The pesticide registration process is an initial, proactive approach for screening undesirable products. It includes the assessment and evaluation of the technical data submitted for registration, followed by the validation of the biological effectiveness in the field under local conditions. The registration process grants pesticides different statuses: Restricted, Provisional and Full, subject to a wide range of uses by the general public.

Pesticide use practices, despite adherence to recommended handling instructions, may result in human and animal health exposures and environmental pollution, as is common in most developing countries. A previous Tanzanian study revealed that products registered under the Full and Provisional category were reported to be involved in poisoning (4).

Restricted products, on the other hand, are registered for specific uses and can only be handled by well-trained personnel.

The risks arising from pesticide depend on the Chemical group and Hazard classification, amount used, and route of exposure. One study conducted in Tanzania recently revealed that the majority of products linked with poisoning were in category OP/CA, and WHO hazard classification Class I and II (4).

This survey examines the current products registered and used in Tanzania and their respective categorization, which essentially reflects their potential risks. Through this article, the authors address the questions frequently asked by various researchers intending to engage in pesticide risk assessment research locally and internationally.

What was done?

This study involved a review of different data, including the list of registered pesticides in Tanzania, TPRI Annual reports, and the WHO List of Classification of Pesticides by Hazard (5–7). Data collected included, but was not limited to, active ingredients, chemical categories, formulation type, products' registered usage, products imported 2013/2014, pesticide target crops, number of active ingredients per formulation, WHO hazard classification, product registration category, and target crop and pest.

For the purpose of describing human risks, the formulations were further categorized into Cholinesterase inhibitors vs. others; EC formulation vs. others and WHO class I and II vs. other categories, restricted vs. others and finally Bio pesticides vs. other products. Currently registered products and those imported to Tanzania during the period 2013/2014 were also compared.

Table 1. Categories of pesticides registered in Tanzania by chemical group.

Chemical groups	n	%
Anilide	20	2.4
Avermectin	10	1.2
Benzimidazole	14	1.7
Biological	13	1.5
Bipyridylium	22	2.6
Carbamates	22	2.6
Choronicotinyl	37	4.4
Chloroacetamide	14	1.7
Chloronitriles	30	3.5
Dinitroaniline	16	1.9
Dithiocarbamates	56	6.6
Glycine	43	5.1
Inorganic	67	7.9
Organophosphate	135	15.9
Phenoxy acid	30	3.5
Pyrethroid	230	27.2
Triazine	20	2.4
Triazole	68	8.0
Total	847	100.0

Results

The review identified a total of 1182 products registered in Tanzania, representing a variety of active ingredients. The registered products were categorized into the following categories: Provisional (minimum missing documents required for registration) (n=132) (11.2%), Full (all requirements for registration fulfilled) (n=986) (83.4%) and Restricted (Highly hazardous products) (n= 64) (5.5%). All products under these registration categories are assigned registration numbers on the basis of their target pests, with the exception of restricted products whose registration numbers start with "RE". Tanzanian products are categorized into pesticides for agricultural usage (986) (83.4%), public health products (123) (10.4%), animal health pests (61) (5.2%), timber treatment, various construction and other uses (5) (0.4%), and formulation purposes (7) (0.6%). In terms of formulation type, the majority of the products were found to fall under Emulsifiable Concentrate EC (n= 373) (39.6%), WP (138) (14.6%), and suspension concentrates (127) (13.5%). The chemical categories found on the list were predominantly pyrethroids (230) (27.2%) and organophosphates (135) (15.9%) (Table 1).

Table 2. Pesticides registered in Tanzania by active ingredients, chemical categories, crops and target pests.

Product by target pest	n	%
Acaricide	56	4.7
Avicide	2	0.2
Fungicide	321	27.2
Growth regulator	10	0.8
Herbicide	289	24.5
Insecticide	493	41.7
Nematicide	3	0.3
Rodenticide	8	0.7
Total	1182	100.0

The top ten crops consuming a high number of products were horticulture (n=406 products), sugarcane (n=65 products), flowers or ornamentals (n=57 products), cotton (n=56 products), coffee (n=51 products), cashew (n=39 products), rice (n=24 products) and beans (n=22 products)

The review found that the most frequent active ingredients amongst the products registered in Tanzania were cypermethrin, mancozeb, deltamethrin, dimethoate, imidacloprid, lambda cyhalothrin, glyphosate, chlorpyrifos, 2,4-D, alpha cypermethrin, metalaxyl, profenosof, chlorothaloni, and pyrethrins.

Categorization according to target pest revealed that the majority of the registered products were insecticides (n=493) (41.7%) and herbicides (289) (Table 2).

The review of registered products that fall under cholinesterase inhibitors indicated that OP/CA accounted for about 16% of all products registered, while highly hazardous products (WHO Class I and

II) accounted for over 50% of all products registered in Tanzania (Figure 1).

The proportion of safer bio-pesticide products on the list was small, accounting for only 1.8%, whereas other products accounted for 98.2% of all registered products.

The majority of the products registered in Tanzania predominantly had one active ingredient (79.6%) with only 20.5% having more than one active ingredient.

The study revealed that in the financial year July 2013 to June 2014, a total of 11 481.5 MT of pesticides were imported to Tanzania. These were insecticides (1390.4 MT) (12.1%), herbicides (2424.9MT) (21.12%), fungicides (6528.1 MT) (56.8%), and restricted categories (including fumigants, technical materials and high-risk products) (1058.8 MT) (9.1%) (Figure 2).

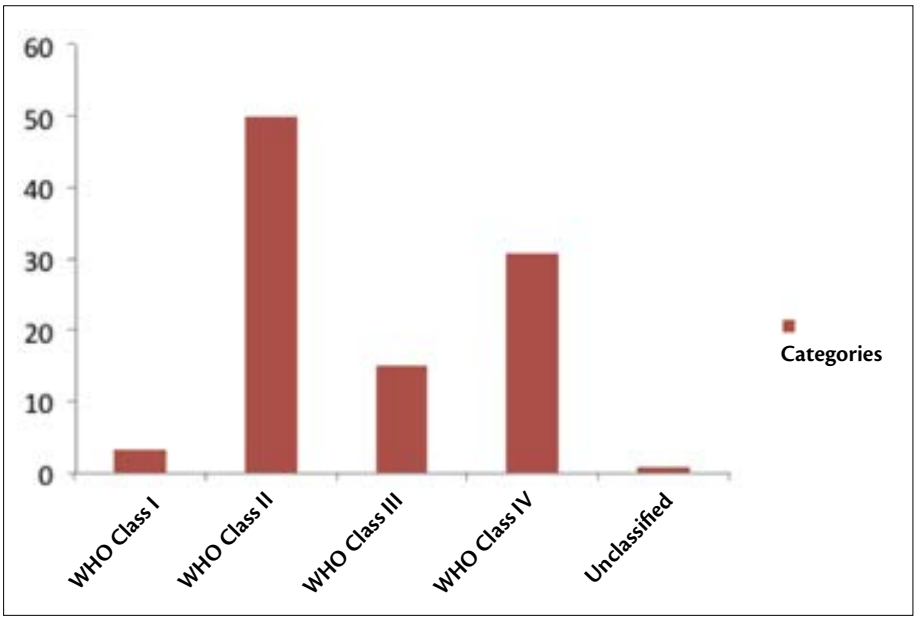

Figure 1. Pesticide categorization based on WHO Hazard Classification (percentage)

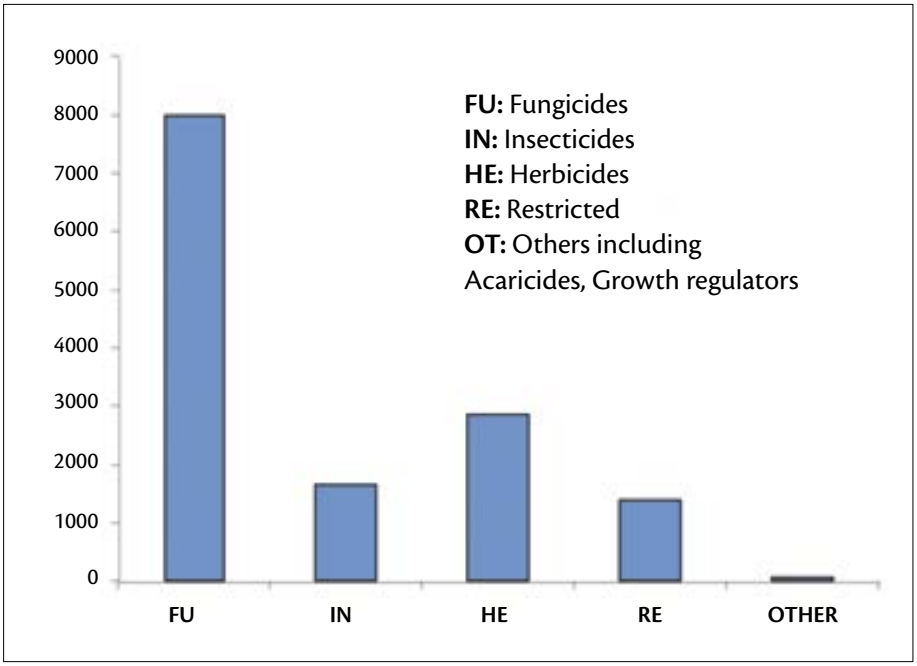

Figure 2. Pesticide import data from July 2013 to June 2014 (MT)

Discussion

Tanzania currently has over 1000 registered products, indicating a high demand for use in pest control operations. This large list may be proportional to the size of the country's agricultural land area, which is 40% of Tanzania's 945 000 km^2 (8). This huge number of registered products also reflects potential human health risks, particularly due to poor agricultural practices, which are common in developing countries. This study demonstrates the high demand for pesticides in agricultural use as compared to other uses: 83.4% of the products registered are used in agriculture.

The four registration categories included about 64 restricted products, which is proportional to 5.4% of all registered products. This category includes highly toxic, fumigants, technical materials (products with highest active ingredients mainly used for formulation purposes), products with potential for resistance and many others. Restriction coupled with enforcement is a good approach for risk reduction due to the fact that it ensures that these high risk products are strictly handled by knowledgeable users, leading to low likelihood of exposure and poisoning.

The presence of a high number of cholinesterase inhibitors, including organophosphates and carbamates (16%), as well as WHO class I and II (over 50%) chemicals, also reflects potential human health risks for users of these products, small-scale farmers in particular. This situation is common in studies in many developing countries, and these products are known to result in serious health problems. OPs have become increasingly popular for both agricultural and home use because their unstable chemical structure leads to rapid hydrolysis and little long-term accumulation in the environment (9). Their widespread use and accessibility have resulted in increased numbers of human poisonings, especially in developing countries (9).

Bio-pesticides are also reported in this review but in quite a low proportion (about 2%). These products include biological, natural, botanical products which are believed to be less harmful compared to synthetics, affecting only the target pest and closely related species, and are effective in small quantities. The registration

of these pesticides should be promoted, to avoid human health risks.

The cross examination of products by crops in this study indicates that horticulture crops consume more pesticides than other crops. The reason for the large number of products in horticulture could be, firstly, the expansion of horticultural cultivation, in particular for export earnings. Secondly, the registration of products for horticulture use is faster than that of other crops. The bio-efficacy testing of products for registration in Tanzania usually requires three cropping seasons. While single cropping season for vegetables is around 3–4 month, the single cropping season for crops such as cotton and coffee can be counted as one year. This encourages many investors to register their products for horticulture crops. Although this large number of products in horticulture may be good for pest control, it may also be detrimental for human health, in particular for unprotected farmers and consumers of horticulture crops raised under conditions of poor agricultural practices. Poor agricultural practices result in crops with high residue levels, which cause potential human health risks.

The number of active ingredients per formulation as analysed in this study indicates that over 20% of the products had two or more active ingredients per formulation. The health risk from a formulation usually arises from the accompanying active ingredients as well as inert ingredients. The high number of active ingredients, although it was only 20% of all registered products, is likely to reflect human health risk, especially under conditions of poor and unsafe handling.

Another area indicating potential human health risk is the nature of common active ingredients, available in high frequencies. Of the 13 active ingredients that recur with high frequency in Tanzania, almost 70% of them are classified as WHO class II (hazardous). This indicates potential health risks to the users of these pesticides.

As reported in this study, the leading target pest for products registered in Tanzania were insecticides, accounting for 41.7%. This trend is almost the same as that reported in India, although the proportion of insecticides there was much higher (76%) than in Tanzania (10). The proportion of insecticides in Tanzania is similar to that reported worldwide, which was 44% (10).

Whereas horticulture leads in the consumption of many varieties of pesticides in Tanzania (about 50%), a study in India reported that the major crop consuming many varieties of pesticides is cotton (45%) (10).

Fungicides accounted for 56% of all products imported to Tanzania in the study period. This high figure is likely to be caused by the great demand for fungicides in the cashew-growing areas of the Southern regions of Tanzania. The potential risk posed by the high usage of these products, as well as human injuries among unprotected farmers, is the impact on soil acidity, since some fungicides are believed to lower soil acidity. A study conducted in Tanzania on soil acidity revealed that the soils of the Makonde plateau have a relatively low pH indicating risk of acidity (11). Further studies are necessary to assess the impact of these products on soil acidity in Southern Tanzania.

Conclusion

The products registered and used in Tanzania are adequate for the control of the pests targeted, but some of them, such as cholinesterase inhibitors, are hazardous to human health and the environment, especially as some farmers have poor agricultural practices. The fact that many products are registered for use in food crops also indicates a potential human health risk, likely to arise from the consumption of the treated crops. Huge quantities of fungicides are imported to Tanzania, and this trend causes the risk of diminished soil acidity, particularly in Southern Tanzania where these fungicides are used in cashew-growing areas. Interventions suggested include the strengthening of enforcement organs, and the reduction or restriction of highly hazardous products. However, most important is the suspension of the usage of cholinesterase inhibitors in horticultural crops.

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Importance of workers understanding of chemicals for safety – information, communication and safety culture

Introduction

Workers are exposed to various kinds of chemicals at their workplaces. Different workplaces handle different kinds of chemicals in different ways, depending on their processes. Different uses of the same chemical may also give rise to different risks.

Photo by P. Lajini

Photo 1. Chemicals on display.

Example: A process in which sulphuric acid comes into contact with metals presents a high risk of fire due to the hydrogen released, whereas a process in which sulphuric acid is only poured into containers poses a high risk of skin damage.

It is therefore important to understand chemicals, and how to safely use and handle them. Safety is best achieved when those using and handling them understand the risks. Thus effectiveness in communication; ensuring that the information is passed on to those who handle chemicals, is crucial.

Understanding chemicals for safety

Dealing with chemicals can be very complex as regards health and safety. Chemicals have their own individual characteristics, and when mixed, become different. Their complexity is increased by how our bodies handle and react to them. The safety issue can be further complicated by a lack of knowledge, experience and beliefs among those who handle them, i.e. workers.

Information

When purchasing chemicals, information that will help in handling and storing them safely must be acquired from suppliers. Such information, and any other information that emerges during risk assessment, must be communicated to those who handle them while working.These workers must really understand what the information means. The items in the material's safety data sheet must make sense to them and they must understand:

Photo by P. Lajini

Photo 2. Workers in a chemical manufacturing factory.

- The health effects
- First aid measures
- Fire fighting measures
- Handling and storage
- Exposure controls and personal protection etc.

Assuming that the information is simple should not be an excuse for not checking whether the employees understand it.

During inspections and workshops, the issue of drinking milk at the end of a shift when working with chemicals surfaced. The workers demanded to be given milk as a safety measure. One small business owner actually kept milk for his workers to drink at the end of the day. However, this was simply for drinking and not a protective measure.

Photo by P. Lajini

Photo 3. Information on the safe handling and risks of chemicals is crucial at the workplace for those who use and handle the chemicals.

This shows a lack of information, and how beliefs and myths can lead to unsafe actions if no information is given to employees. Unfortunately, some employers may not have the information. It is nevertheless their responsibility to acquire the information in order to make the workplace safe. Information provides the underlying structures needed to achieve the sound management of chemicals (2).

Communication

Constant communication with employees is important, i.e. giving them information and receiving feedback from them. Consultations should be held where necessary, especially when changes are made in work processes or when there is a problem. This will encourage self-regulation, the employees are highly likely to own the measures put in place when they are consulted. It will also help to regulate undesirable attitudes, behaviours, actions etc.

Safety culture

How things are done at the workplace will determine the standard of safety. It is common for chemicals at the workplace to be mishandled when workers get used to them.

Employees will occasionally use their bare hands to handle chemicals. They may form new unsafe habits at the workplace, for example; using a certain chemical to wash their hands to remove a certain substance they have handled.This will eventually become their standard way of always handling chemicals if there is no intervention. It must not be allowed. Chemicals can be insidious; their effects may be delayed or difficult to detect.

Conclusion

- Just because you have been using a chemical for years and have not carried out a risk assessment it does not mean you should continue without checking its safety. Pause and carry out a risk assessment.
- Chemicals may cause ill health, and you should protect your health. Demand facts about a chemical, do not make assumptions or believe all you hear about a chemical without verifying it.
- Health surveillance is essential. Measure or monitor the efficiency of personal protective equipment or any safety measure that is in place.
- Provide information, communicate effectively and build a positive culture. Make sure that myths are eradicated.
- Acquire information when purchasing chemicals – do not take their safety for granted. Carry out a risk assessment: the way employees work when handling the chemical should be looked into.

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Uganda

Working conditions in flower farms in Uganda

Background

The flower industry in Uganda started in 1993, with its first exports from only three farms. By December 2013, Uganda had around 21 flower farms. Seventeen of these subscribe to the Uganda Flower Exporters Association (UFEA), which is an umbrella body that caters for the interests of the farms.

Most of the flower farms are situated near the shores of Lake Victoria in the Mukono and Wakiso districts, which are relatively semi-urban and rural locations. The most distant farm is in the Ntungamo District, over 200 km South West of the capital, Kampala. The farms cover a total area of around 300 hectares and employ around 10 000 employees directly.

According to the 2002/03 Uganda National Household Survey, unemployment is high among female youth. The majority of the estimated 10 000 people that the industry employs (over 60%), are women, and the number of individuals whose livelihoods are supported by the industry is estimated at 30 000 people.

Conditions at the farms

Three farms have very good working conditions, each with day care centres for employees' children aged 6 months to 2 years. One flower farm had its medical clinic upgraded to a Health Centre III status – to cater for the surrounding community and receive support from the Government.

Eight of the farms provide on-site clinics for their workers. Workers receive on-site HIV testing and counselling – also accessible to non-employees residing in the community. Antiretroviral drugs (ARVs) are also available to non-employees.

Sixteen of the farms subscribed to the Milieu Programma Sierteelt (MPS) – an international voluntary standard developed by the Dutch floriculture industry specifically for the flower sector. Although not mandatory, having this certification gives growers access to the overseas markets of their choice.

The MPS subscription has partly contributed in assisting farms in improving working conditions for their workers, as their umbrella body, UFEA, provides training on MPS-ABC as an environmental standard under which participating growers document their monthly use of fertilizers, energy and chemicals, as well as their waste management techniques for a score of A, B or C.

Although an Impact of the Flower Industry report (1) by the International Labour Organization in 2000 observed adherence to occupational safety and health requirements such as proper use, storage and handling of chemicals, this was not the case on a number of flower farms.

Nine flower farms had adequate and suitable provisions for the storage of chemicals, and changing rooms for use before and after the use of chemicals.

Though the subscription of the flower farms to the MPS standards has partly assisted them in improving their working conditions, more needs to be done to promote the safe use of chemicals on the farms.

Challenges on the farms

There are a number of challenges related to effective compliance with the occupational safety and health provisions: These include:

1) Inadequate training of the workers on the safe use of chemicals
2) Poor record keeping on the chemicals in use on the farms
3) Poor record keeping on the incidences or near misses that occur on the farms
4) Poor quality personal protective equipment (PPE) provided for the workers
5) Inadequate instructions on the safe use of the PPE.

The flower industry uses large quantities of chemicals, namely fertilizers and pesticides. The use of these chemicals increases the risk to the health of the workers, many of whom are females of reproductive age.

Provisions of the regulatory framework

The Occupational Safety and Health Act (OSH), No, 9, 2006 (2) requires all employers to inform their workers of the risks within the work environment. This implies that the employers are in effect supposed to carry out risk assessments, which would benefit them in the selection of the appropriate risk management mechanisms.

The OSH Act clearly brings to the fore the important elements in Conventions related to occupational safety and health, namely those that call for workers to have a right (3):

a) to be informed and consulted on safety and health matters, including risks from new technologies
b) to participate in the application and review of safety and health measures, in accordance with national law and practice, to select safety and health representatives and representatives in safety and health committees;
c) to remove themselves from danger resulting from their work when they have reasonable justification to believe there is an eminent and serious risk to their safety and health and that they must inform their supervisor immediately.

Recommendations

In view of the above elements, there is a need:

1) to raise awareness regarding occupational safety and health, especially in regard to the storage and use of hazardous chemicals
2) for duty holders to provide instructions on the proper use of equipment
3) to have suitable control measures in place – proper storage of hazardous materials. Chemicals and pesticides must be stored separately from other products
4) for shower-room facilities to wash off chemicals after application and/or use
5) to provide clean drinking water
6) for well-stocked first-aid kits for emergencies; periodic medical check-ups
7) for proper, well planned welfare facilities.

Above all, the regulatory agency responsible for workplace safety needs to provide back up support through training, and supplying information materials to workers to inform them of their rights and their duties to their employers. Employers also ought to be informed of their obligation to their workers through well-packaged information materials.

Photo by © International Labour Organization / M. Crozet

Conclusion

The provision of information to duty holders on safety and health at the workplace and their respective responsibilities, produced in packages which are user friendly for the target groups will go a long way towards improving and providing a safety culture at flower farms.

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Chemical elements in welding fumes

Welding is a hazardous process, and is so common that up to two per cent of the working population in industrialized countries has been engaged in some sort of welding (1).

Welders are exposed to both chemical and physical hazards. Common chemical hazards include metal particles, fumes, and gases (carbon oxides, nitrogen oxides and ozone). Physical hazards include electrical energy, heat, noise, vibration, and radiation (2,3). Welders are exposed though inhalation to a number of fumes and gases (4).

Shipbuilding is one of the major industries in Ismailia city, Egypt. Many welders are employed to build shipbody parts and bridges, and to do other repair/maintenance work.

Although there are many types of welding, it has been estimated that shielded metal arc welding (SMAW), and gas metal arc welding (GMAW) of mild steel, stainless steel and aluminum are performed by 70 per cent of welders (1,5). One shipbuilding facility affiliated with Arab Contractors in Ismailia, uses different types of arc welding. The main processes are SMAW, but others include gas tungsten arc welding (GTAW), carbon arc welding (CAW), and plasma welding.

Despite advances in control technology, welders continue to be exposed to welding fumes and gases (5). The chemicals in these fumes depend on several factors: 1) type of welding being performed; 2) material of the electrode; 3) type of metal being welded; 4) coatings on the metal; 5) time and severity of exposure; and 6) ventilation.

The elements of welding fumes to which workers are potentially exposed include the following:

Welding gases

Carbon monoxide: Welding and cutting may produce significant amounts of CO. In poorly ventilated areas, operations that use carbon dioxide as the inert gas shield may produce hazardous concentrations of CO. Carbon monoxide is odourless, colourless and tasteless, and cannot be detected by the senses. Ozone: Produced by ultraviolet light from the welding arc. Ozone is produced in greater quantities by GMAW, gas tungsten arc welding (GTAW) and plasma arc cutting. However, it breaks very fast from around the welding dot. Ozone is a highly active form of oxygen and irritates all mucous membranes.

Photos by Dr Yousra Saeed

Excessive exposure to ozone can cause pulmonary oedema. Nitrogen oxides: Produced by GMAW, GTAW and plasma arc cutting. Even greater quantities are formed if the shielding gas contains nitrogen. High concentrations of nitrogen dioxide can cause dyspnoea and pulmonary oedema.

Fumes from materials, mainly oxides

Chromium and nickel: Main components in stainless and acid-proof steel. Exposure to these is known to cause cancer.

Zinc and copper: Used in large quantities in the manufacture of brass, galvanized metals and various other alloys. Exposure to these fumes is known to cause metal fume fever.

Iron Oxide: Iron is the principal alloying element in steel manufacture. During welding, fumes arise from both the base metal and the electrode. They induce irritation of the nasal passages, throat and lungs. Chronic exposure may induce Siderosis.

Fluorides: Found in the coatings of many types of fluxes used in welding. Exposure may irritate the eyes, nose and throat. Repeated exposure to high concentrations may cause pulmonary oedema and bone damage (Osteosclerosis).

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Valuable feedback from the readers

The Editors of the African Newsletter are very thankful for the valuable feedback from the readers of the African Newsletter. We received 50 replies by mid-November.

Half of the respondents were in the age group of 40–59 years and 40% were between 20 and 39 years. Most respondents were men (62%) and 38% were female. They were mostly safety officers, researchers, lecturers/trainers or professors. Of these, 34% read the whole newsletter, 40% most of the articles, 20% a couple of articles, and 6% browsed through the newsletter. Most of the respondents found the newsletter very useful (74%) and 24% useful. The majority read the newsletter for their own information, used it as background material and also in training events. A total of 42% very easily accessed the newsletter in its online version, 32% easily, and 22% not easily. Only 2% of the respondents had no access to the internet. It should be noted this questionnaire was only available on the internet, and thus did not reach all our readers. The result would most likely have been different if the questionnaire had been sent by letter. We received some letters from readers who have no access to the internet. The six most important topics were safety, the work environment, new risks, small-scale enterprises, hazardous branches of industry, and occupational health services. Of all the respondents, 60% would like to receive a paper copy of the newsletter and 40% the online version.

Photo by Suvi Lehtinen

Survey respondent raffle took place in December 2014 and was carried out by the editors of the African and Asian-Pacific Newsletters, Marianne Joronen (left) and Inkeri Haataja.

The winners of the raffle were Pius Borona and Jalab Ashraph from Kenya, Naanjela Msangi from Tanzania, G. Kavitha from India, and Antonello Ammanna from Italy. USB memory sticks have been sent to the winners. Congratulations!

Themes for the African Newsletter in 2015

1/2015 Infectious diseases
manuscripts by 27th February

2/2015 Age management, including young workers
manuscripts by 30th May

3/2015 Training in occupational health and safety
manuscripts by 30th September

Other topics in the field of occupational health and safety are also welcome.

See for further details on www.ttl.fi/AfricanNewsletter or contact the editors.

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Tanzania

Post-registration surveillance of pesticides:

Towards Best Practices of Pesticide Management (BPPM) for environmental and human health protection in Tanzania

Introduction

Tanzania is primarily an agricultural country: over 80% of the population depend on agriculture for their livelihood. Agriculture accounts for over 25% of the Gross Domestic Product (GDP) and provides the development basis for the sectors of the economy by generating foreign exchange, providing raw materials for local industries, generating employment, alleviating poverty, and providing food. The country lies in a tropical climate, which favours various agricultural pests and diseases. In order to realize good agricultural productivity, as well as control of public health disease vectors, the use of pesticides for the control of these pests and diseases is inevitable. As reported by the Food and Agriculture Organization, without pesticides, crop destruction could probably rise to over 60% (1). With this in mind, the successful control of pests and diseases relies on effective pesticide products of adequate quality, which do not cause any unacceptable effects when used as recommended (2). The use of substandard products can have serious adverse effects on human health and the environment. It can also result in ineffective pest or vector control operations, leading not only to increasing application rates and cost, but also to the loss of crops and even human lives. It may also result in the development of pest resistance to the pesticides. In addition, it may increase risks to users and the environment, as substandard formulations may contain impurities or chemicals that can increase the toxicity of the products to mammals and other non-target species.

Photo by Florence Mununa

Photo 1. Pesticide store in Mtwara

Effective and comprehensive pesticide compliance monitoring is essential for assuring the safety of pesticide handlers, field workers, the public, and the environment. Compliance monitoring includes pesticide use and record inspections, surveillance and episodes. In pesticide registration and control, pre- and post-registration schemes are important aspects of pesticide management. Pre-registration is carried out before the pesticides are registered in the country for commercial use, and is considered the first line of defence to prevent the entry of substandard pesticides into the country. However, post-registration is carried out after pesticides are registered in the country for commercial purposes (3). Pesticide surveillance activity is one of the tools that enhance the presence and use of quality pesticides. Other important tools in pesticide quality include awareness creation (training or education) and enforcement of the pesticide law, which are equally important, especially in developing countries such as Tanzania, where poor quality and counterfeit pesticides have frequently been encountered (4). Examples of post-registration activities include the surveillance of pesticide activities, such as their importation, distribution and sale, and fumigation activities.

Pesticide handling, importation, and use in Tanzania is regulated by the Plant Protection Act of 1997 (5) and its regulations (6). The Act and Regulations (Pesticides Law) demand that pesticides must be registered. The procedures of pesticide registration in Tanzania are found in sections 16, 17, 18 and 19 of the PPA and in sections 19, 20, 21 and 22 of its regulations. One of the major aims of the regulations is to ensure that only quality pesticides intended for commercial use are distributed and used in a sustainable way in order to protect the environment and human health against pesticide hazards. Over 450 pesticide products are currently registered in Tanzania (7). Generally, the use of pesticides may pose risks to human health and the environment, particularly if they are used before they are evaluated for safety and author-

ized for general use. It is therefore imperative to conduct the post-registration surveillance of all pesticide activities in the country, in order to investigate the status of pesticides that are put on the market, and to come up with recommendations to ensure that end users (farmers) obtain and use quality pesticides for pest control. This will also help ensure environmental and human health protection. A study on the post-registration surveillance of pesticides was conducted in the Mtwara and Lindi regions in September 2012, covering Mtwara town, Masasi, Nanyumbu, Newala, Tandahimba and Nachingwea. The objective was to ascertain the quality and authenticity of the pesticides sold and used for market consumption, in order to plan for necessary action.

Inspection and survey

On-site physical inspections and interviews were conducted in the Mtwara and Lindi regions in order to assess the quality of the pesticides that are put on the market and to see whether they observe the legal procedures for conducting pesticide businesses, including safety measures while handling pesticides. Data collected include the names of the firms and the type and quantity of unregistered, expired, unlabelled, and repacked pesticides. Representative pesticide samples were collected for quality assurance at the Tropical Pesticides Research Institute (TPRI), Pesticides Laboratory. A total of 33 shops and pesticide distribution centres were visited. Local pesticide media, including television and radio were involved to create awareness among the public on the safe handling and effective use of pesticides. Other information collected included pesticide sale/retail/distribution, pesticide status, pesticide handling, staff competence, and the use of protective gear, fire fighting equipment, first aid kits, and washing facilities.

Some of the data collected in Mtwara town (warehouses) and the Masasi district (agricultural Marketing Cooperatives Society) were subjected to further investigation. Furthermore, all firms observed as operating in contradiction to the Plant Protection Act 1997, were informed and required to follow the legal procedure for conducting pesticide business. All firms operating without a valid permit were closed pending the registration process. Unregistered and expired products were kept in pesticide stores pending disposal advice from relevant authorities. Awareness raising was conducted through physical visits and the public media (including radio and television) as a way to educate the public and stakeholders at large. Warning letters were forwarded to the firms with minor offences. Some of the shops that were operating contrary to the pesticide laws, for example without valid permits, were closed in order to discourage illegal pesticide handling, which can cause health and environmental hazards.

Table 1. Pesticide irregularities

Irregularities found during inspection	No. of shops	No. of pesticides	Percentage (%)
Unregistered firms operating with no permit (unlicensed)	15	-	45.5
Firms with unqualified staff behind the counter	12	-	36.4
Firms with lack of protective gear/ first aid kits/fire fighting equipment/washing facilities	12	-	36.4
Firms with inadequate ventilation and unsuitable premises	5	-	15.2
Premises with poorly labelled pesticides	4	7	12.1
Firms with unregistered pesticides	13	16	39.4
Firms with expired products	5	7	15.2
Firms with expired, unregistered and poorly labelled pesticides	22		66.7

Results

A total of 33 pesticide firms were visited and inspected in the Mtwara and Lindi regions. These included retailers/wholesalers, importers, suppliers and fumigators (Table 1). Different irregularities were found during the inspections. The survey indicates that 7 types of pesticides had expired and 16 different types of pesticides were unregistered and 7 were poorly labelled. In addition, 67% of the surveyed pesticides dealers were selling unregistered pesticides, expired pesticides and poorly labelled pesticides, and 46% were not licensed to conduct pesticide businesses. A total of 36% did not have the necessary protective gear/first aid kits, fire fighting equipment, or qualified shop attendants.

The results above indicate that pesticides dealers (retailers, wholesalers and distributors) selling unregistered and expired pesticides accounted for 67% of those surveyed. The current situation concerning pesticide use and handling, both in business and agriculture, is that pesticide dealers, handlers and farmers obtain information on the use of pesticides from various sources, some of them untrained business dealers. It was observed that this may be attributed to the fact that most pesticide companies have scanty, if any, field extension workers to train the retailers and /or farmers on appropriate pesticide handling and use, and on the requirements for human and environmental health protection.

Pesticide field technicians require regular updates and guidance in order to empower them and provide the required technical support with regard to correct pesticide handling and use. It should be well known that many agricultural pesticides in developing countries such as Tanzania are used by small-scale farmers, whose livelihood and well-being may be negatively affected by the poor quality of the pesticides that many use. It is reported that the use of substandard products can have serious adverse effects on human health and the environment (8). For example, there may be an increase in pesticide exposure and health risks to users and the environment because substandard formulations may contain impurities or chemicals that can increase product toxicity to mammals and other non-target species. This can also lead to the development of pest resistance to pesticides and aggravate any such existing problems.

In this survey many problems were found, indicating that most small-scale farmers could lose their crops to pests if the poor quality of the pesticides used makes them ineffective. It is also suspected that most pesticide dealers may contaminate pesticides or deal with illegal pesticide products (4). Among the possible reasons for the presence of unauthorized pesticides noted on the market may be a range of factors that include trade liberalization, whereby many products are

imported into the country through many licensed retailers. Moreover, the geographical location of two regions (Mtwara and Lindi) sharing the border to three countries, namely Malawi, Zambia and Mozambique, contributes to difficulties in monitoring. In 2001, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) estimated that around 30% of pesticides marketed in developing countries with an estimated value of USD 9000 million annually were below internationally accepted standards of quality. (9) Higher incidences of substandard pesticides have also been reported by national pesticide quality control laboratories in industrialized countries (8). This means that monitoring the quality control of pesticides is a crucial and integral part of pesticide management, and also of the implementation of the code of conduct by various stakeholders, and should be sustainable.

The domination of the pesticide retail trade by the small enterprises noted during surveillance could be another reason for the abundance of unwanted products on the market. These small-scale enterprises are only able to make minimum investments into their businesses and hence opt for lower standard products at cheap costs. This was also noted in the study conducted in Arusha on compliance with pesticide retailing regulations in Tanzania.

Conclusion

The findings from this survey indicate that many untrained pesticide dealers sell and distribute unauthorized products, which can bring about health and environmental risks. The users of pesticides, mainly smallholder farmers, are also unaware of the health and environmental risks associated with the use and handling of pesticides. There is therefore a need to set up intervention programmes to ensure the sustainability of the industry, which includes the training of service providers and farmers.

General recommendations

- Control of pesticides should be an ongoing sustainable activity. The process is expensive and therefore requires careful planning and implementation due to the use of limited resources. This means that the regulatory authorities should make efforts to implement realistic cost recovery mechanisms to ensure sustainability and continuity. The process involves the registration of pesticides imported into the country, and pesticide formulation manufactured in the country. In addition to the registration process, post-registration surveillance of pesticides that are put on the market is an important aspect.
- There should be an emphasis on quality control laboratories being well equipped, not only to analyse the active ingredients of pesticides, but also to conduct the tests required to check the compliance of all their physical and chemical properties, including impurities, with human and environmental health and safety specifications.
- Complaints should be properly managed, including timely intervention by relevant authorities, especially regarding poor quality pesticides on the market. Farmers and consumers should have easy access to relevant officers, who in turn should have facilities for responsible authority. Standard formats for reporting such incidences should be well developed, widely publicized and disseminated.
- There should be an emphasis on promoting the awareness of the safe use and handling of pesticides through training, seminars, and public awareness in order to improve the knowledge and understanding of this topic among pesticides stakeholders. This would increase compliance with the pesticide law.
- Unqualified shop attendants should attend a Pest and Pesticides Management Training Course. This could be achieved through training at TPRI and outreach.
- Strengthening the control of pesticide movement across the country border should be given priority.
- Pesticide inspectors and other implementers of the pesticide control and regulation law should be well motivated to effectively enforce the law.
- All expired products unfit for use should be collected from all stores and be destroyed to avoid the loophole of distributing them to end users, specifically farmers.
- Good collaboration between inspectors and other relevant agencies such as the Customs Department, Police, and Government Ministries is crucial to ensure effective enforcement of the law.
- Steps should also be taken to link important segments electronically to ensure that only pesticides that have been registered are imported.

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International Chemical Safety Cards – ICSC

The International Chemical Safety Cards (ICSC) project is a joint venture between the World Health Organization (WHO) and the International Labour Office (ILO), with the cooperation of the European Commission.

This project began during the 1980s with the objective of developing a product to disseminate appropriate hazard information on chemicals at the workplace in an understandable and precise way.

To date, more than 1,700 ICSC are available in English. The Cards are prepared by ICSC participating institutions and updated periodically to take account of the latest scientific developments. New Cards are proposed by countries or stakeholder groups, while national institutions translate them into different languages.

What are ICSC?

The ICSC (International Chemical Safety Cards) are data sheets intended to provide essential safety and health information on chemicals in a clear and concise way.

ICSC follow a fixed format which is designed to give a consistent presentation of the information, and is sufficiently concise to be printed onto two sides of a standard sheet of paper from an office printer, an important consideration to permit easy use in the workplace.

Who are ICSC intended for?

The primary aim of the cards is to promote the safe use of chemicals in the workplace and the main target users are therefore workers and those responsible for occupational safety and health.

ICSC are also used as a readily available source of concise information for first responders dealing with a chemical incident, as a reference, for example, for manufacturers or employers to provide chemical safety information, and for other purposes, such as education and training activities.

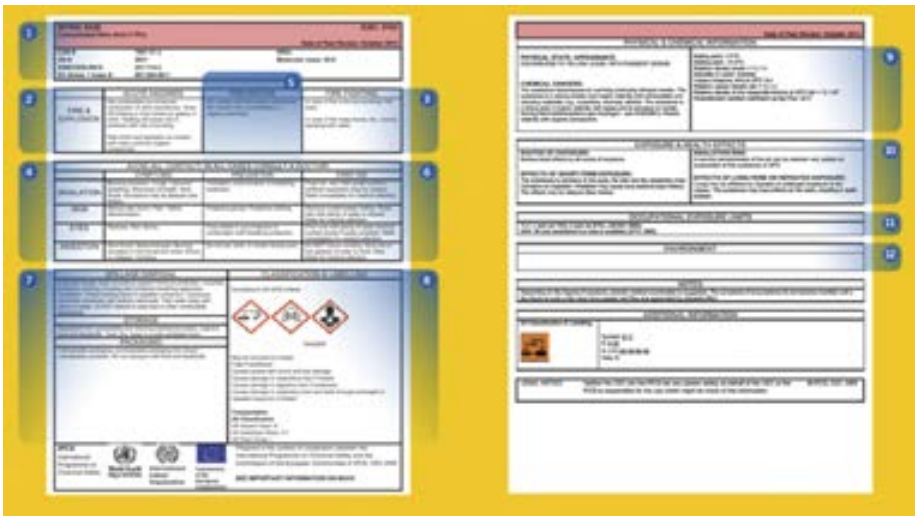

Figure 1. Picture of ICSC 0183 - Nitric acid Card, with numbers indicating the categories of information provided.

Category	Examples of the information provided
1. Identity of the chemical	Chemical name, synonyms, molecular formula, common registry numbers (CAS, EC number).
2. Fire and explosion hazards	Situations which could give rise to a risk of fire or explosion.
3. Fire fighting	Emergency response in case of fire.
4. Acute health hazards	Symptoms of exposure (inhalation, skin, eyes, ingestion) Routes by which the chemical can be absorbed into the body.
5. Preventive measures	Information on appropriate engineering controls, protective clothing and other equipment which could either prevent exposure or avoid the risk of fire or explosion.
6. First aid	Emergency response advice.
7. Spillage disposal, storage and packaging	Methods for containment, safety measures to protect workers dealing with a spillage, appropriate storage conditions based on chemical properties.
8. Classification and labelling	Symbols/Pictograms, hazard and precaution statements from EU legislation and increasingly according to GHS.
9. Physical and chemical properties and dangers	Physical state, melting and boiling points, vapour pressure, solubility in water. Substances with which the chemical can react to form a hazardous product or which will result in a fire or explosion hazard. Materials known to be incompatible with the chemical.
10. Short-term and long-term health effects	Adverse health effects which could arise from short or long-term exposure, as identified from toxicological tests or from poisoning incident case studies.
11. Regulatory information	Occupational exposure limits published by institutions in various jurisdictions.
12. Environmental data	Information on environmental hazards e.g. risk to aquatic organisms, bioaccumulation.

What information is provided in ICSC?

It is intended ideally that an ICSC should complement any Chemical Safety Data Sheet which is available; ICSC do not have any legal basis and cannot be a substitute for any legal obligation on a manufacturer or employer to provide chemical safety information.

How are ICSC produced?

The preparation of ICSC is an ongoing process of drafting and peer reviewing by a group of scientists working for a number of specialized scientific institutions concerned with occupational health and safety in different countries.

Chemicals are selected for new ICSC based on a range of criteria for concern (high production volume, incidence of health problems, high risk properties). Chemicals can be proposed by countries or stakeholder groups such as trade unions.

ICSC are drafted in English by the scientists, based on publicly available data and following specific criteria from the Compiler's Guide (Figure 2) to this purpose, and are then peer reviewed by the full group of experts in biannual meetings before being made publicly available. Existing Cards are updated periodically by the same drafting and peer review process, in particular when significant new information becomes available.

In this way, approximately 50 new and updated ICSC become available each year and the collection of Cards available has grown from a few hundreds during the 1980s up to more than 1700 today.

Are ICSC authoritative?

The international peer-review process followed in the preparation of ICSC ensures the authoritative nature of the Cards and represents a significant asset of ICSC in contrast with other packages of information.

The Cards have no legal status and may not meet all requirements included in national legislation. However, it is recognized that ICSC might be the principal source of information available for both management and workers in less developed countries or in small and medium-sized enterprises.

In general, the information provided in the Cards is in line with the ILO Chemicals Convention (No. 170) and Recommendation (No. 177), 1990; with the European Commission Directive 2001/59/EC; and with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) criteria.

18100000 Skin

18100000 Skin: ACUTE HAZARDS/SYMPTOMS.

Expl. A substance may produce acute symptoms when it comes in contact with the skin. Where a substance may be absorbed by the skin, consideration must be given to whether or not this constitutes an acute physical hazard. The degree of hazard following skin absorption depends chiefly on:
- the permeability of the skin;
- the duration of exposure;
- the concentration of the substance;
- the nature of the substance; and
- the properties of the solvent, if used.

Absorption may occur without visible symptoms! The symptoms on the ICSC are mentioned as far as possible in sequence of occurrence on increasing exposure. However, personal sensitivity and/or other influences may cause symptoms to appear in a different order. For each routes of exposure (inhalation, skin, eyes, and ingestion), a brief survey is given of the principal perceptible symptoms (signs) which may result when contact with the substance exceeds a certain degree. Only symptoms due to an acute exposure to the substance are mentioned.

Ind. Do NOT mention more than 8 symptoms in each subsection. In general only symptoms from human experience should be mentioned. Symptoms established in animal tests should only be mentioned if they are important to the reader and possible (in the professional judgement of the compiler) in humans; application of the symptoms has to be peer-reviewed. List symptoms in sequence, if appropriate. This sequence should be based on the occurrence of the symptoms on increasing exposure. Use an alphabetical order if an occurrence sequence can not be given. Systemic symptoms should be mentioned in the subsection on the route of exposure. Example: a possible symptom of ingestion of thallium is 'loss of vision'. This should be mentioned in subsection 'Ingestion', NOT in 'Eyes'.

Figure 2. Example of criteria in the Compiler's Guide:

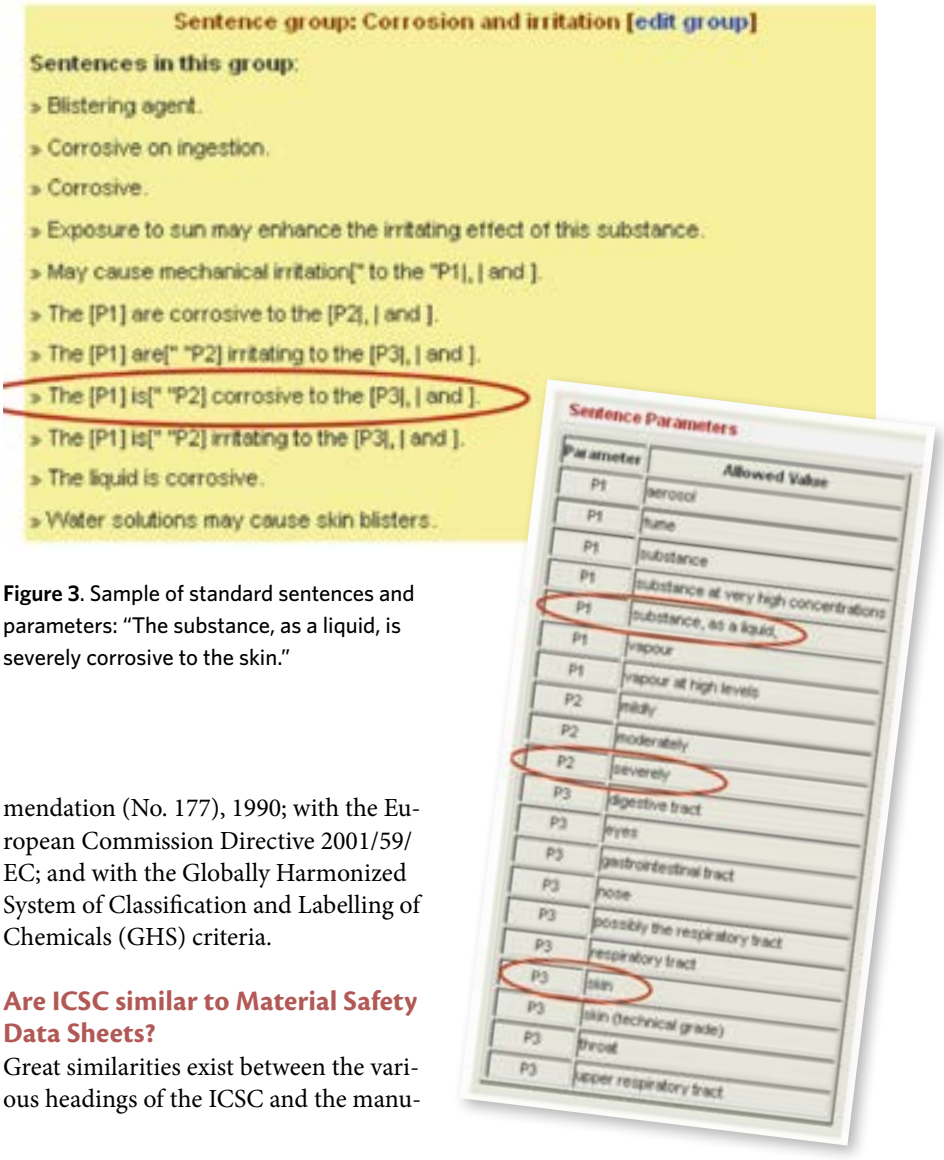

Figure 3. Sample of standard sentences and parameters: "The substance, as a liquid, is severely corrosive to the skin."

Are ICSC similar to Material Safety Data Sheets?

Great similarities exist between the various headings of the ICSC and the manu-

facturers' Safety Data Sheet (SDS) or Material Safety Data Sheet (MSDS) of the International Council of Chemical Associations, and also the Safety Data Sheets mandated by the REACH legislation in Europe.

However, MSDS and the ICSC are not the same. The MSDS, in many instances, may be technically very complex and too extensive for shop floor use, and, secondly, it is a management document. The ICSC, on the other hand, set out peer-reviewed information about substances in a more concise and simple manner.

This is not to say that the ICSC should be a substitute for an MSDS; nothing can replace management's responsibility to communicate with workers on the exact chemicals, the nature of those chemicals used on the shop floor and the risk posed in any given workplace.

Indeed, the ICSC and the MSDS can even be thought of as complementary. If the two methods for hazard communication can be combined, then the amount of knowledge available to the safety representative or shop floor workers will be more than doubled.

How are ICSC translated?

ICSC are initially prepared and peer reviewed in English in biannual meetings. Subsequently, national institutions translate the Cards from English into their native languages. The standard sentences and consistent format used in ICSC facilitates computer-aided translation of the information with not much resource commitment required from the translating institutions. At present, there are about 1500 standard sentences and 4300 standard parameters in the ICSC database; a sample of these sentences and parameters is shown in Figure 3.

The objective of the ICSC project is to make essential health and safety information on chemicals available to as wide an audience as possible, especially at the workplace level. The project aims to increase the number of translated versions available and is always seeking the support of additional institutions who could contribute to the translation process.

In what languages are ICSC available?

The English collection of ICSC is the original version. To date, the full collection of ICSC in English has been translated into at least six languages. Subsets of the Cards – and not full collections – are available in various other languages.

We count on the interest and capacity of institutions in the world to translate the Cards into as many languages as possible!

2014 List of national institutions participating in the preparation of International Chemical Safety Cards:

Country	Institution
Canada	Commission de la santé et de la sécurité du travail Commission for Health and Safety at Work
Canada	Institut de recherche Robert Sauvé en santé et en sécurité du travail Occupational Health and Safety Research Institute
Finland	Työterveyslaitos Finnish Institute of Occupational Health
France	Institut national de recherche et de sécurité National Institute for Research and Safety
Germany	Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area
Hungary	Munkahigiénés és Foglalkozás – egészségügyi Föosztály, Munkavédelmi és Munkaügyi Igazgatóság, Nemzeti Munkaügyi Hivatal Department of Occupational Health, Directorate for Labour Protection, National Labour Office
Italy	Agenzia Regionale Prevenzione e Ambiente dell'Emilia-Romagna Regional Agency for Prevention and Environment Emilia-Romagna
Japan	National Institute of Health Sciences
Poland	Instytut Medycyny Pracy Im. Prof. J. Nofera Nofer Nofer Institute of Occupational Medicine
Spain	Instituto Nacional de Seguridad e Higiene en el Trabajo National Institute for Occupational Safety and Hygiene
United Kingdom	National Chemical Emergency Centre
United States of America	National Institute for Occupational Safety and Health

How are ICSC disseminated?

As documents intended for use at the workplace level, it is important that ICSC are easily accessible to the target audience.

The Cards are made available free of charge via the Internet (www.ilo.org/icsc), in a searchable database which provides access to the ICSC collection from a continuously-updated source, in as many languages as possible, and in a format which is easily displayed (html) or printed (PDF format onto two sides of one sheet of paper).

The web-based database hosting the Cards can be searched by chemical name, common synonyms or CAS number.

Future developments may include increasing the number of languages available, and making ICSC viewable via mobile phones and portable devices.

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