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Development of a new categorization system for pesticides exposure to support harmonized reporting between EU Member States☆

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ABSTRACT

Objectives: European legislation requires reporting from Member States on acute poisoning incidents involving pesticides. However, standard rules for data collection and reporting have not yet been set out. The new categorization system presented in this paper is aimed at enabling Member States to gather comparable data and provide standard reporting on pesticide poisoning exposures.
Materials and methods: European Regulations providing separate official categorization of biocidal and plant protection pesticides, were used as a basis to build up a unified pesticide categorization and coding system. Data on selected pesticide exposures collected by Poison Control Centres in six EU countries were reviewed, categorized and reported according to the proposed system.
Results: The resulting pesticide categorization system has two dimensions. The first part identifies the main category of use, i.e. biocide/plant protection pesticide/unknown, and the secondary category of use, e.g. *Rodenticides*, *Insecticides and acaricides*. The second part of the system is organized into two levels: level one identifies chemical grouping, e.g. *Coumarins*, *Pyrethrins/pyrethroids*, while level two identifies the active compound by using its Chemical Abstract Service Registry Number. The system was used to provide a unified categorization to compare exposures to plant protection and biocidal *Rodenticides* and *Pyrethrins/pyrethroids Insecticides and acaricides* identified by six EU member states.
Conclusion: The developed pesticide categorization system was successfully applied to data extracted from different databases and was able to make the required information comparable. The data reported filling in common templates containing a pre-ordinate list of active compounds categorized according the proposed system, highlighted different capabilities in data collection and recording, showing that some of the collaborating centres were not able to distinguish between main categories of pesticide products or provide information on active compounds. The results indicate that a special effort should be dedicated to support detailed data recording at national level. Providing common tools to systematically report to the EU Commission hazardous exposures to pesticides, as well as to other selected categories of products, could allow for data comparability between Member States and greatly improve post marketing surveillance and alerting systems in Europe.

1. Introduction

The term "pesticide" identifies a heterogeneous group of active substances or mixtures containing one or more active substances or biological agents intended for preventing, destroying, repelling or mitigating any organism that is considered a pest. Due to their properties, pesticides serve many useful purposes and are widely used in agriculture, other occupational settings, and in the home. Nevertheless, since these agents are by definition biologically active, they are potentially able to cause adverse effects to humans and the environment.

In 1985, considering the large availability for consumers of pesticides as well as their toxicity, the Food and Agricultural Organization of the United Nation (FAO) adopted the International Code of Conduct

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on Pesticides Management, lately developed through the FAO World Health Organization (WHO) joint collaboration on pesticide managements (FAO and WHO, 2014). This document specifically recommends that governments should utilise all possible means for collecting reliable data and maintaining statistics on incidents and poisoning cases. Such data collection is intended to identify emerging problems and populations at risk; support development of preventive and regulatory measures and evaluate their effectiveness, assess the magnitude and severity of the observed problems as well as their trend overtime and define new research areas.

Technical reports with guidelines to assist national systems for data gathering and reporting have been developed in the USA by the Centre for Disease Control and Prevention (CDC) and National Institute for Occupational Safety and Health (CDC, 2005; Calvert et al., 2010) and FAO and WHO (FAO and WHO, 2009).

Within the European Union (EU), for the purposes of regulation, pesticides are categorized into two main groups, i.e. biocidal pesticides and plant protection (PP) pesticides. More specifically, according to the European Commission (EC) and EU biocidal pesticides are agents intended to act against any organism able to cause detrimental or undesired effects to humans, human activities and products (plant product excluded), animals, and the environment (EC, 1998; EU, 2012), while PP pesticides are those agents intended to act against any organism dangerous to plants or plant products (EC, 2009a).

Directive 2009/128/EC (EC 2009b), has established a framework for Community action to achieve the sustainable use of pesticides. This Directive currently applies only to plant protection pesticides but in the future is expected to cover biocides as well. It requires that member states (MSs) shall adopt national action plans (NAPs) aimed at reducing risks and impact of plant protection pesticides on human health and the environment and at developing alternative approaches and techniques to reduce their use. Among the objectives and measures required, NAPs shall include the implementation of systems for gathering comparable data on pesticide acute poisoning incidents (Art. 7, point 2). Furthermore, in Regulation (EC) No. 1107/2009 on plant protection pesticides (EC, 2009a) is stated that a regulation shall set out provisions concerning, among others, the collection of information and reporting on suspected poisonings (Art. 68). However, no indication has been provided yet on how data should be collected and when MSs should provide their reports on plant protection pesticides-related poisonings.

With reference to biocides, the requirement for data reporting on human poisonings was initially provided by Directive 98/8/EC (EC, 1998). On that basis, since 2000, every three years MSs have provided the Commission with national reports containing information on biocide-related poisonings. Regulation (EU) No. 528/2012 (EU, 2012) reinforces the requirement regarding poisoning reporting and states that every five years, from September 2015, MSs shall submit to the Commission a report including information on any poisonings involving biocidal products. However, no guidelines have been ever provided by the Commission on how data on biocide-related poisonings should be collected, categorized and reported.

This lack of standard rules seriously hampers data comparability between MSs and the ability to identify emerging problems or unexpected health effects. This situation is of particular concern since pesticides are easily available and widely used hazardous products which can be accidentally or intentionally involved in serious threats to health. These types of events can have transnational relevance and should be promptly notified in order to support reporting, alerting and management measures at national and European level, as highlighted by Decision 1082/2013/EU (EU, 2013) on serious cross border threat to health.

Regulation (EC) No 1272/2008 on classification, labelling and packaging of chemicals (the CLP Regulation) (EC, 2008), requires that national bodies responsible for defining preventive and curative measure in case of exposures, i.e. Poison Control Centres (PCCs) should be informed by the industry in a harmonized manner about the composition of hazardous chemical mixtures placed on the market. This implies that the procedures adopted for harmonizing information on composition of hazardous mixtures, such as pesticides, should provide an informative basis for standardized reporting on poisoning exposures and incidents.

The present contribution is specifically aimed at defining a categorization system to harmonize reporting of exposure to pesticides collected by PCCs and other national bodies in charge of data reporting on pesticide related poisonings. In order to pursue this objective, European legislation providing separate indications on biocidal and PP pesticides classification (EU, 2012; EC, 2009c) was reviewed and, on that basis, a unified coding system was developed to identify pesticide active substances, the related main and secondary categories of use, and chemical classes.

2. Materials and methods

2.1. Review of the European legislation

European legislation on pesticides (Table 1) was reviewed in order to compare the two specific categorization systems adopted for biocidal and plant protection pesticides, respectively, and identify standard denominations of active substances and corresponding categories of use. A comprehensive list of pesticides was built up by merging the plant protection active substances reported in Annex III ("Harmonized classification of substances") of Regulation (EC) No. 1185/2009 concerning statistics on pesticides (EC, 2009c) with the biocidal active substances listed in Annex I ("Active substances identified as existing") of Regulation (EC) No. 1451/2007 concerning the placing of biocidal products on the market (EC, 2007).

2.2. Structure of EU categories for biocides and plant protection pesticides.

As shown in Table 2, pesticides are grouped according to specific categories of intended use within the two categorization systems.

Biocidal pesticides are categorized according to four main categories of intended use, denominated *main groups*, i.e., *Disinfectants*, *Preservatives*, *Pest control*, *Other biocidal products*, and 22 *product types* (PTs) subdivided within the *main groups*, e.g., biocidal pesticides classified as *Pest control* (*main group* 3) are subdivided into the following PTs: *Rodenticides*, PT 14; *Avicides*, PT 15; *Molluscicides*, *Vermicides and products to control other invertebrates*, PT 16, *Piscicides*, PT 17, *Insecticides, acaricides and products to control other arthropods*, PT 18, *Repellents and attractants*, PT 19. Each active substance identified as existing in 2007 and listed in Annex I of Regulation (EC) No 1451/2007 (EC, 2007) can be classified in one or more than one *main group*, according to use it is authorised for, e.g., *Bifenthrin* can be classified as *Pest control-Insecticides, acaricides and products to control other arthropods* (*main group* 3, PT 14) and as *Preservative-Wood preservatives* (main group 2, PT 8). Furthermore, within a given *main group*, the same active substance can be classified according to different PTs, e.g., *Biphenyl-2-ol* can be classified as *Disinfectants* (*main group* 1) and, within this *main group*, can be used in soap formulation for hand disinfection (*Human hygiene*, PT 1), in surface disinfectants in health care settings (*Disinfectants and algaecides not intended for direct application to humans or animals*, PT 2), in product to control pathogenic microorganism in intensive farming (Veterinary hygiene, PT 3), and as a smoke generator preparation used for disinfection of surface (*Food and feed area*, PT 4) (ECHA, 2015).

Plant protection pesticides are categorized according to six main categories of intended use denominated *major groups*, i.e., *Fungicides and Bactericides*, *Herbicides*, *Haulm destructors and Moss killers*, *Insecticides and Acaricides*, *Molluscicides*, *Plant growth regulators*, *Other plant protection agents*, 29 categories of product, and 97 chemical classes. These last two categories are partially overlapping since both provide combined information on category of product and chemical class. This implies that a given chemical class can assume different codes according to the category of product it is combined with, e.g. *Organophosphorus Insecticides* (code: I4.1), *Organophosphorus Fungicides* (code: F6.9),