

# GLOBAL AGROCHEMICAL INFORMATION SOURCES

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## 1. Introduction

Information and knowledge relating to pesticides is the key to having an understanding on their risks and benefits. However, it has not always been easy to find authoritative sources and what was true in 18<sup>th</sup> century England is as true today.

"The next best thing to knowing something is to know where to find it"

*Samuel Johnson - famous English writer (1709 - 1764)*

Before the advent of the Internet, information on pesticides was confined to various journals, textbooks, published compilations of data such as the Pesticide Manual or unpublished registration dossiers. Such information is located in libraries, or with government and industry regulatory authorities, thus limiting public access to these resources. Even when access is possible this printed information is only up-to-date when it is published and may rapidly become outdated. Today the Internet is a modern tool which has come of age and it is now possible to freely access a large amount of information on pesticides *via* the World Wide Web. Yet the fact that there is such a large amount of information available is in itself problematical. For example, putting "pesticides" into Google brings up 13 to 15 million "hits" depending on Google's geotargetting. Moreover, anybody can post information on the Internet with no check as to whether or not it is correct. It is important, therefore, to ensure that any information found on the Internet comes from a reliable source and has a sound scientific basis. When using the Internet it is important to always have as a guiding principle the idea that everything may not be as it seems – a principle that has been around since ancient times.

"Man's most judicious trait, is a good sense of what not to believe "

*Euripides - Greek philosopher (c. 480 - 406 BC)*

This paper will concentrate on the main aspects of pesticides and their usage, and will highlight the IUPAC agrochemical portal [1] that provides summaries and links to various sites on the Internet where useful and reliable information can be found, including the following topics; glossary of terms used in pesticide chemistry, regulatory requirements; safe use, Good Laboratory Practice; experimental guidelines; risk assessment, pesticide profiles and eLearning courses.

## 2. Glossary of terms

For students, researchers, government officials and the general public interested in agrochemicals it is essential to understand the terms in common usage. The most definitive glossary is the IUPAC sponsored "Glossary of Terms Related to Pesticides" which was updated in 2006. The glossary contains definitions of more than 500 terms frequently used in relation to the chemistry, mode of action, regulation and use of pesticides. This work exemplifies the wide range of disciplines involved and the need to address communication barriers between researchers, government regulatory authorities and chemists in associated professional areas. A significant milestone was the translation of the 2006 glossary into Spanish.

## 3. Regulatory Requirements

The regulation of pesticides and their formulations by government agencies really began after World War II, and was given further impetus by the publication of Rachel Carson's book "Silent Spring" in 1962.

Today the regulatory process for pesticides has become more stringent and, in order to compare the properties of different pesticides, the requirements for registration have become more formalized. This has resulted in a large number of documents being published which give detailed instructions on which studies are required and how to report the results etc. An excellent source of information on pesticides can be found on the OECD website which includes links to other regulatory sites, guidance on the preparation of documents for pesticide registration, an overview of procedures for pesticides in different countries and the launch of an initiative for a global regulatory scheme by 2014.

#### **4. Safe Use of Pesticides**

The International Code of Conduct on the Distribution and Use of Pesticides is the globally accepted standard for pesticide management. FAO and its member countries first adopted it in 1985 and the revised version was adopted in 2002. This code is backed up by various guidelines issued by FAO. The safe use of pesticides is further strengthened in some countries by the requirement that applicators are trained and certified as being competent to use and apply pesticides. In many countries information and training on safe use has been funded by industry via CropLife trade organizations. Safety, both for human health and the environment, is also the driving force behind the Rotterdam Convention which aims to promote shared responsibility and cooperative efforts in the international trade of hazardous chemicals in order to protect human health and the environment from potential harm. Currently there are 24 pesticides and 4 severely hazardous pesticide formulations in Annex III of the Convention.

#### **5. Good Laboratory Practice**

Prior to 1976 the data from laboratory studies used to support agrochemical registrations were taken mainly on trust by government authorities. However, in 1976 during a routine audit, the US Food and Drug Administration (FDA) uncovered discrepancies between raw data and reports on toxicology studies at Industrial Bio-Test Laboratories. This finding gave a major impetus for the introduction of Good Laboratory Practice (GLP) in the US in the late 1970s, initially for toxicology studies and subsequently for the majority of studies required for registration. The OECD has also published GLP principles and these have dominated the international scene with the OECD member states agreeing to make these principles binding upon them. The primary objective of the OECD Principles of GLP is to ensure the generation of high quality and reliable test data which is mutually acceptable between countries.

#### **6. Experimental Guidelines**

In the early days of agrochemical registration no formal guidelines existed for conducting the various studies required. However, in order to have a consistent approach, and to enable regulators to compare more easily the properties of one agrochemical against another, formal guidelines have been introduced on how studies must be conducted. Whilst there is a certain similarity between the requirements of different countries there are, nevertheless, some differences in the conduct of studies. The OECD has issued test guidelines for the harmonization of methods to evaluate pesticide risks to health and the environment and these are now available on-line. Several sources focusing on residue studies are also available on-line. Currently there is a move, particularly in Europe, to minimize experiments with vertebrates which has led to extensive work on the use of modeling using Quantitative Structure Activity Relationships (QSARs).

#### **7. Risk Assessment**

Whilst QSAR's predict physico-chemical and biological properties of chemicals, there are also many risk assessment models that can be used to predict exposure to pesticides and the risk to human health or the environment. To assess this risk, the toxicity of the agrochemical must be taken into account as well as

the amount of agrochemical to which a person or the environment may be exposed. Various emission scenario documents are currently available which are available on-line and although many are for chemicals other than pesticides, they do give a good indication of the techniques and procedures to use. Many models have also been developed to assess the likely contamination of ground or surface water after application of a pesticide. A large number of these models are available for downloading from the Internet e.g. PRZM, PELMO, EXAMS. When employing models it is essential that the correct parameters are used and that these are critically evaluated in the context of the situation being modeled.

## **8. Pesticide Profiles and Other Information**

The Internet is an extremely useful resource for information on the properties of individual pesticides, including, for example the common name, chemical name, formula, structure and activity. Several sites supported by government regulatory authorities can be accessed which give extensive information on agrochemical properties such as physicochemical, toxicological and ecotoxicological properties. Other sites giving agrochemical properties include the FOOTPRINT database, INFOCRIS, EXTTOXNET and the ARS Pesticide Properties Database. The Pesticide Action Network database is an example of a site managed by an NGO (non-governmental organisation). Toxicological reviews, together with information on residues, acceptable daily intake (ADIs) and maximum residue limits (MRLs) for specific pesticides can be found in publications of the Joint FAO/WHO Meeting on Pesticide Residues (JMPPR). Information on specifications, giving minimum purity requirements, for technical materials can also be found on-line at the FAO website.

## **9. eLearning courses**

Information is expanding exponentially and offers solutions to many resources and development problems. Yet in today's world, time is a precious resource. Web-based eLearning courses provide a structured solution to this dilemma and means to accelerate capacity building. They are more than taking a course from a remote location: eLearning allows contact with other students and mentors through specific forums and helps develop networking. The IUPAC agrochemicals portal provides annotated links to free courses that anyone can join. They include courses on: Ecological risk assessments of pesticides, Basics of radiotracer use; Documentation of laboratory work; Handling pipettes and syringes; Introduction to conformity assessment in analytical laboratories; Laboratory pre-requisites 1; Pesticide management; Pesticide residue analysis; and personal development courses such as project management.

## **10. Conclusions**

The Internet is an excellent source for finding and retrieving facts about pesticides and acquiring new skills. Anyone with access will find a wealth of information that is freely available. Most of the information will be correct but there will be instances when it is incorrect, out of date or scientifically inaccurate. It is up to the user to sieve out the poor or wrong information and to use only that based on sound scientific principles. The IUPAC Agrochemical Portal [1] provides guidance and hyperlinks to all of the above topics and is an excellent starting point for those new to the field or wishing to update their knowledge.

## **11. Reference**

[1] Global Availability of Information on Agrochemicals. <http://agrochemicals.iupac.org>

*The views expressed in this publication are those of the authors and do not necessarily reflect the views of the International Union of Pure and Applied Chemistry nor the Food and Agriculture Organization of the United Nations or the International Atomic Energy Agency.*