

Current Evaluation Procedures on Toxicology

**Gizachew Assefa
Ministry of Agriculture
Addis Ababa**

Introduction

- All pesticides must be toxic, or poisonous, to kill the pests they are intended to control;
- But because pesticides are toxic, they are potentially hazardous to humans and animals as well as the environment.
- Since pesticide toxicity varies widely, it is very important for people who use pesticides to have at least a general knowledge of the relative toxicity of the products they are using

Kinds of Toxicity

- **Acute toxicity** - refers to how poisonous a pesticide is to a human, animal, or plant after a single short-term exposure.
- Acute toxicity is used to describe effects which appear promptly, or within 24 hours of exposure.
- Acute toxicity levels are used as a way to assess and compare how poisonous pesticides are.
- Acute toxicity is measured as acute oral toxicity, acute dermal toxicity, and acute inhalation toxicity.
- The acute toxicity of a pesticide is used as the basis for toxicity classification and the warning statements on the label.

Kinds of Toxicity.....Contd

Class	LD ₅₀ for the rat (mg/kg body weight)				
	Oral		Dermal		
	Solids ^a	Liquids ^a	Solids ^a	Liquids ^a	
Ia	Extremely hazardous	5 or less	20 or less	10 or less	40 or less
Ib	Highly hazardous	5 - 50	20 - 200	10-100	40 - 400
II	Moderately hazardous	50 - 500	200 - 2000	100-1000	400 - 4000
III	Slightly hazardous ^b	Over 500	Over 2000	Over 1000	Over 4000 ^b

Kinds of Toxicity.....Contd

Chronic toxicity

- Is the delayed poisonous effect from exposure to a pesticide.
- Chronic toxicity of pesticides concerns the general public, as well as those working directly with pesticides because of potential exposure to pesticides on/in food products, water, and the air.
- It is measured in experimental conditions after three months of either continuous or occasional exposure.

Kinds of Toxicity.....Contd

- The highest dose at which no effect can be observed or the lowest dose at which an effect starts to show up, is used as a measure of chronic toxicity.
- This concentration level is expressed as -
no observed effect level – **NOEL**
or no observed effect concentration- **NOEC**

Routes of Entry

There are three specific ways in which pesticides may enter the body.

Oral route

- Pesticides can enter the body through the mouth (also called ingestion).
- Ingestion can occur when hands are not properly washed before eating or smoking or
- They may be swallowed by mistake, if they are improperly stored in food containers.

Routes of Entry....Contd.

Dermal Route

- **Wet, dry, or gaseous forms of pesticides can be absorbed through the skin.**
- **This may occur if pesticides are allowed to get on the skin while mixing or applying or**
- **If pesticide-contaminated clothing is not removed promptly and properly cleaned before being worn again.**
- **The eyes, ear drums, scalp and groin areas absorb pesticides more quickly than other areas on the body**

Routes of Entry....Contd

Inhalation route

- Dusts, spray mist, or fume pesticides can be drawn into the lungs as we breath.
- Inhalation of pesticides can occur during the mixing of wettable powders, dusts, or granules.
- Poisoning can also occur while fumigating or spraying without a proper respirator in enclosed or poorly ventilated areas such as greenhouses or apartments.

Effects of pesticides

- **Exposure to pesticides may result in the following:**
 - **Reproductive effects**
 - **Teratogenic effects**
 - **Carcinogenic effects**
 - **Mutagenic effects**
 - **Neurotoxicity**
 - **Immuno-suppression**

Pesticide Registration Procedure in Ethiopia

Data requirements

- Based on SEARCH format and
- country (Ethiopia) specific requirements

SEARCH - Southern and Eastern African Countries
Regulatory Committee on Harmonisation of Pesticide
Registration

The SEARCH format

Has three parts

- Application
- Active Ingredient Dossier Index
- Formulated Product Dossier index

SEARCH format

I -Application

- **Applicant identification**

- Name and address of registrant, status of the registrant (formulator/importer)

- Name and address of local agent

- **Product identification**

- Product trade name, function, intended use, target pest, formulation, active ingredients and composition,

- **Summary of toxicology on formulated products**

- **Packaging**

- **Declaration**

SEARCH format

II. ACTIVE INGREDIENT DOSSIER INDEX

1. DESIGNATION

Common name ,manufacturer or development code, chemical name, structural formula and empirical formula

2. Physical and Chemical properties

Physical state, color, odour, density, solubility in water , solubility in organic solvents, vapour pressure, water partition coefficient, photolysis and method of analysis

SEARCH format

3. Toxicology

ADI, acute oral LD₅₀, dermal LD₅₀, Inhalation LC₅₀
Skin irritation, Eye Irritation, Sensitization,
Neurotoxicity, Teratogenicity, Mutagenicity

4. Ecotoxicology

Acute toxicity - Bird (2 sp.)LD₅₀, Fish (2 sp.) LC50, Daphnia LC50,
Bees LD50, Earth worms LC50

Chronic toxicity - Bird (2 sp.)NOEL, Fish (2 sp.)(NOEL),
Daphnia (NOEC), Algae (NOEC), Soil mo. (NOEC)

Reproduction toxicity - Bird (NOEC), Bees (brood test)

BCF - Fish

SEARCH format

5. Behaviour in environment

- behavior of the pesticide and ways of degradation
- degradation products in soil and water, DT₅₀

6. Mode of action

7. Residue in the plant

- Major metabolites
- MRL codex on the crop to be registered
- MRL country on the crop to be registered
- Method of residue analysis

SEARCH format

III. FORMULATED PRODUCT DOSSIER INDEX

1. Physical and chemical properties

Physical state/formulation type, color, odor, Storage stability, shelf life, density, flammability, Flash point, compatibility with other products, PH, oxidizing properties, corrosiveness, water content, watability, solubility in water, foaming, particle size, Suspensibility, emulsion stability, volatility and Method of formulation analysis

SEARCH format

2. Toxicology

- Acute oral LD₅₀ on rats
- Acute dermal LD₅₀ on rats
- Skin irritation on rabbit
- Eye irritation on rabbits
- Sensitization on guinea pig
- WHO classification
- Emergency procedures in case of accidental procedures or poisoning
- Emergency procedure in case of fire /spillage

SEARCH format

3. Use patterns

- Application method
- Rate of application
- Frequency of application
- Crop stage
- PHI

Country specific requirements

- Local efficacy data generated from research institutions or universities
- Sample of the technical grade and the formulated product- 2 lots of 500 gm or ml of the formulated product and one lot of 1 gm of the technical grade
- Agency agreement (between local agent and the registration holder)
- Third party batch certificate of analysis from accredited laboratory (if the analysis is done by the registrant itself ,the laboratory should be GLP certified)
- Manufacturing license in the country of origin

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Physical and chemical characteristics	Volatility	Value	a.I & FP
	Hydrolysis DT 50 in days	Value	a.i
	Photolysis DT 50 in days	Value	a.i
	Vapour pressure	Value	a.i

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Physical and chemical characteristics	Solubility in water g/l	Value	a.i & FP
	water partition coefficient	Value	a.i
	Hydrolysis DT 50 of a.i (days)	Value	a.i
	Method of analysis	Study report	a.i & FP

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Toxicology	ADI	Value	a.i
	Acute oral toxicity	Study report	a.I & FP
	Acute dermal toxicity	Study report	a.I & FP
	Acute inhalation	Study report	a.I & FP

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Toxicology	Skin irritation	Study report	a.I & FP
	Eye irritation	Study report	a.I & FP
	Sensitization	Study report	a.I & FP
	Reproduction	Study report NOEL mg/kg bw/d	a.I

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Toxicology	Subchronic toxicity 90 days NOEL mg/kg bw/d	Study report	a.i
	Chronic toxicity life time NOEL mg/kg bw/d	Study report	a.i
	Carcinogenicity NOEL mg/kg bw/d	Study report	a.i

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Toxicology	Neurotoxicity NOEL mg/kg bw/d	Study report	a.i
	Teratogenicity NOEL mg/kg bw/d	Study report	a.i
	Mutagenicity/ genotoxicity NOEL mg/kg bw/d	Study report	a.i

Required data on toxicology for the registration of pesticides in Ethiopia

Property	Data required	Data type	Test substance
Toxicology	Metabolism in rats	Study report	a.i
	WHO class	value	FP
	Other studies	Study report	a.i & FP

THANK YOU !