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किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch

SAFE USE OF PESTICIDES

भाकृअनुप
ICAR

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Preface

Pesticides are toxic to both pests and humans. However, they need not be hazardous to humans and non-target animal species if suitable precautions are taken. Most pesticides will cause adverse effects if intentionally or accidentally ingested or if they are in contact with the skin for a long time. Pesticide particles may be inhaled with the air while they are being sprayed. An additional risk is the contamination of drinking-water, food or soil. Special precautions must be taken during transport, storage and handling. Spray equipment should be regularly cleaned and maintained to prevent leaks. People who work with pesticides should receive proper training in their safe use. Authors are thankful to the Director ATARI Umiam and other staff of KVK Hailakandi for their support and help during preparation of the technical bulletin.

Authous

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CHAPTER 1

INTRODUCTION

Poisons are substances which when they enter an organism in different ways (through the integument, respiratory tract, alimentary tract) in insignificant amounts are capable of causing malfunctioning of its vital activity which in definite conditions results in unhealthy state, i.e. produce a toxic effect which is called as poisoning. The concept “poison” implies interaction between a living organism and a substance. A poison is always a chemical substance, either synthetic or natural.

The effects of poison on living organism are of two types viz., acute poisoning and chronic poisoning. Acute poisoning of an organism by a poison occurs when the poison chemicals acts once. It manifests itself in upsetting of the vital activity of the organism with a possible lethal outcome. Chronic poisoning of an organism is the result of the repeated action of relatively small amounts of a poison manifests itself in slowly developing malfunctioning of normal vital activity.

In our everyday life, we are using and handling number of poison chemicals viz. medicine, veterinary medicine, washing and cleaning chemicals, pesticide etc. without knowing its proper handling procedure, which leads to toxic effects i.e. poisoning. Among the different poison chemicals,

the pesticides used by the farmers in our country, who are mostly illiterate or poorly literate. The pesticide poisoning is a very common phenomenon in our country. Worldwide survey in 19 countries indicates further that approximately 500000 accidental poisoning occurs each year with nearly 2000 deaths. There is enough evidence from all over the world that acute poisoning by pesticide can cause instant deaths and others severe symptoms. Cases of acute poisoning are well documented but there is very little scientific information available on delayed and chronic effect of pesticides. Poisoning by pesticides may be occupational or non-occupational.

Occupational poisoning occur among workers who are working in the pesticide industries or workers busy in preparing the working formulation of pesticides or treating orchards or fields, or occupied in the treatment of seeds. The poisoning by pesticides of persons having no direct relation to work with them is referred to non-occupational poisoning. eg. accidental poisoning. A major case of such poisoning is the careless storage of pesticides. A great hazard to health is the use of containers free of toxicants to store food products. To overcome such poisoning of pesticide or reduction of such severity of poisoning we have to know the sanitary fundamentals of pesticides exposure in different steps, such as, working formulation preparation, application, storage, disposal of containers etc.

CHAPTER 2

PESTICIDES AND ITS CLASSIFICATION

Chemical or biological substance designed to kill or retard the growth of pests that damage or interfere with the growth of crops, shrubs, tress, timber and other vegetation desired by humans. Practically all chemical pesticides, however, are poisons and pose long-term danger to the environment and humans through their persistence in nature and body tissue. Most of the pesticides are non-specific, and may kill life forms that are harmless or useful.

CLASSIFICATION OF PESTICIDES

a) Insecticides: An insecticide is a substance used to kill insects. They include ovicides and larvicides used against insect eggs and larvae, respectively. Insecticides are used in agriculture, medicine, industry and by consumers. Insecticides are claimed to be a major factor behind the increase in agricultural 20th century's productivity. Nearly all insecticides have the potential to significantly alter ecosystems; many are toxic to humans; some concentrate along the food chain.

Fig. Insecticides

b) Acaricides: Acaricides are pesticides that kill members of the arachnid subclass **Acari**, which includes ticks and mites. Acaricides are used both in medicine and agriculture, although the desired selective toxicity differs between the two fields.

Fig. Acaricide

c) Fungicides: Fungicides are biocidal chemical compounds or biological organisms used to kill fungi or fungal spores.

Fig. Fungicide

d) Nematicides: A nematicide is a type of chemical pesticide used to kill plant-parasitic nematodes. Nematicides have tended to be broad-spectrum toxicants possessing high volatility

Fig. Nematicide

e) Rodenticides: Rodenticides, colloquially rat poison, are typically non-specific pest control chemicals made and sold for the purpose of killing rodents.

Fig. Rodenticide

f) **Herbicides:** Herbicide(s), also commonly known as weed killers, are chemical substances used to control unwanted plants. Selective herbicides control specific weed species, while leaving the desired crop relatively unharmed, while non-selective herbicides (sometimes called “total weed killers” in commercial products) can be used to clear waste ground, industrial and construction sites, railways and railway embankments as they kill all plant material with which they come into contact.

Fig. Herbicide

g) **Plant growth regulators:** A plant growth regulator is an organic compound, either natural or synthetic, that modifies or controls one or more specific physiological processes within a plant.

h) Adjuvants: Adjuvants are used to enhance the effectiveness of pesticides such as herbicides, insecticides, fungicides and other agents that control or eliminate unwanted pests.

Fig. Adjuvants

PESTICIDE TOXICITY

Managing risk

Hazard/ Risk = Toxicity X Exposure

the potential for injury	the capacity of a pesticide to cause injury	the risk of a pesticide contacting or entering the body

Hazard

Higher toxicity = greater hazard

Lower toxicity = less hazard

Higher exposure = greater hazard

Lower exposure = less hazard

INDIAN TOXICITY CLASSIFICATION

Category	Oral LD_{50} (mg/kg)	Dermal LD_{50} (mg/kg)	Warning Symbol
Extremely Toxic	1-50	1-200	
Highly Toxic	51-500	201-2000	
Moderately Toxic	501-5000	2001-20000	
Slightly Toxic	>5000	>20000	

SAFETY DURING STORAGE AND TRANSPORTATION

A. Precaution for storage at distribution/ dealer level

- Storage warehouse away from populated areas
- Storage structure well drained/ Free from water contamination
- Storage structure made of non-combustible materials (stone, brick, and cement)
- Lighting, Ventilation, Electric frame :flameproof
- Stack height and aisle space maintained
- Well-trained staff to face accident, Movement of goods and fire fighting easy
- Fire extinguisher and Safety equipment (Goggles, Boots, Gloves, Masks) provided
- Inspect for leakage, damage or expiry

Don't

- Don't handle roughly or carelessly
- Don't permit smoking, drinking or eating
- Don't let drainage from store to domestic sewage system

B. Precautions while displaying and selling pesticides in the dealer shop

Dos

- Store in original labeled container
- Highly toxic one kept behind glass doors/ shelf
- Keep danger board/ first aid kit
- Trained shop personnel
- Advice customer to carry pesticide and foodstuff separately
- Store herbicide away from pesticides or fertilizers

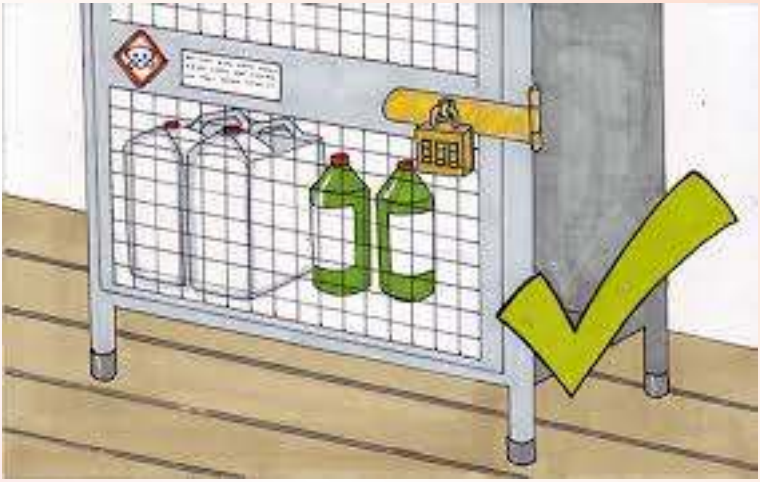


Fig. Proper storage of pesticides

Fig. First aid box

Don't

- Don't keep pesticide in sitting place, near medicine, consumer goods or office table where food or tea is served
- Don't sell to children

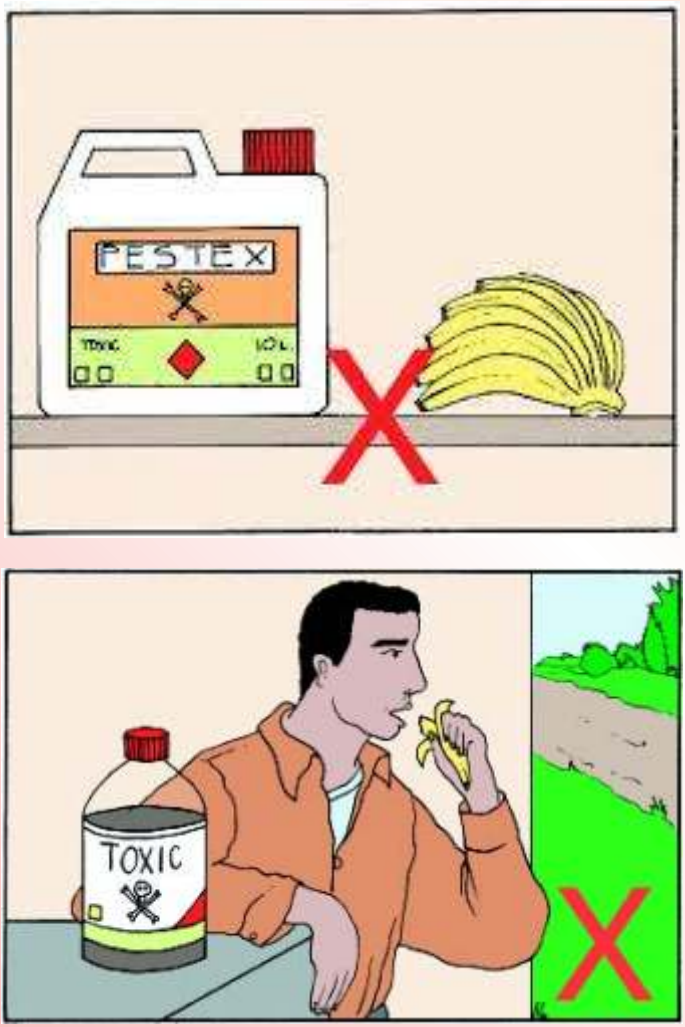


Fig. Do not eat near pesticide

C. Precaution while storing pesticides by the farmer

Dos

- Store in original container with label, not in drink container
- Use old stock first
- Keep away from children
- Inform family members
- Store minimum , Required quantity
- Inspect for leakage

Keep away
from children.

Fig: Proper storage of pesticides

Don't

- Don't store in living areas/ kitchen/Animal food/ Food stuff

SAFETY DURING TRANSPORTATION

Dos

- Protection from rain
- Care during Load/unload
- Load sealed and tightly packed containers & send instruction leaflet to deal with emergencies
- Clean vehicles after unloading

Fig. Do not carry pesticides open in rainy season

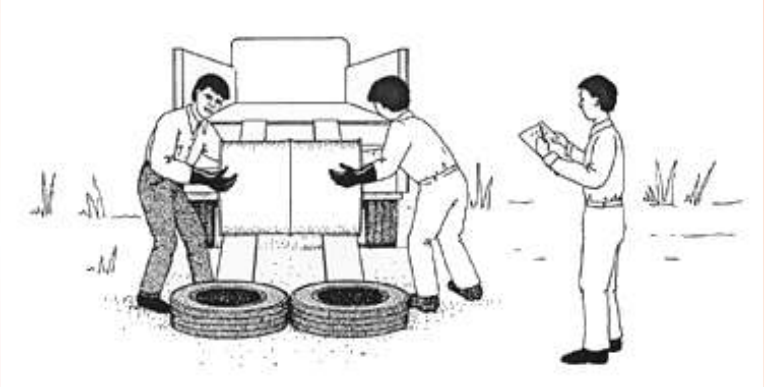


Fig: Care during loading and unloading of pesticides

Don't

- Don't transport in closed trucks
- Don't leave loaded truck unattended
- Don't allow worker to smoke or chew tobacco during loading/ unloading
- Don't transport herbicide with other pesticide/ Fertilizers
- Don't overload/ keep beside passengers
- Don't transport pesticide with foodstuffs, animal feed or livestock

Fig. Keep away the children from pesticide van

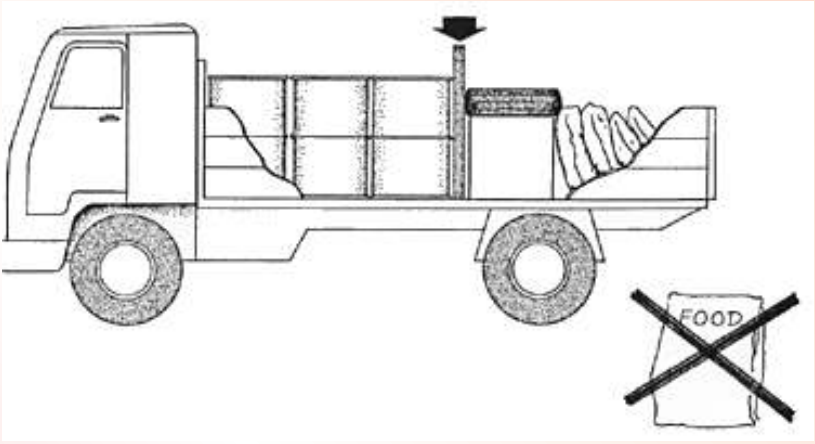


Fig. Do not carry food grains with pesticides

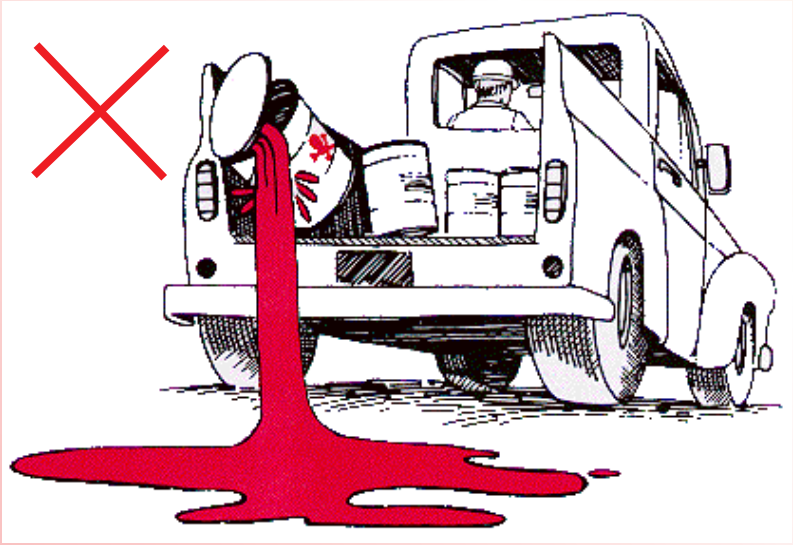


Fig. Do not carry a loose container that may leak

CHAPTER 4

APPLICATION TECHNIQUES & SAFETY DURING PESTICIDE APPLICATION

A. APPLICATION TECHNIQUE

- The quality of Pesticides
- Timing of application
- Quality of application and coverage
- Dosage, Droplet Density, Dispersal Technique

Fig. various application techniques

Fig. various application techniques

SPRAYING TECHNIQUES AND EQUIPMENTS

Spraying techniques	Equipments used
High volume	Knapsack hand compression sprayer
Low volume	Knapsack mist blower
Ultra Low volume	Battery operated ULV Sprayer
Fogging	Fog Machines
Herbicide application	Knapsack sprayer with flat fan nozzle
Dusting	Rotary or Power duster
Granule application	Granule spreaders or applicators

Fig. Hand operated knapsack sprayer

Fig. Mist blower

Fig. Battery operated ULV Sprayer

B. PRECAUTIONS DURING HANDLING AND MIXING

- Read instruction carefully
- Use protective clothing and safety devices
- Calibrate equipment
- Mix in open/-ventilated areas
- Use funnel
- Mix exact quantity
- Clean spill. If body contaminated, wash immediately

Fig. Read the instructions carefully before use

Fig. Do not use bare hands

Fig. safely handle the pesticides

Don't

- Don't spill contents
- Don't mix with hand
- Don't allow children to mix
- Don't eat, drink or rub face
- Don't leave pesticides unattended in field

C. PRECAUTIONS WHILE APPLYING PESTICIDES

- Spray in cooler part of the day
- Spray in windward direction
- Take food
- Wear protective clothes
- Check for leakage
- Ensure no animals/ people/ labour working

Fig. Use protective cloths while spraying

Don'ts

- Don't spray in windy days
- Pregnant women / Nursing mothers not allowed to spray
- Don't clear Blocked nozzle with mouth
- Don't contaminate stream, ponds or water sources
- Don't eat, smoke or chew tobacco

Fig. Do not eat or drink while using pesticides

D. PRECAUTIONS AFTER APPLYING PESTICIDES

Dos

- Decontaminate equipment, buckets
- Wash clothes and take Bath
- Mark treated areas

Fig. Always mark the treated area

Don'ts

- Don't leave used spray equipment unattended
- Don't empty spray solutions in canals, ponds or wells

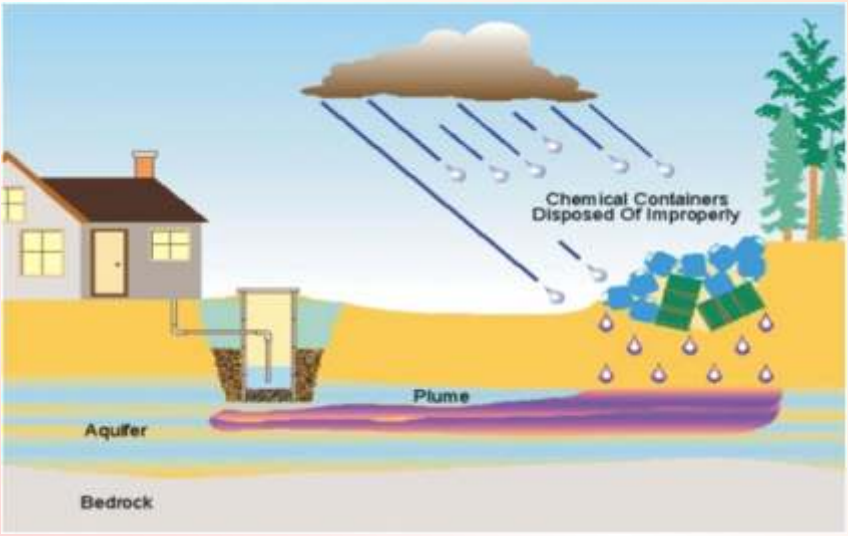


Fig. Don't empty spray solutions in canals, ponds or wells

DECONTAMINATION

PROCEDURE FOR DECONTAMINATING SPILLS

- Clean/ Absorb by solid absorbent(saw dust or sand)
- Sweeping dust/powder after spreading sand/saw dust
- Decontaminate using chemicals (alkalis)

PROCEDURE FOR DECONTAMINATING APPLICATION EQUIPMENT

- Handle with care/ depend on type of pesticide
- Use washing soda, soap and bleaching powder

PROCEDURE FOR DECONTAMINATION AND DISPOSAL OF USED OR LEAKY CONTAINERS

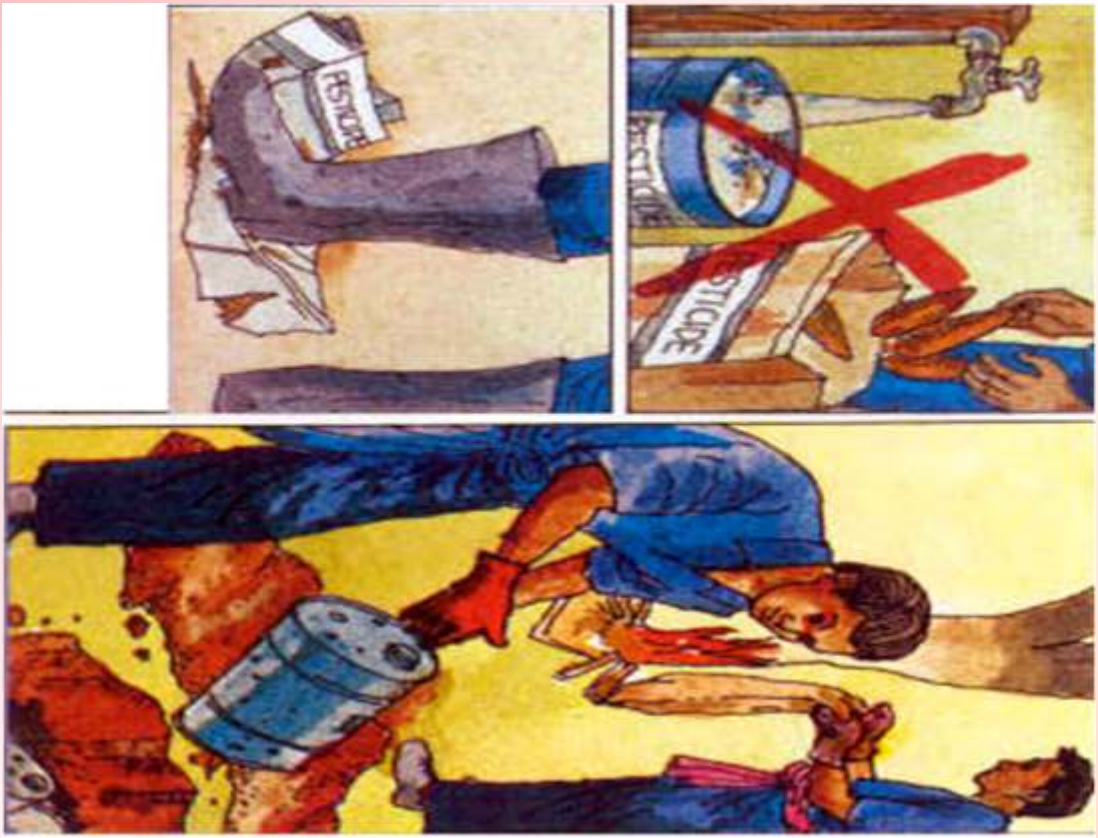
- Wash, drain and deform the container
- Avoid water run off /Ground water contamination

Fig. Collect and dispose empty vessels of pesticides

PROCEDURE FOR DECONTAMINATING SPRAY PERSONNEL

- Wash body with soap properly
- Wash clothes and contaminated equipment

Fig. Wash body and cloths properly



GENERAL SYMPTOMS OF PESTICIDE POISONING

- Allergic effects; Asthma, Skin/nose /eye irritation
- Acute effects:immediately- within 24 hrs
- Delayed effects: female -Birth defects. Miscarriage infertility, sterility
- Male- Asthma, paralysis, tremor, brain damage, skin disorder, Respiratory/ lung/ kidney disease/Jaundice

EARLY SYMPTOMS OF ACUTE POISONING

- Mild poisoning
- Moderate poisoning
- Severe poisoning

Fig. Pesticide poisoning

CHAPTER 7

FIRST AID INSTRUCTION IN PESTICIDE POISONING

GENERAL FIRST AID INSTRUCTIONS

- First aid kits
- Source of clean water
- Clean change of clothes
- Medical attention

BASIC PRINCIPLE OF FIRST AID

- Keep patient at rest and warm
- Wash mouth
- Don't give anything /induce vomiting if patient semi-conscious or convulsing

GASTROINTESTINAL DECONTAMINATION

- Inducing vomiting
- Water/Ipecac syrup
- Use finger into throat
- Don't use salt water or carbonated beverages
- Precautions
- Petroleum products/Corrosive poisons

ACTIVATED CHARCOAL ADSORPTION

- Universal sponge: 4 tablespoon of toast+ 2 tablespoon of tea+ 2 Tablespoon of milk of magnesia

CATHARIS/PURAGATION

- Sorbitol in charcoal formulations

NEUTRALIZING ACIDS

- Milk of magnesia/Baking soda/chalk in
- water

NEUTRALIZING ALKALIS

- **Lemon juice/ Dilute vinegar**

SKIN DECONTAMINATION

- Remove clothing
- Wash affected area with soap and running water dry and cover

Don't

- Avoid use of ointments, greases, powder and medications unless instructed by doctors

EYE DECONTAMINATIONS

- Gently washing
- Cover with cloth
- Medical attention
- Don't use drugs unless instructed
- Avoid contamination of other eye

INHALATION POISONING

- Fresh air
- Rest/ Loosen clothing
- Artificial respiration
- Keep warm

Fig. wash properly after contamination

TREATING CONVULSIONS/SEIZURES

- Diazepam/Lorazepam/Phenobarbitral
- Keep patients warm, comfortable and quiet
- Ventilation, Medication

TREATING UNCONSCIOUS PATIENT

Dos

- Maintaining body temperature
- Breathing

Don'ts

- Don't give anything by oral route
- Don't induce vomiting

Fig. Preliminary treatment of the unconscious patient

WORKER PROTECTION STANDARD

- Pesticide safety training
- Notification of pesticide application
- Use of personal protective equipment
- Restricted entry interval following pesticide application
- Decontamination supplies
- Emergency medical assistance

Fig. Pesticide safety training

PERSONAL PROTECTIVE EQUIPMENT

- Covering entire body
- Use disposable clothing for limited time
- Separate from other clothing
- Gloves
- Boots
- Head and Neck covering
- Goggles or Face Shield
- Respirators (Cartridges and Gas Masks)

Fig. Pesticide protective equipments

Fig. Pesticide protective equipments

LAUNDERING PESTICIDE CONTAMINATED CLOTHING

- Remove clothing after spray immediately
- Use rubber or Vinyl gloves for handling
- Launder all clothes daily
- Separate from family laundry
- Pre-rinse garment
- Use heavy detergents
- Line/Air dry
- washing machine: use full water level, hot water temp and maximum cycle

DOSAGE OF SUBSTANCES USED DURING FIRST AID

- **Syrup of Ipecac**

  Adult:15-30 ml with 240ml water

  Children :15 ml with 120-240 ml water

- **Activated charcoal**

  Adult: 25-100 mg in 300-800 ml water

  Children: 25-50 g

- **Sorbitol**

  1-2 g/kg as one time dose

DOSAGE OF DRUGS USED DURING MEDICAL TREATMENT

- **Diazepam**

  Adult: 5-10 mg/kg IV, Repeat every 5-10 min, max 30 mg

  Children: 0.2-0.5 mg/kg IV Repeat every 5 min, max 10 mg

- **Lorezepam**

  Adult: 2-4 mg/kg IV over 2-5 min

  Children: 0.05-0.1 mg/kg over 2-5 min

- **Phenobarbitrol**

  15-20 mg/kg an IV loading dose

- **Atropine**

  Adult: 2-4 mg/kg, Repeat every 15 min

  Children: 0.05-0.1 mg/kg, Repeat every 15 min

- **Pralidoxime**

  Adult: 1-2 g @ 1-2 g / min

  Children: 20-50 mg/kg

- **Cholestyramine**

  4 dose 4 times a day

  Children: 240 mg/kg/24 hrs

Fig. Consult a doctor immediately after getting poisoned


Pesticide-FREE


PESTICIDE
FREE ZONE


Pesticide
Free Zone
Pesticide
Free Zone