Safe and effective use of household insecticide products

Guide for the production of educational and training materials
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World Health Organization
Communicable Diseases Prevention and Control
WHO Pesticide Evaluation Scheme (WHOPES)
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Acknowledgements

The Communicable Diseases Prevention and Control Department (CPC) of the World Health Organization wishes to thank the following for their valuable contributions to this document:

- Mr Ian Adams, Reckitt & Colman Products, NSW, Australia
- Dr David Brown, Sacto-Yolo County MAD, Elk Grove, CA, USA
- Dr Christian Frederickson, WHO Regional Office for America (AMRO), Brazil
- Dr Driss Kelili, Dow Agroscience, Sophia Antipolis, France
- Ms Mareli Krause, The Registrar Act, National Department of Agriculture, Pretoria, South Africa
- Dr Peter Miller, University of Technology, Sydney, Australia
- Dr Michael Nathan, Communicable Disease Prevention and Control, World Health Organization, Geneva, Switzerland
- Dr Hans W. Rauen, Bayer AG, Leverkusen, Germany
- Dr Elil Renganathan, Communicable Disease Prevention and Control, World Health Organization, Geneva, Switzerland
- Ms Joanne Sheppard, Communicable Disease Prevention and Control, World Health Organization, Geneva, Switzerland
- Dr E.M. Smith, Programme for the Promotion of Chemical Safety, World Health Organization, Geneva, Switzerland
- Dr Yap Han Heng, Universiti Sains Malaysia, Penang, Malaysia
- Dr M. Zaim, WHO Pesticide Evaluation Scheme, Communicable Disease Prevention and Control, World Health Organization, Geneva, Switzerland
1. SCOPE OF THIS DOCUMENT AND PROBLEM DEFINITION

1.1 Insect-borne diseases

Insects are a major cause of disease and discomfort world wide. Insect-borne diseases, such as malaria, can impede the economic and social development of nations. This is particularly so in the warm and humid regions of the tropics and sub-tropics where insects pose a great risk of human disease to many people by spreading viruses, worms and protozoa such as:

- Malaria - with more than 300 million cases per year and several million deaths, transmitted by mosquitoes Anopheles spp.

- Filariasis - with about 120 million infected, leaving severely disabled persons, transmitted by mosquitoes Culex spp.

- Yellow fever, dengue and dengue haemorrhagic fever - with millions of cases and up to 5% of deaths, transmitted by mosquitoes Aedes spp.

- Japanese encephalitis - transmitted by mosquito Culex spp.

- Leishmaniasis, onchocerciasis, encephalitis - transmitted by sandflies, black flies, ticks.

- African trypanosomiasis - transmitted by tsetse flies in Africa.

- Chagas disease - in Central and South America, transmitted by triatomine bugs.

- Plague - transmitted by fleas.

Moreover, many bacterial, viral and parasitic diseases, e.g., cholera, dysentery, typhoid, leprosy, poliomyelitis, infectious hepatitis, diarrhoea, helminthic infections, and so called hospital syndrome are believed to be transmitted mechanically by flies, cockroaches and other pests.

Apart from the risks of being bitten by insects, allergies linked to cockroach and house dust mite infestations have been found to be a major health hazard, especially in urban and suburban communities of temperate regions where central heating contributes to pest population pressure and allergen loading.
1.2 The role of household insecticide products

The advent of the chemical control of insects has brought about major improvements in public health and social development around the world. Nowadays, chemical control is still considered the most important element in integrated control of insect-borne diseases and nuisance pests in general. While this has primarily involved large scale community vector control programmes, there has been increasing recognition of the role of domestic chemical control products which can be used by the general public around their homes, work sites and other frequently used areas. These products are commonly classified as household insecticide products.

Through the use of household insecticide products, individuals are assuming greater responsibility for protecting themselves against insects and other pests and the diseases they cause.

This has become more important as the level of urbanization increases in both developed and developing countries. Increased personal and family responsibility for their own health and protection is encouraged in many countries. This trend assumes greater importance as national public health programmes are facing increasing economic constraints. Increased personal responsibility for protection against insect-borne diseases may lead to a self-sustaining and potentially more successful approach.

WHO recognises the importance of personal insect control measures and self protection and in recent years has conducted dialogue with national regulatory and public health authorities, industry and scientific experts in fields such as medical entomology, pesticide toxicology and formulation in order to ensure safe and effective use of chemical control methods by members of the public.

Most recently, the WHO Pesticide Evaluation Scheme's (WHOPES) Informal Consultation\(^1\) between industry, government and academia, which was convened in Geneva in February 1998, drafted guideline specifications for household insecticide products. The consultation also prepared a series of recommendations designed to ensure that household insecticide products around the world are of appropriate quality and can be used safely and effectively by the general public. This document has been prepared as a specific response to one of the recommendations of the above-mentioned Consultation:

“WHOPES, in collaboration with industry, national authorities, and research institutes, should prepare educational and training material on safe and effective use of household insecticides. This should be directed towards specific user groups”.

1.3 Definitions

In producing this document, the following definitions have been used:

i) Educational material

Printed or broadcast materials which are designed specifically for the general public to ensure that they use household insecticide products in the most appropriate manner. This material should be prepared in simple, easy to translate language using communication tools such as pictograms and other diagrammatic representations to reinforce key messages. This material should be designed in such a way as to provide a clear indication of the benefit of using these products and how to avoid the risks associated with their misuse. It should include key messages on how to use household insecticide products safely and effectively.

ii) Training materials

Printed or broadcast materials designed specifically for persons involved in public health or educational activities which relate to the control of pests of public health importance and of nuisance value and ultimately in the prevention of insect-borne diseases. These materials should be more technically detailed than the educational material to enable the user to provide training to the general public on how to use household insecticide products safely and effectively. It should also enable them to clearly communicate the risks which can be posed by insect-borne diseases and pests of public health importance and the protective benefits of using these products in combination with other personal protection and control measures. The materials should enable trainers to respond to anticipated questions and to explain in simple language the key messages. Trainees may include local public health workers, nurses, doctors, pharmacists, teachers, persons working in the media and public relations.

iii) User groups

Two sets of user groups have been identified:

Consumers:

Aspects to consider with this group include levels of literacy, language, culture and the level of urbanisation. It is to be assumed that this group has little or no understanding of the threats that can arise from insect-borne diseases or how to use household insecticide products.
Educators:

It is assumed that this group has at least a basic level of education, which enables them to understand and communicate information on good health care and hygiene practices to the consumers. It is desirable that they also understand how the general public complies with health care education and that they understand the process of product registration in their countries. This group comprises mainly public health workers, school teachers, pharmacists and medical staff. National authorities are notified to support such campaigns to be undertaken on a local level and to provide the legislative background for the use of household insecticide products.

1.4 Scope of this document

The scope of this document is to provide an authoritative summary on:

- the importance of the control of pests of public health significance which appear around the home;

- the preventive measures that members of the public can take to reduce and minimize insect infestation;

- the nature and mode of action of chemical household insecticide products;

- the proper and safe use of household insecticide products for the control of insects causing significant disease and of nuisance value.

The following flow chart (Figure 1) gives an overview of the steps and educational and training material needed to reach user groups at community level with the key messages. It is intended that this document form the basis of educational and training materials which can be used in individual countries.
Fig. 1: Flow of communication of key messages to the target groups.

Technical summary on household insecticide products efficacy and safety → WHO Document

Key messages plus technical source information → WHO Document

National authorities for local campaigns/activities
(registration, health, vector control, etc.)

Material used "as is" or adapted for local use
(national/regional languages or dialects / pictograms)

Direct broadcast or transmission → Distribution of training, educational materials, technical sessions → Direct broadcast or transmission

Target Groups:
- Housewives/ mothers in rural or urban areas
- Community, public health workers, Physicians, pharmacists
- Schools
- School children > 12 years of age
2. SAFE AND PROPER USE OF HOUSEHOLD INSECTICIDE PRODUCTS

2.1 General principles

Household insecticide products are typically formulated as dilute and ready-to-use products, as compared to the more concentrated forms typically used by professional and government vector control applicators. As such, they can be easily applied by the general public and are readily available in shops, drugstores, supermarkets and other outlets. Nevertheless, these products contain toxic ingredients and therefore must be handled with care and in accordance with the manufacturer’s recommendations for use. It is therefore critical that instructions for safe use are easily comprehensible to consumers of all literacy levels.

The general principles for safe and effective use of household insecticide products described in this section can be considered to apply to all product types (e.g., aerosols, coils). However, the nature of these individual products may require that additional instructions be given to users to ensure that they are used appropriately. Supplementary measures relevant to each product type and use pattern are included in Section 3.

In order to educate consumers effectively, key messages need to be identified and they should be clearly and unambiguously communicated to the target consumer groups. This, of course, also implies that target groups can be identified and that the most effective means of communication and education have been selected. This also implies that appropriate groups of educators are identified.

For the purpose of this document we are considering two target consumer groups - housewives/mothers and school children. In addition, we are considering educators at community level, e.g., doctors/nurses at health centres, teachers and at national level, e.g., public health authorities. It may be that further differentiation will be necessary in individual countries.

2.2 Key messages for target groups

The key messages outlined below are considered generic for all formats of household insecticide products, i.e., aerosols, coils, electrical devices, etc.

i) Key messages for consumers

• Insects found in and around the house/home can transmit a wide variety of diseases and, in the case of venomous spiders and scorpions, can cause severe injury. All building environments, including houses, have the potential to harbour a wide variety of insects and other pests of health and nuisance significance.
• Household insecticide products can either kill or repel insects and thus can help to prevent disease transmission and ensure well being.

• Manufacturers of household insecticide products formulate these products to have specific action against identified insects. This action is dependent on the use pattern of the product. Manufacturers use the product label as the key means of communicating the correct pattern of use. In addition, in many countries government regulatory authorities also review labels and specify label requirements relating to safe and effective use. In such countries, consumers should look for evidence of local authority approval.

• The product label is the most important tool the consumer has to ensure safe and effective use. They should read and try to understand the label. If the consumer cannot understand the label, it is vital that they consult someone who can.

• Use the product as the label directs to ensure optimum effect. The directions for use indicate how the product should be used to be most effective against target insects.

• Do not use more than the recommended dosages or outside target treatment areas. Excessive use of a product and/or of recommended treatment areas may be a waste of insecticide and may expose the consumer or the environment to potential hazard.

• Consumers need to wash their hands and exposed skin after handling or coming into contact with the product. The urgency of this recommendation depends on the active ingredient/s and formulation used.

• Many products have specific storage requirements because of the nature of their ingredients, formulation and packaging. It is important that products are stored as recommended in their original containers so that they remain stable, safe to use and retain their efficacy.

• Children may be tempted to play with or misuse consumer insecticide products if they are accessible. Therefore, it is imperative that consumer insecticides should be kept in a safe place, out of the reach of children.

ii) Key messages for educators at community level

The key messages for educators at the community level are the same as for the consumers mentioned above. However, educators require a basic understanding of the rationale behind each of the key consumer messages so that they can communicate more clearly and answer questions. They should:
• Communicate clearly that the label is the most important source of information available to consumers.

• Understand the basic rationale behind each major element of the label and in particular the warnings and safety statements.

• Understand the rationale behind guidelines on appropriate storage and handling of household insecticide products.

• Have a basic understanding of insect behaviour to enable them to communicate how and where to use products in the most effective manner. This also includes an understanding of the risks posed by excessive use or misuse so that they can communicate this to consumers.

iii) Key messages for national authorities

Two types of national authorities have been identified as having a role in the safe and effective use of household insecticide products. They are as follows:

National regulatory authorities, who have responsibility for authorizing and overseeing the supply of safe and effective household insecticide products in their country.

National health authorities, who have a responsibility for public health and hygiene programmes including the control of insect-borne diseases and health extension programmes in their country.

a) Key messages for national regulatory authorities include the following:

• Check that the active ingredients in the products are safe to use in a domestic environment. The WHO document “Chemical methods for the control of vectors and pests of public health importance” is an appropriate reference2.

• Ensure that the product has appropriate standards of quality and safety. WHO Guideline Specifications for Household insecticide Products3 is an appropriate reference document which outlines the requirements for this purpose.


Ensure that all products have clear labelling which includes the following components: content; legibility; prominence of key facts and warnings; clarity of directions for use; basic first aid; and storage recommendations.

Assess whether products have been designed and labelled to minimize the hazards to consumers during normal use and possible conditions of misuse.

Ensure that evidence supporting claims relating to efficacy and safety is available and valid (following Recommendations of the WHO Informal Consultation³).

Provide evidence on the product label of approval by national regulatory authorities in the country where a product is marketed (if there is no national regulatory authority, evidence of conformity to international standards should be included on the product label).

b) Key messages for national health authorities:

Household insecticide products can play an important complementary role in the prevention of insect-borne diseases. This is particularly important at times of high risk of diseases such as dengue fever and malaria.

National health authorities should support education programmes on the safe and effective use of household insecticide products in their country.

National health authorities should co-operate with national regulatory authorities in their country in order to ensure that the relevant public health benefits of household insecticide products are taken into account when regulatory approval is given to allow a product onto the market.

2.3 Linkage between key messages and target groups

These key messages, and the interrelationships between messages for consumers, educators and regulators, are summarized in Figure 2. The key messages for consumers, educators and national authorities are interdependent.
**Fig 2: Linkage between key messages and target groups**

<table>
<thead>
<tr>
<th>Key messages: consumer</th>
<th>Key messages: educators</th>
<th>Key messages: national authorities</th>
</tr>
</thead>
</table>
| How household insecticide products protect from disease | By diseases identify how household products would protect | * Efficacy data  
* Evidence of approval  
* Clarity of directions for use |
| Read & understand label | * Label is the consumer's first & only permanent source of information  
* Explain the label for those who cannot understand | Ensure clear labelling which reflects efficacy & safety data |
| Use only as directed | Instructions should reflect the best way to kill/repel insects & to protect user | Labelling plus understand the risks from misuse |
| Wash hands & skin | Remove any insecticide which user may have been in contact with prevent potential harm to user through accidental ingestion | Labelling (as above) plus understand the risks from accidental exposure |
| Store as recommended | Ensure that product remains effective & does not pose any unanticipated risk. Also ensure that the packaging remains intact and fully functional | Labelling |
| Store out of reach of children | Ensure that product cannot be misused by consumer who cannot properly use/understand product | Labelling |
| Look for registration approach | Give guarantee that reviewed by local officials & that product is considered safe & effective when used as directed on label. | Provide evidence for public to understand if product has been assessed as safe & effective |
3. PRODUCING EDUCATIONAL AND TRAINING MATERIALS

Individual and community health knowledge and perceptions form the basis for decisions made about health, health behaviour and attitudes. Health education and training provide an opportunity for accurate information and healthy behaviour to be conveyed, enabling individuals and communities to take control of different aspects of their health.

Health interventions apply strategic tools such as the development of educational and training materials to get key messages across.

Planning and designing effective educational and training materials is dependent on a number of factors:

- Target group;
- Support and political will;
- Available resources.

For the purpose of this guide, target groups have been identified at the community and national levels. Both consumers (housewives/mothers and school children) and educators (doctors/nurses employed by health centres and teachers) have been included at the community level, whereas regulatory authorities have been targeted at the national level.

It is necessary to gain support from identified key informants within each target group. This support is vital to encourage programme commitment and is also essential in advocating for policy or legislative change.

Available resources will vary between target groups according to country priorities, however, an innovative programme can still reach realistic objectives with little funds if the commitment is there.

3.1 Needs assessment

When planning to design materials, particularly at the community level, it is necessary to undertake a needs assessment to gain an understanding of the situation such as, the target group, existing knowledge, beliefs and practices, current policies, commitment and resources. Information collected during a needs assessment provides a baseline for evaluation. A needs assessment involves conducting interviews and/or focus group discussions, or questionnaires.

Appropriate strategies, in this instance education and training materials, will be designed using the information collected during the needs assessment combined with the technical information addressing household insecticide products and the generic key messages in this guide. Remember design will vary according to the target group, support and political will, together with available resources.
3.2 Teaching methodologies

Successful implementation of strategies to deliver key messages relies greatly on the facilitator's understanding of the message, the target group and the teaching methods applied.

A facilitator needs to have a clear understanding of the message and it's objectives and how this relates to the target group.

An understanding of teaching and learning is vital. In most learning situations the facilitator's purpose will be to communicate a message which aims to achieve one or more of the following:

- Teach skills;
- Present facts;
- Organize knowledge;
- Change attitudes.

The existing knowledge of the facilitators and learners also affects the learning process; previous experience, interests, attitudes and values can have an impact on understanding and processing new information.

3.3 How to get the message across

In most countries people are learning to read and write, however, a wide range of communication tools are becoming available, such as:

Visual Materials: Visual materials arouse interest, provide a clear mental picture, speed up understanding, help memorize and provide a clear point to generate discussion.

Multi-Sensory-Materials: People receive experiences through all five senses, **sight, hearing, smell, taste and touch**. If possible, the audience should be involved in different experiences, using several senses. The message is more likely to be understood and accepted. This is particularly important when designing messages for communities and school children.

3.4 The effectiveness of message delivery

Short-term effect: Note the effect the message is having on individuals in the audience; reactions and expressions would indicate whether they are interested or bored, clear or confused.

Long-term effect: The long-term effect of teaching will be found in the learner's actions.
3.5 Commonly used teaching methods

These teaching methods can be applied in numerous situations.

3.5.1 Brainstorming

Brainstorming is a group process, which brings together everyone’s ideas to solve a common problem.

- Anyone who has an idea on how to solve a specific problem shares it with the group;
- Members of the group should only offer ideas which concern the problem under review;
- Group members are not allowed to make remarks or judgements about ideas during the Brainstorming process;
- Someone should record ideas as they come up;
- When there are no more new ideas, the group reviews all of the suggestions;
- The group then votes on which ideas are most likely to solve the problem;
- There may be more than one idea which is considered;
- Once an idea has been chosen, the group discusses the details;
- When several groups are looking at the same problem, the ideas may be very similar or completely different - there can be more than one way to solve a problem.

3.5.2 Role play

Role-play exercises are very useful in teaching communication and decision-making skills. They are used to reveal the core of a situation, and to explore attitudes and reactions.

- A role play must have a clear learning objective and needs careful planning;
- Devise a simple situation with 2 to 4 role players;
- Role players are given a basic description of their character and the situation;
- Too much detail can make it difficult for the role players to follow instructions;
- The facilitator should describe each player’s role and the situation to the audience;
- Explain to the audience what they should look for during the role play:
  - Accuracy of the information mentioned,
  - Communication skills used,
  - Interpreting the attitudes of each role player;

- The situation is acted out by the role players;
• The role play may come to a natural end or the facilitator may decide that it has gone on long enough for educational purposes and stop the play;
• After the role-play the facilitator guides the discussion to emphasise the main aspects learned and to summarise the session.

3.5.3 Class discussion

Class discussion gives learners the opportunity to express their own opinion about a topic, contributing to the learning process.

• The facilitator will be the discussion leader;
  This method can be used at difficult points in a lesson or at the end of a topic for review purposes;
• Discussion ensures a two-way dialogue between facilitator and learners;
• It is one way for a class to review their experiences and reinforce what they have learned;
The style of asking questions during a discussion is vital. It is strongly recommended that closed questions be used such as: “Do you agree with what has just been said?” instead of “What do you think about that?”
• It is a rapid way to find out what the class has understood or remembered and to give immediate feedback to confirm ideas or corrects errors.

3.5.4 Group discussion

Learners are divided into small groups of 5 to 10 people. Each group discusses a case study and makes a decision on how to solve it. This teaching method can be used to achieve a wide range of objectives.

• Use case studies or questions which apply what has already been learnt, rather than covering new subjects;
• To make the discussion more purposeful, each group should write either a list of recommendations, advantages and disadvantages, or a decision;
• Encourage all learners to actively take part;
• Direct questions at those who are talking the least and invite the more talkative to wait until the others have had a chance to speak;
• Set a reasonable end point;
• Bring the group together and discuss what each group has come up with;
• Refer to the summary of points recorded by each group;
• Ask learners to identify whether their comments are facts or opinions;
• Correct errors of fact when they occur;
• Comments should be kept to the main theme of the discussion.

Facilitators need to be aware of the physical environment where training is taking place, environmental factors can have an affect on learning. Learners need to be in a non-threatening environment where they feel comfortable.
3.6 Schools

Schools provide a perfect environment to communicate messages and encourage healthy behaviour change. It is important to involve school representatives early on in decision making and design of strategies. School-based health education programmes often use community development approaches, which encourages empowerment. School children are also receptive to change and new ideas. If learning is made enjoyable, children are often willing to share new information with others, distributing messages. It is therefore essential that children leave a health education session with accurate, simple information.

Some schools may be resistant to new health education initiatives; this is usually related to staff being overburdened or limited resources.

3.7 Designing visual materials

There are numerous factors, which must be considered in the design of visual materials. Importantly, the literacy level of the target group, language and any cultural issues must be considered. These should have been identified during the needs assessment.

Keep messages clear and simple, use pictures rather than words, and use local languages where appropriate. For a visual message to be successful, people must be able to identify with it and/or understand the concept. Design aspects such as colour and layout also play a role in communicating messages.

The media can often take a lead in mass distribution of messages, however; this often requires large financing. Short radio messages are an effective media tool, especially if the message is catchy and repeated enough. However, there are a number of limitations associated with the use of mass media. Not all communities have access to television or radio and a lot of people in rural or remote districts do not have access to print media. Problems associated with language or the message being perceived as “something that does not affect me”, or as a “talking authority”, can decrease the effectiveness of the strategy.

3.8 Evaluation

Process evaluation must take place throughout each stage of planning, design and implementation of education and training materials. Outcome and impact evaluation methods need to be designed to assess the effectiveness of interventions and strategies.
4. SPECIFIC GUIDELINES FOR THE USE OF HOUSEHOLD INSECTICIDE PRODUCTS

4.1 General Principles

The term "household insecticide product" refers to a range of ready-to-use products which are effective against specific target insects and are readily accessible to the general population in supermarkets, shops, pharmacies and other retail outlets in the cities and in the countryside. These products have been developed in such a way that consumers can use them in a safe and effective manner.

Household insecticide products are most effective when used in combination with physical control measures, which aim at the elimination and or reduction of vector or pest breeding sites or keeping them away from human habitation.

The combination of different control measures is called "integrated control". The benefits of household insecticide products as part of integrated vector/pest control have been described in previous sections of this document.

The most important products out of the common range of household insecticide products are described in the following sections and include the product formats described below:

- aerosols for space application (oil or water-based), also known as "Flying Insect Killers" (FlKs);
- aerosols for residual application and for the control of crawling insects (oil or water-based) also known as "Crawling Insect Killers" (ClKs);
- oil sprays and water-based liquids to be applied with manual pump systems;
- electric vaporiser systems such as mat, liquid and gel-type vaporiser;
- mosquito coils;
- insecticide baits (cockroach, ant and fly baits) and traps (glue traps for cockroaches and flies);
- dustable powders;
- strips which evaporate active substances without electrical energy;
- moth protection products such as mothpaper, mothbag and mothballs.
Some of these products are only effective against specific target insects (e.g. electric vaporiser) and some of them work against a wide range of target insects (e.g. aerosols). Some products have an immediate effect while others work for a longer period of time. Some products are designed to kill while others will only repel. The behaviour of target insects, their health significance and the environment within which the product will be used influence the product design.

The active ingredients used in household insecticide products can have potent biological and toxicological activity. Often they are the same active ingredients, which are used by professional pest control operators, although at much lower concentrations. Their safety and effectiveness is dependent on their formulation, and selective and proper use.

The development of new active ingredients for pesticides is a complex, lengthy and expensive process. Typically, development takes around 10 years and can cost up to US$ 100 million. As part of this process a thorough examination of the biological and toxicological properties should be undertaken. This process would ensure that only active ingredients which have an acceptable risk benefit profile are brought onto the market.

A basic knowledge of the biological and toxicological properties of these active ingredients is important for consumers and educators. Active ingredients commonly used in household insecticide products can be grouped as follows:

- **Chlorinated hydrocarbons**: this group has been widely used in the past but has been completely abandoned for household use because of persistence in the environment and bio-accumulation, which represent a risk to non-target organisms, including man.

- **Organophosphates**: this group is based on derivatives of phosphorus based acids. They are generally active against a broad spectrum of insects, do not persist in the environment and do not bio-accumulate. They are, in the majority of cases, used for residual activity targeting crawling pests.

- **Carbamates**: This group is derived from carbamic acid and has properties similar to those described for organophosphates above.

- **Pyrethroids**: These are synthetic chemicals which are similar in structure to natural pyrethroids (derived from *Chrysanthemum* plant) and are characterised by their generally low mammalian toxicity when in an appropriate formulation. This group is further divided into two sub-groups: active ingredients with high knock down activity, such as allethrin and a sub-group of active ingredients mostly known for their high residual activity such as permethrin.

- **Synergists**: these are not active ingredients but they enhance insecticidal activity of some groups such as pyrethroids. The most commonly used synergist is piperonyl butoxide.
4.2 Space spray products (FIK aerosols)

Space spray products are aerosol cans designed to release small droplet suspensions into the air to control flying insects. They are therefore called flying insect killer aerosols (FIK)

Technical description and biological properties

Flying Insect Killer sprays are water based or oil-based formulations used mainly for the control of flying insects such as mosquitoes and flies. If applied in a room, an immediate effect on mosquitoes and flies is achieved. Usually no residual effect is sought from this application.

The active ingredients in FIK are mainly from the pyrethroid family. In FIK, a combination of a killing agent and a knock-down agent is very common. The water based aerosol formulations may provide a more environmentally friendly product with low content of organic compounds, low flammability, and improved product safety.

Efficacy and protection profile

The insect comes in contact with the aerosolized droplets of insecticide which induces immediate effects of knocking down and killing the insect.

Some water-based products can be used on indoor plants.

Instructions for use

Control of flying insects such as mosquitoes and flies is achieved through application to kill and/or repel them within a certain area. Moreover they can be used by applying directly to a single insect.

- close doors and windows before spraying
- shake can well before use
- direct the spray mist slightly upwards and apply evenly around in the room. Follow label instructions for how much to spray depending on the room size
- after spraying, leave the room immediately and leave closed for about 20 minutes
- after re-entry, open the windows to ventilate
- if indicated for indoor plant application, follow specific instructions given on the label.

Precautions

Depend on the active ingredient and formulation. However, in general:

- do not use in the presence of persons with allergies
- do not store with, and do not spray on or over, food and beverages
• do not spray on humans, pets, aquaria, bird-cages and honey bees
• keep out of reach of children
• avoid inhalation of spray mist or direct contact with skin and eyes
• if contact occurs, wash the area with plenty of soap and water
• in case of accidental intoxication, patient should contact a physician, hospital, or poisons information centre for treatment and advice; always have the product label available when seeking treatment or advice.
• the spray can must be protected from direct sunlight and temperatures exceeding 50°C
• do not spray into open fires or onto hot surfaces
• do not open can forcibly
• do not smoke while spraying
• to avoid accumulation of explosive propellant gas, do not spray uninterruptedly into confined small spaces or poorly ventilated rooms
• Make sure the can is completely empty before disposal

4.3 Residual sprays (CIK aerosols)

Residual or Surface Sprays are aerosol cans designed for the control of crawling insects and to be applied on surfaces (such as cracks and crevices, under appliances, etc.), where these insects walk or harbour. Therefore they are also called “crawling insect killers” (CIK). Some products are also designed as knock-down sprays to directly spray and inactivate insects without a prolonged residual effect.

Technical description and biological properties

Crawling Insect Killers, water or oil-based, are aerosol formulations containing one or more active ingredient with different properties, normally a residual agent combined with a killing and/or knock-down agent and, in some cases, with a flushing agent. CIK often require a higher concentration of active ingredients for induced kill than that required for flying insects.

CIK have been designed for the control of crawling insects such as cockroaches, silverfish, bugs and ants. They must exhibit excellent residual effect but also a very good knock-down effect for those designed to be applied directly onto insects.

Some CIK formulations have extension tubes so that the product can reach far into cracks and crevices where crawling insects hide.

Efficacy and protection profile

In CIK, the insect exposure to the insecticide may occur via inhalation, dermal in the case of direct contact with treated surfaces, or via the digestive system resulting from oral intake following insects cleaning contaminated legs and antennas. If applied as surface spray, the residual effect may last several weeks, (4 to 8 or
even up to 12) depending on the physical properties of the sprayed surface, the active ingredient applied and its formulation.

The combination of knock-down, killing and residual agents provides an optimum long-term control of crawling insects, which are difficult to treat directly in daytime, as is the case with cockroaches. The use of flushing agents makes the cockroaches escape from their hiding places and facilitates their exposure to other active ingredients in the formulation, leading to proper control.

Some CIK contain a knock-down agent and a killing agent only. They must be applied directly onto the insect and do not have a residual effect.

Instructions for use

Direct kill and residual control of hidden and crawling pests such as cockroaches, ants and others:

- shake can well before use (especially if water-based)
- spray runways of insects and hiding places such as joints, cracks, crevices, splits, clefts, areas behind furniture and machines, areas underneath sinks and along the walls (all spaces where crawling insects may aggregate), from a distance of 20 to 30 centimetres. Avoid indiscriminate surface application
- spray until surface is slightly moist
- if product is applied in holes or confined areas, spray in short bursts and do not spray longer than 10 seconds in order to avoid accumulation of explosive propellant (refers to hydrocarbon propellants)
- disconnect electric equipment (washing machines, fridges, etc.) before spraying to avoid explosion of propellant gas by sparks (refers to hydrocarbon propellants)
- individual insects may be sprayed directly
- remove spray film with a detergent cleaner, if protection is no longer required

Precautions

Depend on the active ingredient and formulation. However, in general:

- do not spray on surfaces where food is prepared
- do not store with and do not spray on or over food and beverages
- do not use in the presence of a person with allergies
- do not spray on humans, pets, aquaria, bird cages and honey bees
- keep the product out of reach of children
- avoid inhalation of spray mist or direct contact with skin and eyes
- if contact occurs, wash the area with plenty of soap and water
- in case of accidental intoxication, the patient should contact a physician, hospital, poisons information centre for treatment and advice and bring the can/label for reference
- the spray can must be protected from direct sunlight and temperatures exceeding 50°C
• do not spray into open fires or onto hot surfaces
• do not open can forcibly
• do not smoke while spraying
• to avoid accumulation of explosive propellant gas, do not spray uninterruptedly into confined spaces and poorly ventilated rooms (refers to hydrocarbon propellants)
• make sure the can is completely empty before disposal

4.4 Oil sprays

Oil spray formulations belong to the first group of household insecticide products, which were developed in the fifties. Oil sprays are very simple formulations, containing kerosene or paraffin oil in which one or several active ingredients are dissolved. Oil sprays must be applied with spray pumps, which may be used many times. These pumps are usually made of cheap tin plate or, more recently, from PVC. The product must be poured into a container attached to the spray pump, which requires handling of the formulation with the related risk of spillage and skin contamination.

Technical description and biological properties

Oil spray formulations contain one or several active ingredients in a kerosene or paraffin solution. The active ingredients may belong to any chemical group. The kerosene-base for oil sprays is usually not a refined version, so that the product may have a very distinct intrinsic odour.

Oil sprays have been designed for the knock-down of crawling insects, such as cockroaches, silverfish, bugs and ants but may also be used as space spray for the control of flying insects such as mosquitoes and flies. If residual active ingredients are formulated, the product may also be used for long term control of crawling insects. It is the technical predecessor of the pressurised aerosols, but it has a more universal mode of action rather than a specific effect on either flying or crawling insects.

Warning:

Not all active ingredients are suitable for such use as they may represent a specific safety issue. Regulatory authorities need to make a careful assessment of these products.

Efficacy and protection profile

Contact with the insecticide may occur via inhalation (direct spraying), via the skin (direct spraying, contact with sprayed surfaces) or via the digestive system (oral intake after legs are contaminated with insecticide particles and cleaned by the insect). If applied as a surface spray, the residual effect may last up to several weeks, depending on the physical properties of the sprayed surface and the active
ingredients used. Other factors influencing the efficacy of the product is the time of exposure to the treated surface, the age of the spray film, the strength, resistance and age of the target insect and the type of insect which has been contaminated. The combination of knock-down, killing and residual properties provides optimum protection against all pests such as mosquitoes, flies and also a control of crawling insects such as ants, cockroaches and silverfish.

Instructions for use

Control of hidden and crawling pests such as cockroaches, ants and others:

- open the cartridge attached to the spray pump and fill very carefully with the oil spray
- reattach cartridge to the pump and close tightly by screwing
- spray run-ways of insects and hiding places such as joints, cracks, crevices, splits, clefts, areas behind furniture and machines, areas underneath sinks and along the walls (all spaces where crawling insects may aggregate) from a distance of about 10 to 20 centimetres, until surface appears slightly moist
- individual insects may be sprayed directly
- if protection is no longer desired, remove spray film with a detergent cleaner
- if you do not use all the contents of the cartridge, store the product in a safe place
- do not spray on ornamental plants

Control of flying insects such as mosquitoes and flies:

- follow the label instructions for specific information on the application rate
- direct the spray mist slightly upwards and apply evenly in the room
- after spraying leave the room immediately and leave closed for about 20 minutes
- after re-entry, ventilate the room sufficiently
- individual insects may be sprayed directly
- spray doors, window frames and walls, where mosquitoes and flies may settle for preventive and residual control

Precautions

Depend on the active ingredient and formulation. However, in general:

- do not spray onto surfaces where food is prepared
- do not store with and do not spray on or over food and beverages
- do not use in the presence of a person with allergies
- do not spray on humans, pets, aquaria, bird cages and honey bees
- keep product out of reach of children
- avoid inhalation of spray mist or direct contact with skin and eyes
- if contact occurs, wash the area with plenty of soap and water
- do not ingest the product! The kerosene/active ingredient solution will cause severe harm to your health
• in case of accidental intoxication, patient should contact a physician, hospital, poisons information centre for treatment and advice and bring can/label for reference
• the product must be protected from direct sunlight and temperatures exceeding 50°C
• do not spray into open fires or onto hot surfaces
• do not smoke while spraying
• make sure container is completely empty before disposal

4.5 Mosquito Coils

Coils are widely used all over the world for protection against mosquitoes. They are of particular importance in areas without reliable electricity. Smoke and mosquito coils were the first methods used by man for protection against mosquito bites.

Technical description and biological properties

Coils consist of a base made of wood powder, starch, coconut-shell powder, dyestuff, glues and burning regulators. Additionally, insecticides are formulated at a relatively low dosage. This improves the limited effect of the simple smoke particles and leads to a significant improvement in the biological effect of coils, which mainly consist of repellents and after prolonged exposure, have a potential knock-down or killing effect.

The most commonly used active ingredients belong to the group of quick knock-down pyrethroids, which are not persistent. However, in some countries coils are formulated with organochlorine compounds, which give rise to serious health concerns. Pyrethroids and natural pyrethrins are the preferred active ingredients for coils.

Coils are only for the control of mosquitoes and do not effect other flying or crawling insects.

Efficacy and protection profile

Once mosquito coils are lit, the glowing zone proceeds slowly round the spiral shape of the product. Coils provide efficient control against mosquito bites throughout the whole period of burning, which normally lasts between 6 and 8 hours. The heat of the glowing zone slowly increases the temperature of the coil ground mass. This slow increase in temperature leads to an evaporation of the active ingredient, which is incorporated in the coil mass. The smoke particles may bind part of the active ingredient, but there is also a gaseous phase of the active ingredient which, after inhalation by the mosquito, leads to intoxication and later immobilisation of the target.
Since consumers are exposed to a complex but very low dose mixture of combustion products which evaporate from mosquito coils over a long period, safety testing should be based on the finished product and the relevant endpoints that could occur from long-term, low dose exposure.

Instructions for use

- take the twin coils out of their packaging and separate by slightly pulling the heart (central part) in different directions
- place the coil on the metal stand using the pre-stamped hole in the heart (central part)
- place the coil and stand on a heat resistant surface (e.g. saucer)
- light the end of the coil with an open flame until the coil mass is glowing evenly
- place the coil away from all inflammable or combustible materials
- use one coil for a room of approx. 20 m²

Precautions

Depend on the active ingredient and formulation. However, in general:

- do not use coils in the presence of a person with allergies
- place the coil only on stand provided by manufacturer
- take care when lighting the coil
- do not place the coil close to combustible and/or inflammable materials
- do not store the coils together with food and beverages
- keep out of reach of children
- if a coil breaks, only burn broken segments on an appropriate stand and on a heat resistant surface

4.6 Electric vaporiser systems

The group of electric vaporiser systems (e.g., mat-, liquid and membrane vapourisers) includes all those products which require an electrical heating device to evaporate insecticide from a base, which may be composed of any suitable material and which is referred to as "refill". The heater and refill are a unit and must be used together, because in many cases the device and the refill have been developed together by the manufacturer and exhibit an optimum effect only if used together. The electric vaporiser systems have been designed mainly for the control of mosquitoes. They only work with an electric power supply.

This requires the heating devices to have the following characteristics:

- the electrical parts must be constructed in a way that the consumer is protected from electrical shock
the devices must have adequate safeguards to ensure that burning or melting of the device after overheating or accidental long term use cannot occur if consumer forgets to switch the device off

irregularities in voltage, which may occur in many countries, should not effect the evaporation rate of the insecticide with consequent variation in biological efficacy

in countries with dual voltage systems (110-220v), devices must be constructed so that the wrong use of the device is not possible

the electrical parts must comply with international safety standards

resistors must be adequately fixed

the plugs and heating device and the electrical equipment must comply with the appropriate local or international standards for electrical safety

The heating devices should of course provide a sufficient duration of operation and should not be affected by tropical climate, such as heat combined with high relative humidity.

The active ingredients used in electric vaporiser systems belong to the natural pyrethrins and quick knock-down pyrethroids, with a relatively high vapour pressure.

Since consumers are exposed to the active ingredients which evaporate from these systems over a long period, but in very low doses, inhalation toxicity testing involving formulations should take into consideration the relevant endpoints that could occur from long-term, low dose exposure.

4.6.1 Mat vaporisers

Mat vaporisers are the best known and oldest group of electric vaporiser systems. They are sold around the world and the heating device is available as a plug-in version or as a cable version, to be placed somewhere in the room. Mat vaporisers repel and kill mosquitoes.

Technical description and biological properties

Mat vaporisers have been developed for the protection of people from mosquitoes in the indoor environment. Mats have been used for many years and are widely employed throughout the world, especially in tropical countries with high indoor mosquito densities.

With vaporiser mats, the active ingredient is incorporated into the cardboard mat, then dissolved in a pre-solution. After the impregnation, the mat is sealed in proper packaging material in order to avoid evaporation of active ingredients. In addition to the active ingredient, the formulation contains substances which protect
the active ingredient from early thermal decomposition, evaporation inhibitors to prevent a rapid-release of the active ingredient, traces of perfumes, dyestuffs and hydrocarbon solvents.

The mat can only be used together with a mat heater. Both forms a unit and the temperature of the heater must be adapted to the mat. In most systems the temperature on the heater surface is between 140°C and 190°C. If the temperature is too low, consumers may be bitten by mosquitoes because the active ingredient does not evaporate sufficiently. In case of elevated temperatures, the evaporation rate may be too fast, causing the active ingredient to be used up sooner than expected.

As the format of mats and their heating devices are standardized almost world-wide, all mats can be used interchangeably.

Efficacy and protection profile

The mosquito mats are designed for a maximum protection period of one night. The biological effect should last at least 8 hours. In this time, the active ingredient evaporates from the mat, thereby protecting the inhabitants from mosquito bites. The protection is achieved in two ways:

- killing or inactivating mosquitoes which are already in the room (insecticidal effect)
- preventing invasion of new mosquitoes from outside (repelling/expelling effect)

After one night of operation the mat is exhausted and may be discarded in the normal household garbage.

Instructions for use

- take the mat out of packaging
- place the mat on the heating surface of the heater as instructed
- follow label instructions for the number of mats per cubic meter of room
- the product may be used with the windows slightly open
- to obtain the optimum effect, avoid using in strong winds or with the doors and windows completely open
- remove the used mat when putting in a new one
- when the heater is not in use, unplug or switch off the unit in order to avoid unnecessary evaporation

Precautions

Depend on active ingredient and formulation. However, in general:

- keep out of reach of children and pets
- do not use in the presence of a person with allergies
- do not store mats together with food and beverages
- wash hands after touching the mats
• do not cover heating device
• avoid accumulation of dust and dirt on the heater
• do not wash or clean heater with water

4.6.2 Liquid vaporisers

The liquid vaporisers are a more recent development for mosquito control in homes. Like the mat vaporiser, it consists of a heating device and a refill in the form of a bottle containing an insecticide solution. Together they form the working unit.

Technical description and biological properties

The heater is designed in the form of a ring and is located in the upper part of the device. The operation temperature is about 125°C. The bottle has a ceramic or carbon wick which goes from the bottom of the refill bottle up into the heater ring. The structure of the wick enables a continuous flow of active ingredient solution from the bottle to the top of the wick, where the active ingredient evaporates.

Evaporation only takes place if the heater is switched on. If the heater is not operating, the wick does not transport the active ingredients.

The liquid vaporiser works from the time it is switched on until the bottle is empty. The bottle needs to be replaced when empty.

As with mat vaporisers, the most common active ingredients used in liquid vaporisers are pyrethroids with quick knock-down activity and relatively high vapour pressure.

Refer to product instructions for effective room size instructions. If the room size is smaller, the pre-heating time for maximum efficacy will be shorter.

The liquid vaporisers, mats and coils act via the respiratory track of the target mosquitoes and have two modes of action:

• to kill or inactivate mosquitoes which are already in the room (insecticide effect)
• to prevent outdoor mosquitoes from entering the room (repellent effect)

For these reasons the operation of these products with slightly open windows does not affect the product's biological efficacy. However, placement of the product too close to an open window or in the presence of strong winds may reduce its bio-efficacy.

Efficacy and protection profile

The refill bottle generally contains 30 - 45 ml of solution and is designed to last around 30 - 45 cycles of 8 - 10 hours each. As the heater is normally equipped
with a switch and a lamp indicating whether it is working or not, the consumer can use the device according to his needs without touching the active ingredient.

Once the heater is switched on the device starts working, although it takes some time before the solution containing the active ingredient penetrates through the wick and begins to evaporate. Therefore, best results are achieved if the heater is switched on 30 minutes to 1 hour prior to using the room.

Instructions for use

- remove protecting cap from refill bottle
- screw bottle into heating device
- refer to label instructions for the number to be used per cubic meter of room
- bottle must be upright during operation
- product may be used with windows slightly open
- for optimum effect, avoid strong winds and open doors and windows
- replace empty bottle with a new one only after the bottle is completely empty
- empty bottle may be disposed of in normal household garbage
- to avoid unnecessary evaporation, if heater is not in use, unplug or switch off the unit

Precautions

Depend on active ingredient and formulation. However, in general:

- keep out of reach of children and pets
- do not use in the presence of a person with allergies
- do not store the product together with food or beverages
- wash hands after refilling
- do not cover the heating device
- avoid accumulation of dust and dirt on the heater
- do not wash or clean heater with water
- do not open empty or full bottle forcibly
- after contact with wick or liquid, wash hands
- use only original refill bottle

4.6.3 Membrane vaporiser

Technical description and biological properties

The membrane vaporiser is a new product for indoor protection from mosquitoes. It is easy to handle and evaporates the active ingredient without a solvent.

The active ingredient used in the membrane vaporiser must possess a relatively high volatility. The active ingredient is formulated in a gel-type formulation.
The gel is placed in an aluminium container which is sealed in plastic to control the evaporation rate, and with aluminium foil to protect the refill from drying out or evaporating prematurely. The refill is placed into a heating device which has a temperature of around 100°C and which must be designed for the active ingredient.

The active ingredient is evaporated homogeneously after switching on the device. The other formulation compounds (thickener, gel forming agent, dyestuff) remain in the refill. The plastic permits the release of active ingredients and controls the evaporation rate. It needs to be refilled when the formulation turns crumbly, pale and dry.

Efficacy and protection profile

The membrane vaporiser is designed for a protection period of 7, 30 or 45 cycles (nights) of 8 to 10 hours each depending on the amount of formulation placed in the refill. During this time, the active ingredient evaporates from the refill and forms a homogeneous atmosphere of active ingredient in the room, thus protecting from mosquito bites.

The protection is achieved in two ways:

- by killing or inactivating mosquitoes which are already in the room (insecticide effect)
- by preventing invasion of new mosquitoes from outside (repelling effect)

The optimum effect is reached after about 30 minutes. Refills can be adapted to an operation time of 7, 30 or 45 days. The formulation is always the same, but the amount of formulation differs. The active ingredient must be resistant to thermal decomposition during the whole period of operation.

The empty refill may be disposed of with normal household garbage or may be recycled in an appropriate recycling plant.

Instructions for use

- peel off aluminium foil cover of the device before use
- do not damage the transparent film underneath the aluminium foil
- place the refill into the heating device with care to avoid deformation
- turn heating device upside-down so that an optimum evaporation is achieved
- use one refill for a room of up to 20 m³. In bigger rooms use more devices accordingly
- product may be used with windows slightly open
- replace empty refill once it turns crumbly and pale
- before changing the refill, switch the device off and let it cool down for 5 minutes in order to avoid touching the refill while hot
- the empty refill may be disposed off with normal household garbage
- if the heater is not in use, unplug or switch off in order to avoid unnecessary evaporation.
Precautions

Depend on the active ingredient and formulation. However, in general:

- keep out of reach of children and pets
- do not use in the presence of a person with allergies
- do not store the product with food or beverages
- do not cover the heating device
- avoid accumulation of dust and dirt on the heater
- do not wash or clean the heater with water
- do not destroy the transparent film underneath aluminium foil
- do not open the refill forcibly
- do not reuse the empty refill for any other purpose
- use only original refill bottles

4.7 Baits, traps, strips and others

4.7.1 Baits on granular bases and bait stations

Technical description and biological properties

Granular baits have been developed for the control of flies, cockroaches and ants and consist of an active ingredient and a granular base such as sugar or talcum powder. Bitrex, which has a bitter flavour, may be formulated in order to avoid ingestion by non-target organisms, particularly mammals. Insects do not taste the bitter flavour. The ingestion of bait material leads to intoxication of the insect.

Bait stations are a more recent development and are contained in an attractive bait ground mass in which the active ingredient (which should not repel the target insect) is incorporated. Normally the bait is packed in a sealed plastic container with openings to allow the crawling insects (principally cockroaches and ants) to enter and to eat the bait.

Efficacy and protection profile

Baits work through the digestive track. Insects come to the insecticide and not, as in the case of aerosols and vaporisers, the insecticide to the insects. Once the package has been opened, the product works for several weeks, depending on the level of infestation of crawling insects.

Instructions for use

- place the bait where the insect infestation is anticipated
- flies prefer areas close to windows and well lit areas, whereas cockroaches prefer darker areas in closets, underneath sinks in corners and other inaccessible
places, and also in electrical appliances such as housings for personal computers, etc.

- place the bait out of reach of children and in areas inaccessible to non-target organisms such as pets
- dilution with water of a part of the granular bait may improve its biological effect by improving its attractiveness. Consult the label instructions
- place the granular bait on a small saucer or other suitable surface such as paper board or a piece of cardboard
- in case of bait stations, select the number of station according to label instructions

Precautions

- do not store bait with food, feed-stuffs or beverages
- the product should not be placed directly onto the ground or in open water
- the bait should never be taken out of the plastic box of the bait station
- the bait should be kept away from children and pets
- do not ingest the bait material
- if accidental ingestion of the product occurs, patient should contact a physician for treatment. Always have the product name and label available when consulting a physician.

4.7.2 Traps

Traps are insecticide-free devices designed to control cockroaches and flies. They work in the same way as glue traps and were originally designed for commercial pest control operators (PCO’s) to determine the degree of an insect infestation. They later became available on the consumer market and provide control where insect infestation is relatively low.

Traps are placed in a similar manner to baits, along insect pathways or where insects are seen. For effective use, specific instructions on the product label should be followed.

4.7.3 Strips

Strips are used to control flying insects. They consist of a substrate of polyurethane or carton board compounded with an active ingredient which vaporises fairly readily at room temperature. The active ingredient is released slowly from the strip, thus providing control. The disadvantage of the strips is their relative high acute toxicity, because they contain considerable amounts of active ingredients. Strips can also be used to control fly larvae in garbage bins.
5. PERSONAL PROTECTION - THE COMPLEMENTARY ROLE OF HOUSEHOLD INSECTICIDE PRODUCTS TO PHYSICAL CONTROL MEASURES

Physical methods aiming at the elimination and reduction of disease-carrying insects and nuisance pests’ breeding sites in and around human habitations, or keeping them away from human dwellings, are important control measures and should be promoted. However, household insecticide products can complement the use of such measures in providing more effective personal protection.

The following are examples of physical control measures which may be used alone or in combination for the required purpose:

- use of bednets
- use of wire gauze screening in windows and doors to avoid invasion of flying insects
- avoid accumulation of open water in and around the house (puddles, open water tanks, damaged water pipes, tires, coconut shells and other natural containers, etc.) in order to avoid breeding areas for mosquitoes
- fill tree holes with concrete
- keep roof gutters clean
- clean and brush water tanks regularly and thoroughly with a wire brush in order to remove mosquito eggs and to avoid breeding of mosquito larvae
- avoid the accumulation of organic and decaying materials and garbage in and around the house in order to avoid breeding of flies and other pests
- discard garbage properly
- cover food, feed-stuff and water tanks
- keep cooking areas clean and organized
- seal cracks and crevices where cockroaches and bugs may breed and rest
- wear long pants and long sleeve shirts to prevent insect bites
- support natural enemies of insects like birds, frogs, lizards and fish

6. Conclusion

Members of the public should be encouraged to take increased responsibility for their own protection from vector-borne diseases and nuisance pests. This principle is consistent with initiatives in health delivery systems around the world. In particular, products such as household insecticides and topical repellents (not covered in this publication) may be valuable parts of integrated pest/vector management. This is particularly important in areas where rapid, uncoordinated urbanization has taken place.

Household insecticide products are ready-to-use items and must therefore be easy to use and safe in their application. There must also be a sufficient margin of safety in order to prevent any risk of adverse effects to the consumer, even under conditions of misuse.
Household insecticide products provide protection against insect-borne diseases and nuisance pests when used as recommended by the manufacturer. The label on the product is the best means of providing the consumer with this information. It will explain how to use the product safely, as well as information on the correct storage and disposal.

Information on labels and an understanding of insect behaviour should also help community educators to provide advice to consumers on the safe and effective use of the product. This information would also help them gain an appreciation of the risks posed by excessive use or misuse of the product and they should advise the community accordingly.

It is of paramount importance that national registration authorities review the data supporting information on the product label as part of their regulatory review. They should ensure the product meets appropriate standards for efficacy, safety and quality. This includes ensuring that the active ingredient(s) is safe for use in a household environment.

National health authorities should support education programmes on the safe and effective use of household insecticide products. They should also take into account the public health benefits of household insecticide products when considering applications for registration.

In conclusion, proper and efficient use of household insecticide products can be achieved for the sake and benefit of the consumer, with close co-operation between regulatory bodies, health authorities, regional and international organizations and from the industry who provide these products.