

The SAFE strategy

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Preventing trachoma

A guide for
environmental sanitation
and
improved hygiene

WORLD HEALTH
ORGANIZATION

Geneva
2000



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ACKNOWLEDGEMENTS

The authors would like to acknowledge the advice and support of
Dr A.-D. Négrel, Dr B.I. Thylefors and Mrs F. Besson.

The work was funded by
the Edna McConnell Clark Foundation through
the International Trachoma Initiative.
(Grants No. 13496 and 98106)

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Foreword

Personal and environmental hygiene have been identified as crucial determinants in reducing the spread of trachoma. In countries and communities where significant improvements in personal hygiene, water supply and disposal of human and animal excreta and domestic solid waste have occurred, trachoma has ceased to be a public health problem.

Sanitary infrastructure and services, lifestyle and health-related behavioural factors constitute critical aspects in primary prevention of trachoma. They all need to be included in interventions aiming at the sustainable and long-lasting reduction or elimination of blinding trachoma. Coincidentally, these measures are among the essential elements of the primary health care approach, as are health education and the treatment of locally endemic diseases.

As trachoma prevention needs to address both the sanitary environment and hygiene behaviour, intersectoral collaboration between the health system and health related sectors such as water supply, sanitation and education is essential. Such collaboration is a critical element in the strategy for the Global Elimination of Trachoma by the year 2020 (GET 2020).

Dr Ramachandra Pararajasegaram
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1. Introduction

This manual forms part of the comprehensive **SAFE strategy** that has been developed for controlling trachoma through the action of a combination of determinants including **Surgery**, **Antibiotic treatment**, **Facial cleanliness** and **Environmental change**. It addresses the **F** and **E** components of preventive action for trachoma control, which focus on improving hygiene and the environment. A number of additional general hygiene measures that reduce the risk of transmission of other infectious diseases will also be addressed.

The manual is intended for communities where trachoma has been shown to represent a public health problem, which are mainly poorer rural or peri-urban communities. It is designed for use by community health workers, community leaders, nongovernmental organizations (NGOs) and other local individuals who wish to play an active role in the community in order to improve environmental sanitation. It may also be useful for decision-makers in support of hygiene education or the improvement of water supply and sanitation.

Chapters 2 - 5 outline the pathways of transmission of trachoma and measures that can be taken to improve environmental sanitation and thereby reduce the risk of transmission. Annex 1 presents tabular information on chemical methods for fly control in support of section 4.3. Annex 2 on 'Further reading' provides references to additional documents and publications that contain detail on some of the issues addressed in this manual and on community-based trachoma control. The manual describes simple methodologies for trachoma assessment, community participation in control activities, excreta disposal options and their application, methods and material for hygiene education, how to create health-promoting schools, methods for vector control, improved food safety, and other measures that can be taken for a health-promoting environment.

A summary of information on trachoma and its control is set out in the box on the following page.

Your comments on this document and on your experience using it are welcome. Please send them to:

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Summary of information on trachoma

What causes trachoma?

- The causative agent of trachoma is a micro-organism (*Chlamydia trachomatis*) that develops in the lining of the eyelid (conjunctiva), and is sometimes a respiratory or genital disease.
- It is spread through personal contact with hands, towels or other tissues, or indirectly by flies seeking the secretions (discharges) from eyes.

Why is trachoma dangerous?

- Trachoma is a highly infectious disease which can cause blindness.
- After repeated infections during childhood the eyelids become thick and develop scars; these can result in the eyelashes turning inwards and rubbing on the cornea, causing visual loss and blindness.

How can you tell if someone has trachoma?

- The internal part of the upper eyelids is red, with or without visible pale or white spots (follicles); occasionally, copious secretions from the eyes can be observed.
- Trichiasis is a late sign of trachoma: in this condition, the eyelashes are turned inward, so that they rub on the cornea, producing continuous pain.
- Signs of recent removal of the eyelashes can be considered as a sign of trichiasis in hyperendemic communities.

What should you do if someone has trachoma?

- Recommend that patients with trachoma or their parents seek treatment from the nearest health care centre as a matter of urgency.
- Clean the eyes of infected people with clean water at least once a day; if a towel or other tissue is used to clean eye secretions, it should not be shared with others.
- Advise patients with inturned eyelashes to seek surgical treatment without delay.

What can be done to prevent trachoma?

- Wash/clean children's faces with clean water/tissue at least once a day.
- Give appropriate treatment to those infected.
- Improve the general hygiene of the house and the community.
- Convince people to build excreta disposal facilities and use them.

2. Transmission of trachoma

- Trachoma is an infection of the eyelid lining (conjunctiva) caused by *Chlamydia trachomatis*, a micro-organism resembling both bacteria and viruses.
- Transmission occurs through direct contact (for example, contact between healthy children and the contaminated fingers of an infected child, or through exchange of contaminated towels, handkerchiefs or other tissues used for cleaning eye secretions) or by eye-seeking flies (such as the filth or bazaar fly).

As flies can transmit trachoma, fly control plays an important part in reducing the disease. In fact, flies pick up the disease-causing organism (*Chlamydia trachomatis*) while feeding on eye and nose secretions (discharges) of infected people. The contaminated flies then move to non-infected eyes and transmit the germs. Several flies are known to be responsible for the transmission of diseases. For example, the filth fly (*Musca sorbens*) plays an important part in the spread of eye infections such as trachoma and epidemic conjunctivitis.

The flies that play a role in the transmission of trachoma probably breed in human excreta, or are attracted to it. Animal manure, domestic waste, certain types of foods, and the secretions of human and animal eyes may also attract these and other flies.

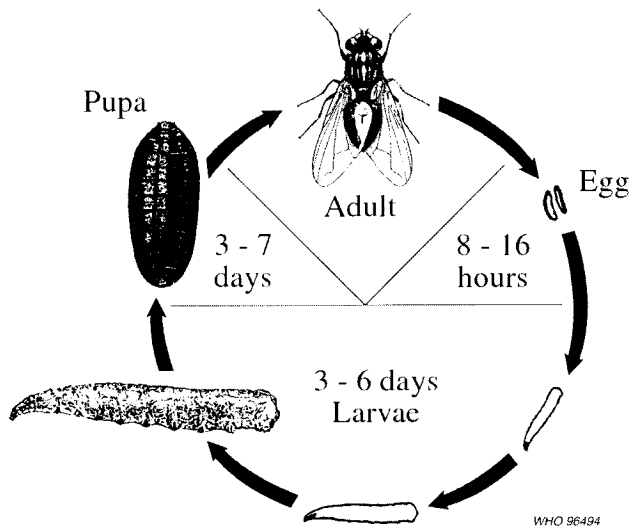


Fig.1 Development stages of the common fly

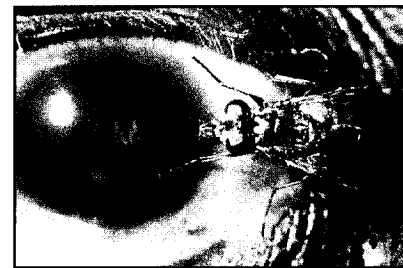


Fig.2 Flies attracted to a child's eye

3. Flies and the transmission of diseases other than trachoma

The housefly and its relatives (including the filth fly) are important pathogen-transmitting insects. They are known to become contaminated with more than 100 species of pathogenic organisms, including the causative organisms of amoebic dysentery, shigellosis, salmonellosis, cholera, poliomyelitis and infectious hepatitis. They can also carry certain helminth eggs, such as those of hookworms and roundworms. Although the exact mechanisms of transmission and the share of transmission by flies are often not well known, it is likely that fly control has a limiting effect on the spread of some of these diseases. Most of the measures proposed in this document will therefore help to improve various aspects of health in the community.

4. Fly control

The number of flies can be reduced by improving the environmental situation or killing them directly by physical or chemical methods. Fly control through changes in environmental sanitation and hygiene is likely to be the *most effective and long-lasting* way to reduce flies. Physical and chemical methods to reduce flies which are usually less sustainable, are briefly outlined in sections 4.2 and 4.3 below.

The following types of interventions can achieve fly control:

- Reduce or eliminate breeding places to bring down fly densities;
- Avoid attracting flies to the environment where people live;
- Limit contact with persons by reducing the number of flies that enter indoor environments, such as homes and schools;
- Eliminate flies or larvae using physical or chemical methods.

In addition to the health benefits, fly control also reduces the nuisance created by the flies. When the fly density is high, individuals and the community are usually motivated to take measures, which can play a key role in the success of fly control.

When the fly density is low, the nuisance they cause is reduced, which in turn could reduce the motivation to control them. It is also more difficult to explain the relationship between flies and disease.

Both nuisance reduction and the control of diseases other than trachoma achieved by fly control and improved hygiene argue in favour of an integrated approach to fly reduction and hygiene improvement in communities. The measures described in this manual are therefore not limited to the control of trachoma alone or to the specific control of particular fly species.

Communities should participate in the selection of the most appropriate fly control method, as they will implement the control measures in the long term.

Methods need to be:

- effective;
- affordable, both financially and in terms of human resources;

- applicable with locally available materials;
- simple to apply;
- adapted to local conditions;
- respectful of local beliefs.

4.1 Environmental methods

Breeding sites can be reduced or eliminated and attractiveness to flies can be reduced by improving the disposal of human excreta, animal dung and sewage disposal, changing the way domestic animals are kept, improving food handling and ensuring that waste is properly managed. These methods are outlined in this section.

Excreta disposal

Preventing flies from breeding in excreta and sewage will reduce their numbers and help to prevent trachoma.

Drinking-water should be protected from contamination with excreta. This will reduce the risk of diseases such as diarrhoea, dysentery, cholera and typhoid. Water at home should be stored in a clean, covered container.

Disposal of human excreta

Installing proper latrines and encouraging people to use them should be priorities. There are many different excreta disposal technologies or systems, some of which are widely used, and others that are still being field-tested (some of the options are described in references 6 and 9). The most appropriate system depends on the specific needs of the users and the resources available. Technologies are described in detail in references 3 and 9 in the Annex on "Further reading" at the end of this document. All of these technologies are suitable for excreta disposal when installed and maintained properly. Some basic recommendations are summarized below.

The ventilated improved pit (or VIP) latrine is one example of a type of latrine that is suitable for fly control (Fig. 3,4).

It is important to prevent latrines from contaminating drinking-water sources. As a general indication, pit latrines should be constructed at a distance of at least 30 metres from rivers, springs or wells. The bottom of the pit should be at least 2 metres above the groundwater table in the wet season.

Hand-washing facilities should be located close to every latrine (Fig. 6).

Sewage

Open sewage in drains, cesspools and seepage pits should be avoided. Outlets of wastewater on to soil should be eliminated.

Waste disposal

Certain species of flies also breed in solid waste, and it is important to isolate the waste in order to reduce breeding opportunities. In warm climates fly larvae may leave the waste containers after only 3 - 4 days from the time the eggs are laid.

Household waste should be collected and transported to a designated pit or landfill (Fig. 8). A simple landfill, consisting of an excavated pit, can be dug outside the village boundaries, or natural features of the land can be exploited.

Recommendation for human excreta disposal

- Open defecation is not acceptable
- Keep latrines clean (clean slabs daily)
- Simple pit latrines: install a tightly fitting lid (Fig. 7)
- If possible, upgrade simple pit latrines to ventilated pit latrines
- Vent pipes should be equipped with a fly screen and checked regularly
- Pour flush latrines: install a water seal

Fig.3. VIP (ventilated improved pit latrine)



Fig.4. Components of a ventilated improved pit latrine

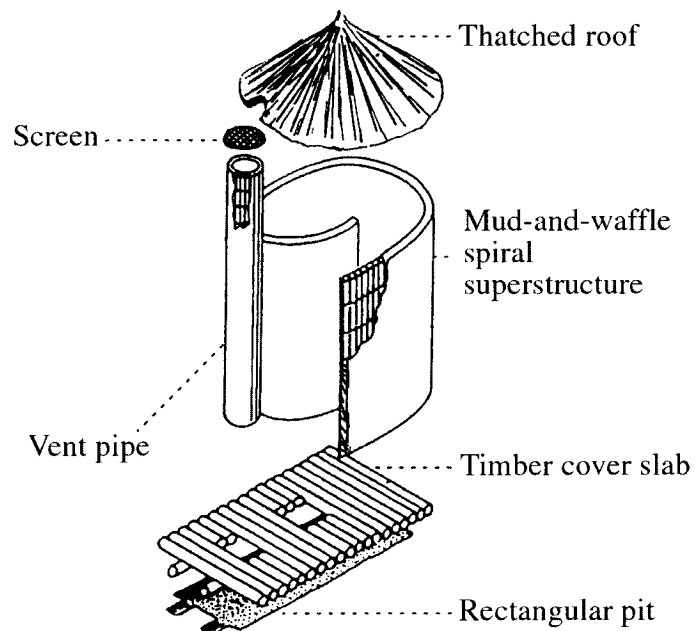


Fig. 5. VIP scheme

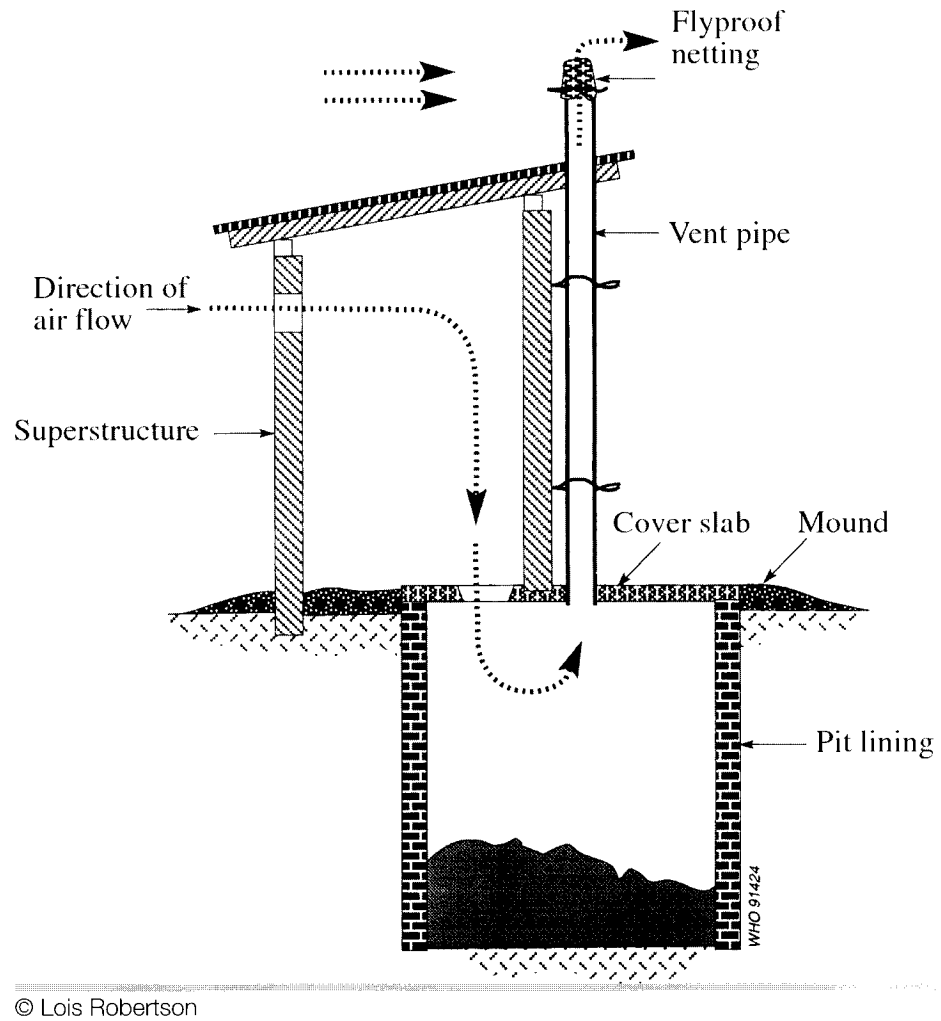


Fig. 6. Hand-washing facilities should be located close to every latrine.

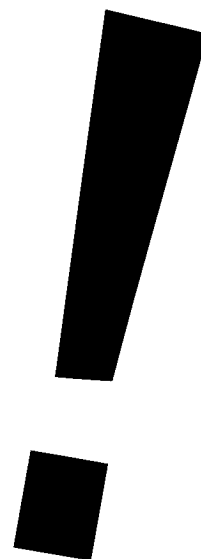
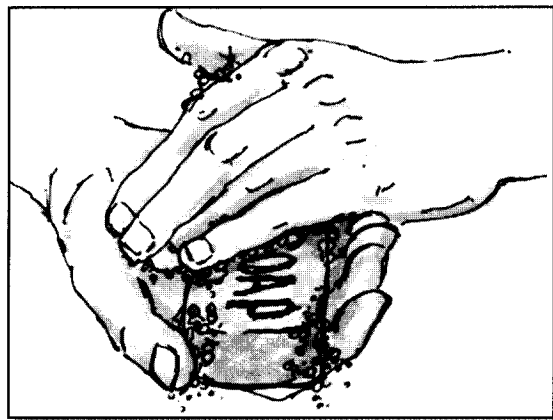
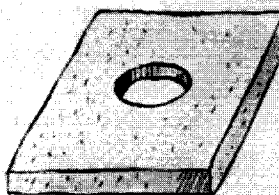
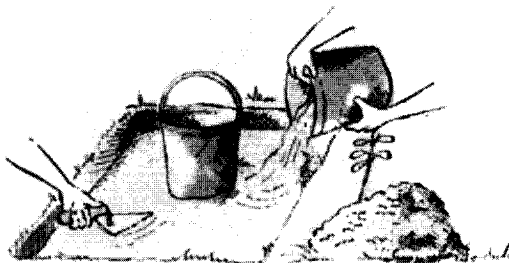
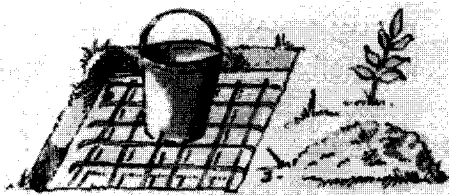
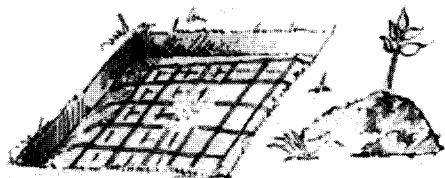
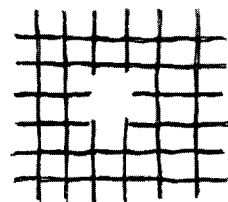
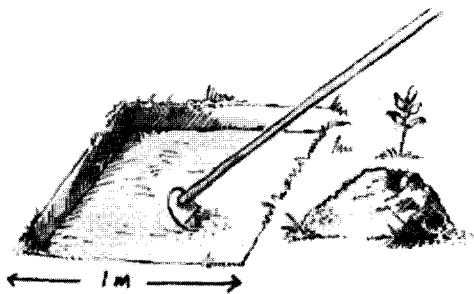
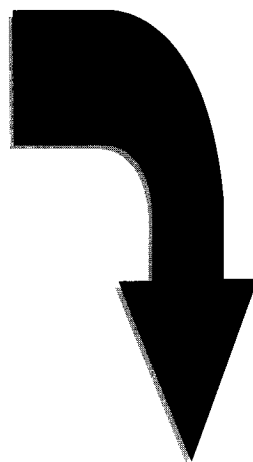


Fig. 7. Tightly fitted lid for pit latrines and construction scheme



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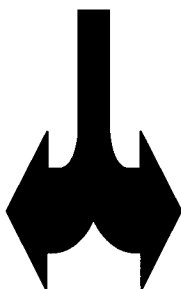
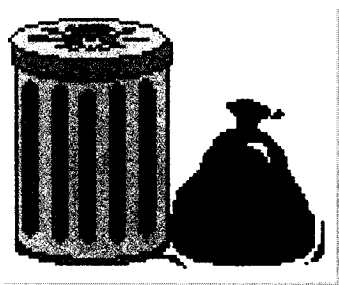


The waste should be covered with a layer of soil at least once a week (Fig. 9). Alternatively, it can be incinerated, again in a designated pit. It is important to determine the direction of prevailing winds and to locate the pit downwind from the village, so to avoid odour and smoke nuisance to the inhabitants (see Fig. 10).

Fig. 8. Adequate garbage container, covered with a lid, or carefully tied plastic bag.

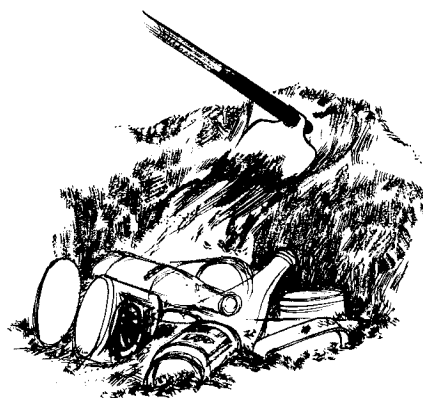


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Fig. 9. Disposal of waste in a designated pit covered with soil



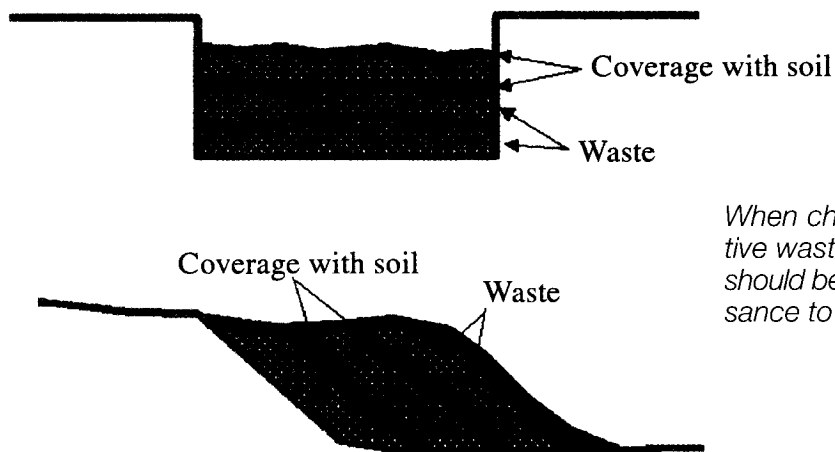
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The waste should be covered with a layer of soil. Tafergalte, Morocco, 1995.



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Fig. 10. Collective waste pits in cross-section. The first is an excavated pit, while the second makes use of a natural or built slope in the land.



When choosing a location for a collective waste pit, the main wind directions should be considered to avoid odour nuisance to inhabitants.

Recommendations for solid waste management

- Place the waste in plastic bags
- Store waste in containers with tightly fitting lids
- In warm climates, waste should be collected at least twice a week
- In temperate climates, one collection per week is sufficient
- When emptying the container, remove all residues left in the bottom
- When there is no collection, waste can be burnt in a designated pit
- Dispose of waste in a designated pit and cover with soil (15-30 cm deep) at least once a week

Food

Flies are attracted by the odours that emanate from certain foods such as fish, bone meal and sweet-smelling fruits (e.g. mangoes and dates). Storage of food attractive to flies in fly-proof containers is an important measure to limit attraction (Fig.11). A market where food waste lies around openly is very likely to attract large numbers of flies. Rotten vegetables and other decaying waste should be removed promptly (Fig.12).

Social gatherings may also play an important part in attracting flies, particularly when large quantities of food and fruit are displayed (Fig.13). It is recommended that food always be stored in fly and odour-proof containers.

Fig. 11. Food cover options



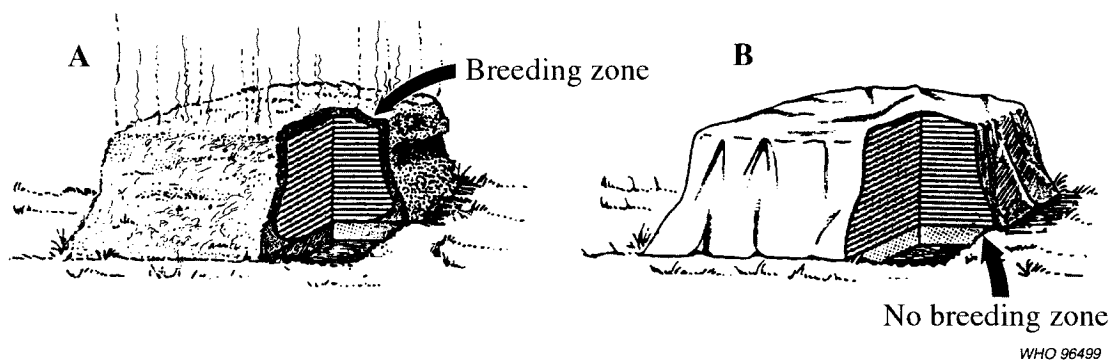
Fig.12. Markets littered by food wastes usually attract large numbers of flies



Fig. 13. Social gatherings may attract flies through displayed food



Fig. 14. Dung heaps with section removed, uncovered and covered. When the dung is not covered (A), flies breed in shallow layer under the surface; in the rest of the heap, the temperature is too high or the dung too old. The use of a light cover, e.g. a plastic sheet (B), reduces heat loss and prevents fly breeding, because even the surface layers become too hot.



Recommendation for animal excreta disposal

Animal sheds, stables, pens and feed lots:

- Construct solid, if possible concrete, floors
- Clean up dung daily and, if possible, flush floors daily

Dung heaps:

- Stack dung to reduce the surface area and zone in which the temperature is suitable for fly breeding
- Cover dung heaps with plastic sheets making the heap too hot for breeding; see Fig.14
- Preferably stack dung on a concrete platform
- In hot climates, dung may spread on the ground and be dried before the flies have time to develop

Domestic animals

Disposal of animal excreta

Accumulated animal excreta, such as dung heaps, are an important site for fly breeding. Breeding preferences depend on the moisture (not too wet), texture (not too solid) and freshness (normally within a week after deposition) of dung (Fig.14).

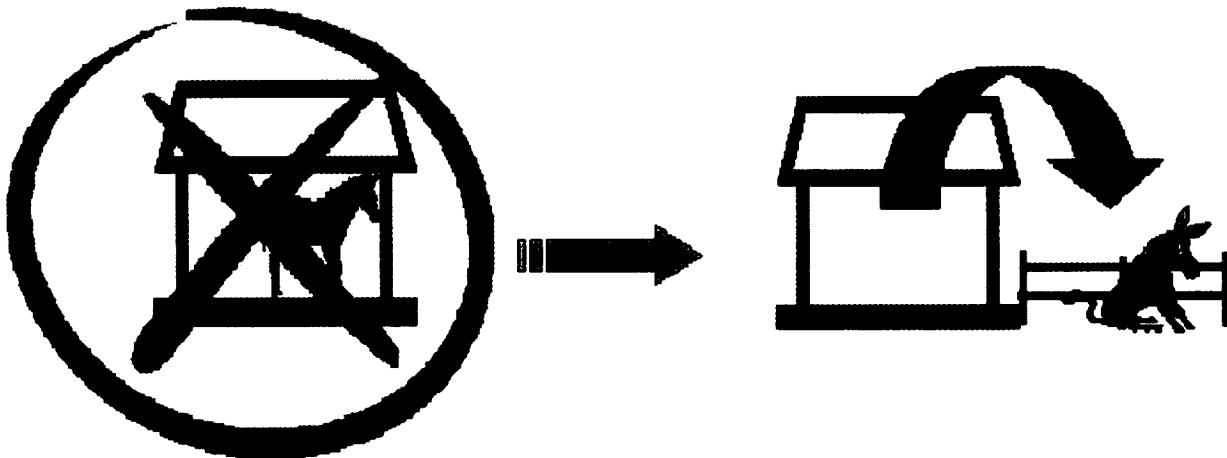
Flies do not usually breed in composted dung.

Certain measures can reduce breeding of flies in animal excreta. The main element in these measures is to isolate the excreta.

Location of animals

Keep the animals outside and away from the household living space. They will attract flies and may carry pathogens (Fig.15).

Fig. 15. Removing animals from the house will help in removing flies



Avoiding contact

To stop flies entering homes, schools or other indoor spaces used for large gatherings the use of screens and nets for doors and windows is an easy and effective measure (Fig. 16).

Doorways can be equipped with anti-fly curtains, made with strings of beads or strips of plastic (Fig.17).

Netting with a mesh of 2-3 mm can be used as window screens; the small size of the openings impedes the access of flies without reducing ventilation (Fig.18, 20). The netting can be made of plastic or metal. To increase its effectiveness it can be sprayed with insecticide (see section 4.3) (Fig.19).

4.2 Physical methods

Some physical methods of fly control are easy to use but are not very effective when fly density is high. They are suitable for small rooms and areas where food is sold or stored.

Fig. 16. Community gathering in unprotected and protected gathering places

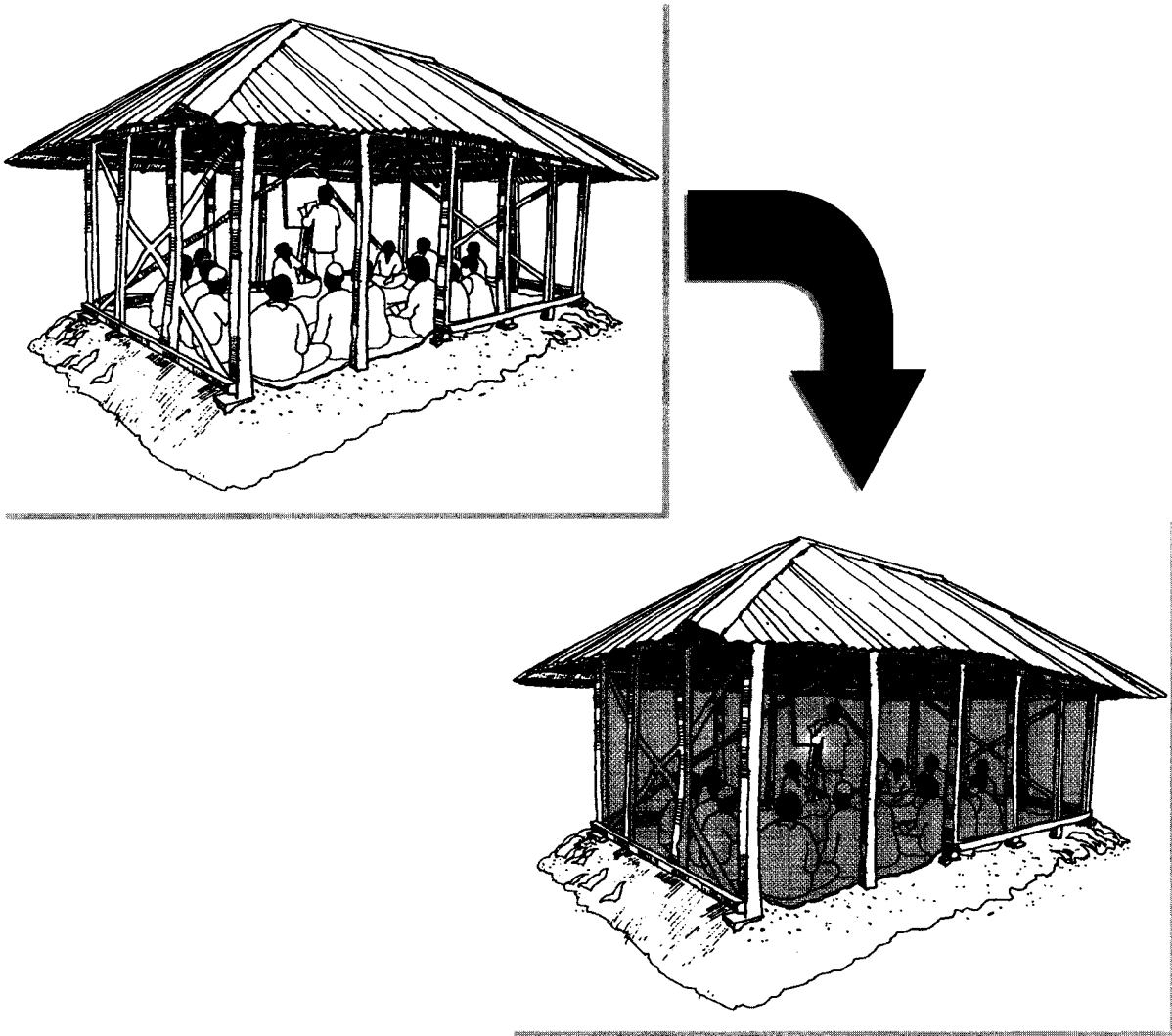


Fig. 17. Bead door screen



Fig. 18. Netting window screens

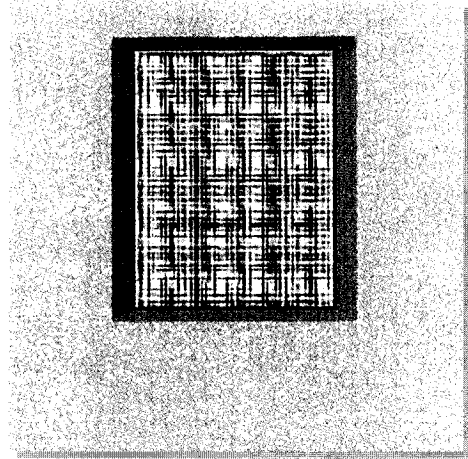


Fig. 19. Window screens sprayed with insecticide



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Fig. 20. Tafergalte, Morocco: window screens are installed on windows of a school building



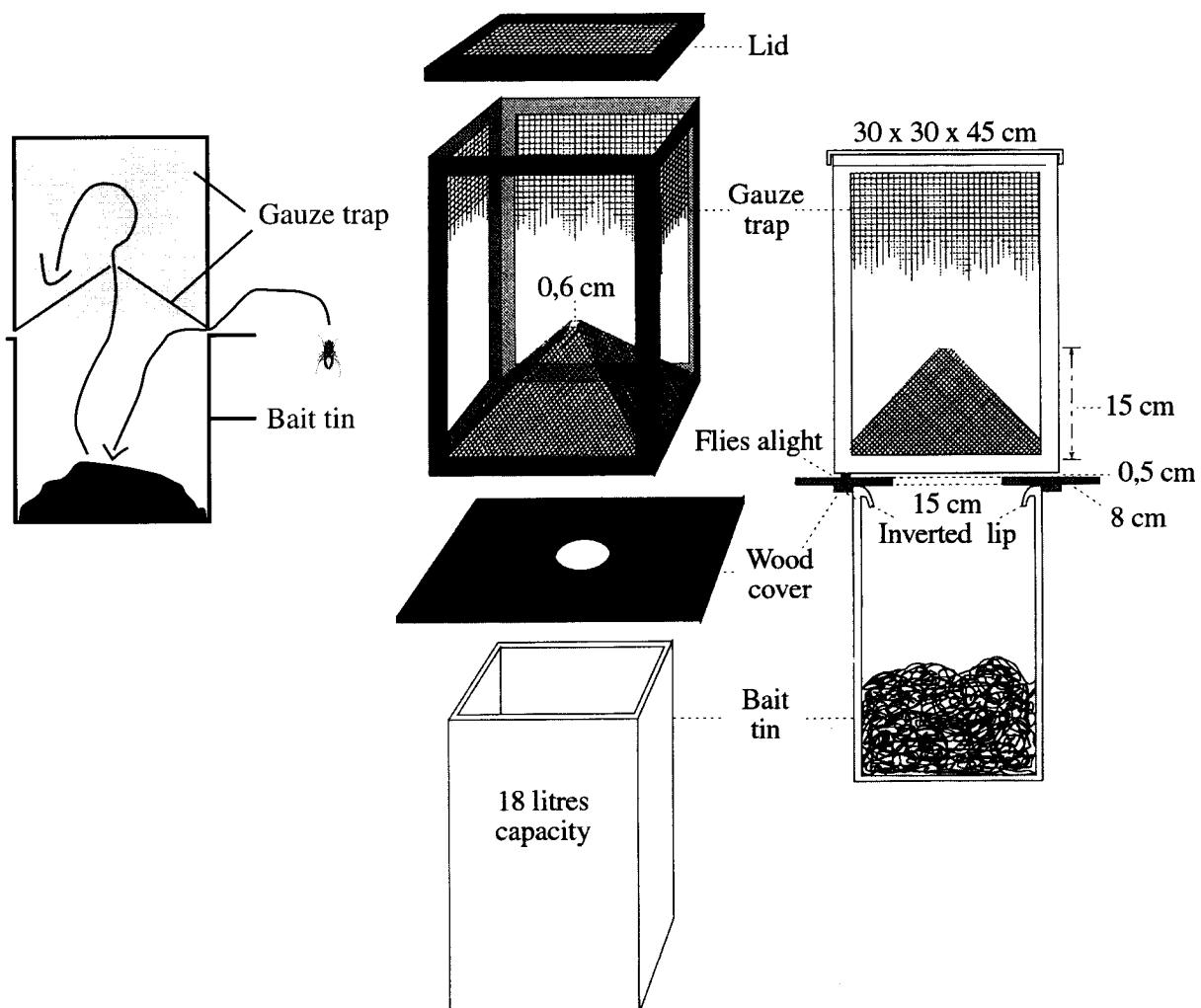
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Fly traps

Fly traps can catch large numbers of flies. Several types of traps are effective. In every country there are popular kinds of traps, made with locally available materials, using baits known to be effective (e.g. fish). The effectiveness of the traps can vary according to their position and exposure to the sun: different positions need to be tried so that the most effective can be determined and recommended to the community.

A model of trap is illustrated in Fig. 21. An attractant is placed in a darkened container. Flies have no difficulty in entering the container but when they try to leave they are caught in a sunlit trap placed on top of the opening of the container. This model is suitable for both indoors and outdoors.

Fig. 21. Fly trap



Sticky tapes

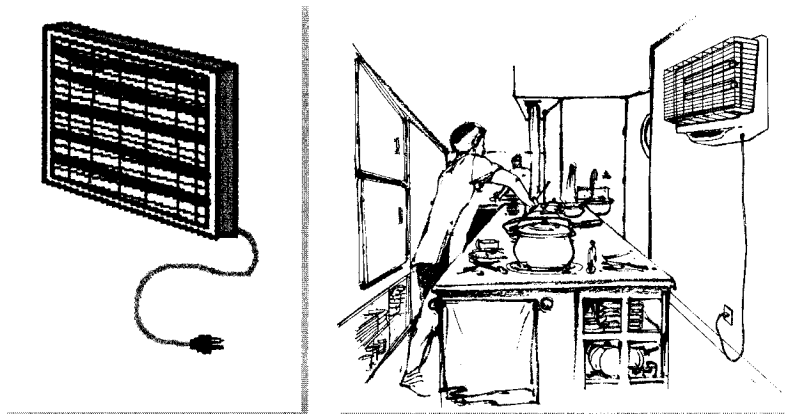
Sticky tapes are suspended from beams, the ceiling or other suitable fixtures. (Fig. 22). They attract flies because of the sugar content in the sticky material on their surfaces; the flies then become entangled. The tapes can be purchased commercially or made with natural sweet substances and locally available sticky materials (e.g. resin, glue, molasses).

Fig. 22. Hanging up sticky tapes



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Fig. 23. Electrocutor



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Light traps with electrocutors

In these traps, flies are attracted to the light and electrocuted when they touch the covering grill (Fig. 23). They are not particularly effective against the filth fly, but contribute to reducing the fly density in closed spaces. They are commonly used in hospitals, food shops and public places, though the need for electric power supply limits their use in many areas.

4.3 Chemical methods

Control with insecticides should be used only for a short period and when absolutely necessary, because flies rapidly develop resistance. This control method can be rapid, though it is not long-lasting. Widespread, routine chemical control may be justified in places where high fly density is associated with a high risk of disease transmission (for example in markets, refugee camps or hospitals). Space spraying needs to be carried out every day during the first week and once/twice a week thereafter to maintain the control.

Dichlorvos vaporizer

Insecticide vaporizers such as strips of absorbent material impregnated with dichlorvos are commercially available. They release dichlorvos slowly over a period of up to three months, but ventilation needs to be limited for them to be effective. There is a potential danger of intoxication in humans and they should not be used in rooms where children or old people sleep.

Insecticide-impregnated materials at resting sites

Flies prefer to rest at night on places such as edges, strings, wires or ceilings. The aim is to position with materials impregnated with insecticide (e.g. bednets, curtains, gauze bands, cotton cord) at resting sites and kill the flies when they land to rest during the night. These materials can be effective for several weeks in tropical and temperate climates. This method is cheap and long-lasting and is less likely to provoke development of resistance than spraying. It is suitable only for rooms without a current of air below the ceiling. Relatively safe chemical substances include organophosphorus compounds, carbamates and pyrethroids (see Annex 1).

Concentrations of active substances of 1-10% should be used.

Toxic baits

Toxic baits are usually made with sugar and water containing poisons (Examples: diazinon, dimethoate, trichlorfon, permethrin, cyfluthrin). The effectiveness of the bait depends on the attractant used and on the competition from other attractants such as food. The range of action is quite small (a few metres).

They are normally cheap and easy to use, but require frequent application (up to six times a week). They can be used in form of liquid bait dispensers, but paint-on baits are more convenient: when applied on fly resting surfaces their residual effect is long-lasting (Fig. 24). The toxic material must be placed or applied out of the reach of children and animals.

Liquid bait dispensers can be made out of an inverted jar or bottle placed over a sponge or wick; balls of absorbent material impregnated with insecticide can also be used.

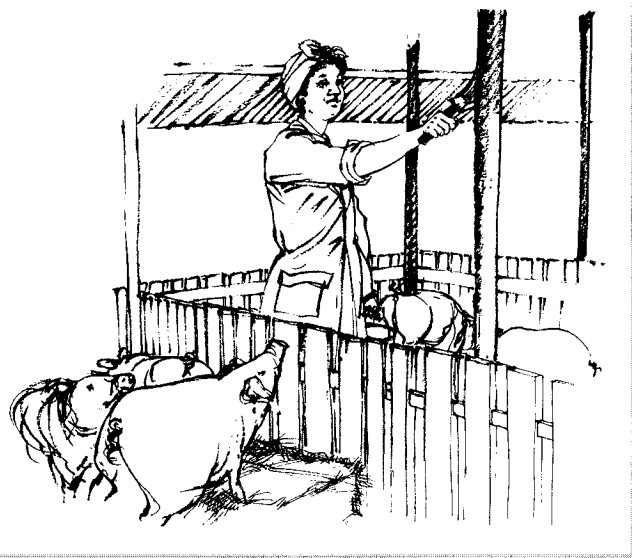
Viscous paint-on baits contain insecticide (2-6% solution) and an attractant with a binder substance (molasses and syrup could serve both as attractant and binder). Once painted on ceilings, windows or walls, the baits remain active for several weeks or months.

The main problem is the identification of the appropriate insecticide. (see Annex 1, Table 2 for more details).

Treatment of resting sites with residual insecticides

Surfaces on which flies rest can be sprayed with an insecticide (see Table 1, Annex 1). This method has both an immediate and a long-term effect. It can last up to several weeks. Only surfaces that have been observed to be used as resting sites should be sprayed. Applications should be made with hand-operated or low-pressure sprays (Fig. 25)

Fig. 24 Viscous paint-on baits



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Outdoor space spraying

Space spraying with insecticides is a rapid but short-lasting method that is expensive and potentially hazardous to health. It contributes to the development of resistance. When used indoors it can effectively reduce fly density in a very short time, but should be used with caution in sleeping or cooking areas.

Outdoor treatment should be applied when fly density is at its peak, e.g. in the morning. Daily treatments over a period of a few weeks can be used to reduce the density of flies to a level where other methods can then continue to keep it low.

Spraying can be used to treat refuse dumps without adequate soil cover, markets and areas used for food storage and display (making sure that the food is adequately protected from contact with the spray). It is also useful in emergency situations when a quick knock-down of flies is needed.

Prolonged use can cause resistance to develop quickly and be expensive, though it is possible to use ultra-low-volume spraying. Table 3 in Annex 1 provides examples of insecticides and dosages for outdoor spraying.

Fig. 25 Sprayer for space-spraying

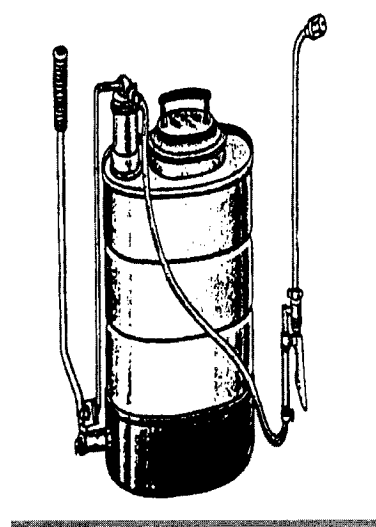
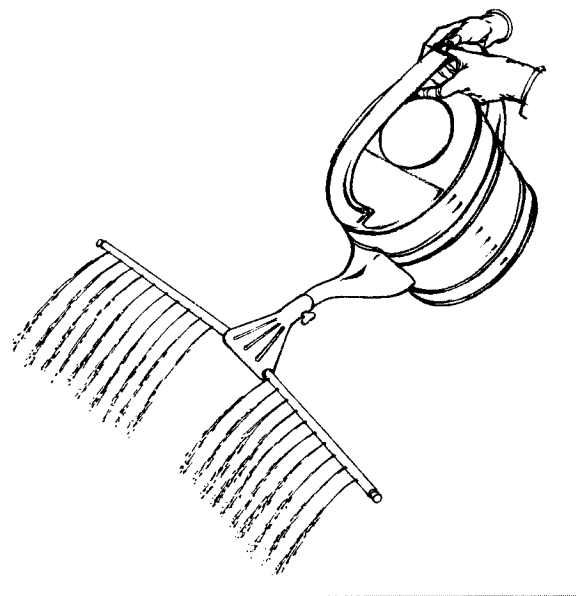


Fig. 26. Treatment of breeding sites with larvicides



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Treatment of breeding sites with larvicides

The use of larvicides on breeding sites is suited particularly to the treatment of dung on farms (Fig. 26). Its main advantage is that it tackles the problem where it arises. However there are several drawbacks: insecticide has to be applied frequently (as dung accumulates continuously), it may kill natural enemies of flies (beetles, mites, earwigs), and resistance may develop.

Effective compounds are:

Organophosphorus compounds:

- dichlorvos and diazinon (at 0.3-1.0 g of active substance per square metre), trichlorfon, dimethoate, fenchlorvos, tetrachlorvinphos, bromophos, fenitrothion and fenitron (at 1-2 g/m²).

Carbamates:

- diflubenzuron, cyromazine and triflumuron (at 0.5-1.0g/m²), and pyriproxyfen (at 0.1g/m²). This group prevents larval development for up to 3 weeks.

5. Hygiene

5.1 Hygiene practices

A number of relatively simple measures can be taken to interrupt the pathways of transmission.

Personal hygiene

Personal hygiene measures reduce not only attractiveness to flies, but also the spread of disease from an infected to a healthy person.

Several options for handwashing are outlined in Fig. 27 - 29.

Domestic hygiene

Domestic cleanliness contributes to reducing the density of different pathogens or vectors present in the house and its immediate surroundings. Similarly the safe handling of food and drinking-water are of great importance for health.

All women, men and children should use safe water sources for drinking. For washing clothes and bathing, water quality is less important. Adequate amounts of water should be available and used for personal and domestic hygiene. About 30-40 litres per person per day are needed for personal and domestic hygiene, including laundry, cooking, domestic cleanliness, and so on. This amount is considered the minimum requirement. Additional quantities do not necessarily improve health, but even with 30-40 litres the level of hygiene depends on the use that is made of the water.

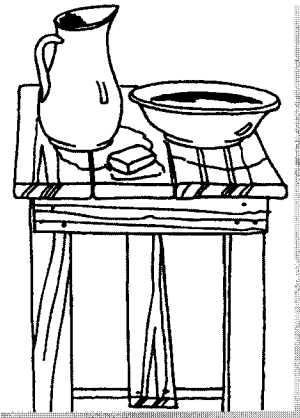


Fig. 27 Handwashing arrangements: pitcher, bowl and soap

Fig. 28.
Handwashing arrangement with a "leaky tin", consisting of an oil drum on a stone or brick stand over a drainage pit filled with gravel. Water can be taken from the drum with a dipper made from a small tin which is perforated at the bottom and hung on the side of the drum with iron wire. The drippers can be made by school children.

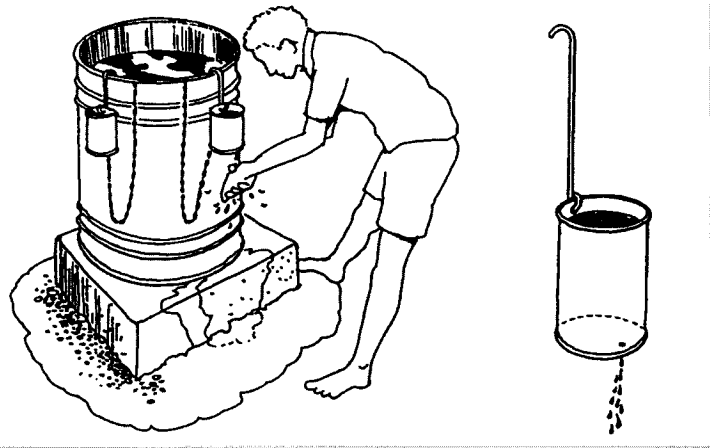
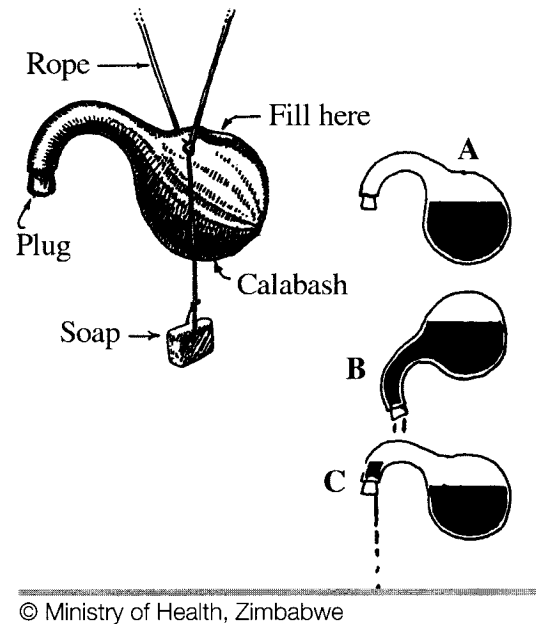


Fig. 29 In some African countries a hollowed fruit, the mukombe, is used to make a simple and water-saving handwashing device. Communities should use systems that make the best possible use of locally available resources.



Personal hygiene

Facial cleanliness

- Washing the faces of children, in particular discharges from the eyes, keeps flies away. These flies could infect the children's eyes. Faces should be kept clean throughout the day.
- Leaky or perforated tins (Fig. 28) can be used for washing where water is scarce.

Handwashing

- Always wash hands with soap before cleaning eyes and faces.
- Handwashing facilities should be available at every latrine or toilet.

Use of towels or other tissues

- Do not use the same tissue to wipe the faces of both infected and healthy children.

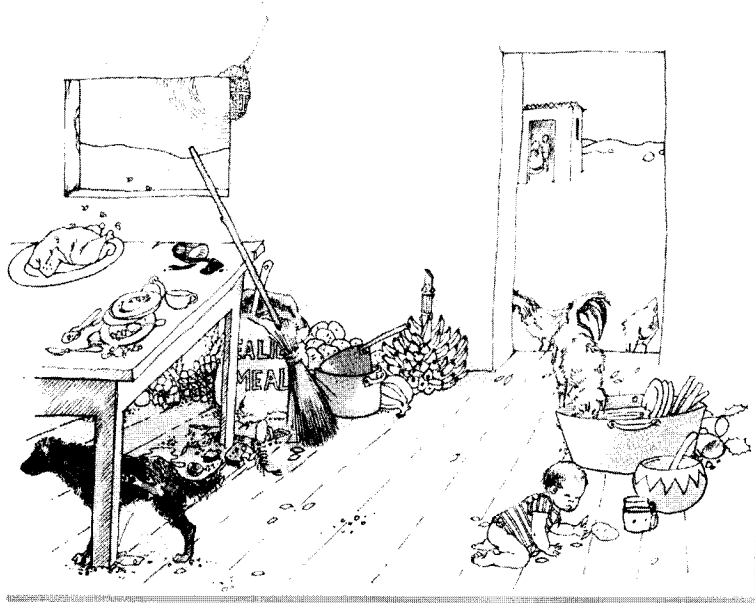
Hygiene education

Hygiene education is aimed at triggering a change in hygiene behaviour that will improve health. It means helping the community to become aware of the links between poor hygiene behaviour and disease. It will also encourage people to construct or improve their own sanitary facilities.

Hygiene education should promote informed decision-making and empowerment of communities. The communities should be directly involved in the process of improving sanitation and be enabled to formulate and implement the choices which they feel are appropriate for their situation. Active participation of the community ensures that it develops a sense of ownership of the options selected. Such processes are called "participatory approaches".

Participatory approaches have proved to be very successful and to have long-lasting effects. Several such methods have been developed. One of them is called the PHAST

Fig. 30. How many problems can you spot in this house ? Write them in the table below.



	Problems
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

General domestic hygiene

Keeping homes clean

- Clean the home frequently
- Remove rubbish from the area immediately around the home
- Keep the walls of the home clean
- Do not spit on the floor
- Destroy the breeding sites of flies (for example holes in the walls)

Drinking water in the home

- Collect drinking water in clean vessels; clean them between uses
- Do not allow contact of the water with hands
- Transport water in a covered container
- Store water in vessels which are covered
- Store drinking water in a separate container from other domestic water, wherever possible
- Take drinking water from the storage vessel with a dipper or ladle so that hands, cups or other objects cannot contaminate water
- Where required, disinfect water through chlorination, boiling or any other suitable method

(*Participatory Hygiene and Sanitation Transformation*) method. Although PHAST is targeted at preventing not only trachoma but also other water- and sanitation-related diseases, it can be easily adapted. The method is described in detail in Annex 2, Reference 2.

Through a participatory approach, the community may wish to define the most suitable hygiene education methods, which might include school hygiene education (see below), house visits by health workers or trained village volunteers (e.g. using visual aids), or entertainment (e.g. using puppet shows). Selected target groups, such as women's groups, parents and child-rearing adults, schoolteachers and health workers in the community, could be addressed directly. Institutions that are already in place (e.g. local health centres) should be involved as much as possible in the process.

School hygiene education

Schools provide unique opportunities for hygiene education. Lessons in class and practice in the adequate use of facilities bring basic knowledge and skills to pupils. Furthermore, pupils often share this experience with their families and further spread their skills.

Teachers should ensure that face washing is practised at school and that children have clean hands and faces throughout the day. Schools should be equipped with latrines which should be cleaned daily. Handwashing facilities should be available.

Any community participation process set up to improve environmental sanitation should involve teachers in the working groups. Teachers should be encouraged to devote time in class to information on health, hygiene behaviour, the environment and specific measures to prevent transmission of trachoma and improve hygiene practices.

Annex 1

Chemical methods for fly control: tabular information

Table 1.
Insecticide-impregnated materials at resting sites

Insecticide	Dosage (g/m²)	Remarks
Organophosphorous componds		
Bromophos	1-2	Low level of resistance in most places
Diazinon	0.4-1	
Dimethoate	0.25-1	
Pyrethroids		
Alphacypermethrin	0.02	Low level of resistance in most places
Cyfluthrin	0.025	
Cypermethrin	0.025-0.1	
Deltamethrin	0.01-0.15	
Fenvalerate	1	
Permethrin	0.025-0.1	

**Always keep
insecticides in safe
places, out of reach
of children!**

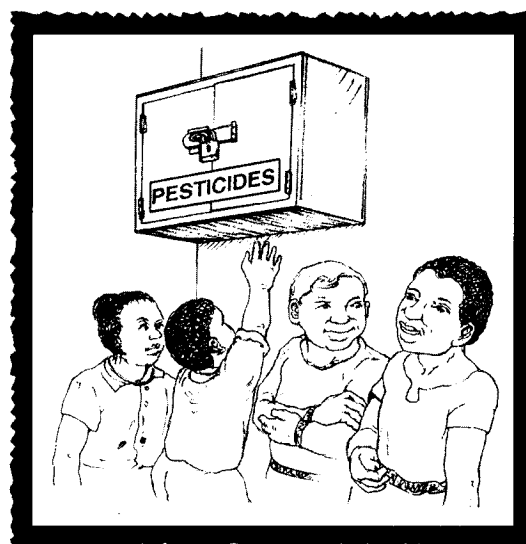


Table 2.
Toxic baits

Type	Application details	Insecticides
Dry scatter	1.0-2% of insecticide in a carrier (granular sugar, sugar plus sand, ground corncob), applied on surfaces or trays, out of the reach of children or domestic animals.	<p>Organophosphorus compounds:</p> <ul style="list-style-type: none"> • trichlorfon (dry scattered, liquid sprinkle and liquid dispenser) • diazinon (dry scattered, liquid sprinkle and paint-on) • malathion (as above) <p>Carbamates :</p> <ul style="list-style-type: none"> • propoxur (dry scattered, liquid sprinkle) • dimetilan (liquid sprinkle dispenser and paint-on) <p>Highly concentrated insecticides may be repellent to flies</p> <p>(0.1% to 10% solutions give good results for both organophosphorus compounds and carbamates)</p>
Liquid sprinkle	0.1-0.2% of insecticide plus sugar; on floors or walls, out of the reach of children and domestic animals.	
Liquid baits dispenser	0.1-0.2% of insecticide plus sugar, in dispenser (inverted jar or bottle over a sponge) or balls of absorbent material	
Paint-on	2-6% of insecticide and an attracting and binding substance (sugar)	

Table 3.
Outdoor space-spraying

Insecticide	Dosage of active ingredient	Insecticide	Dosage of active ingredient
organophosphorus compounds	(g/ha)	Pyrethroids	(g/ha)
Azamethiphos	50-200	Bioresméthrin ^b	5-10
Diazinon	340	Cyfluthrin	2
Dichlorvos	340	Deltamethrin	0,5-1
Dimethoate	220	Phenothrin ^b	5-10
Fenclorvos	450	Permethrin ^b	5-10
Jodphenphos	350	Pyrethrin ^b	20
Malation	670	Resmethrin ^b	20
Naled	220		
Pririmiphos methyl	250		

^b May be combined with other pyrethroids giving a quicker knock-down

Annex 2

Further reading

A. The following can be requested from:

World Health Organization
Prevention of Blindness and Deafness
1211 Geneva 27, Switzerland
E-mail: pbd@who.ch
<http://www.who.int/pbd>

1. *Primary Health Care Level Management of Trachoma Manual and slide set*
WHO, 1993, 42 pages (English, French)
Document WHO/PBL/93.33

This manual and set of slides have been produced to assist trainers of health workers to teach a simplified method for the assessment of trachoma. The manual is for use by the trainers to explain how to examine children and adults for signs of trachoma and how to use the simplified grading scheme. The slides demonstrate the clinical signs and grades of trachoma infection. They can be used in the classroom to help students to understand and correctly grade trachoma.

2. *Achieving Community Support For Trachoma Control. A Guide For District Health Workers.*
V.Francis and V.Turner
WHO, 1993, 40 pages (English, French)
Document WHO/PBL/93.36

The purpose of this manual is to provide district health workers with guidelines for achieving community support for trachoma control activities. It provides information on how to detect, treat, and prevent the disease. Material from it can be adapted for training and involving others in trachoma control. The activities described in the manual can be carried out by all health workers experienced in community work.

B. The following can be ordered from:

World Health Organization, Marketing and Dissemination (MDI)
1211 Geneva 27, Switzerland
Tel: +41-22-791 2651
Fax +41-22-791 4772
E-mail: publications@who.ch
<http://www.who.int/dsa>

or from

Earthprint.com
SMI Distribution Services Ltd., P.O. Box 119
Stevenage, Hertfordshire SG1 4TP, England
Telephone: +44 1438 748 111
Fax: +44 1438 748 844
E-mail: : customerservices@earthprint.demon.co.uk
<http://www.earthprint.com/>

(the undermentioned prices apply to WHO distribution only)

3. *A Guide to the Development of On-Site Sanitation*

R. Franceys, J. Pickford and R. Reed

WHO, 1992, 237 pages (English, French, Spanish)

Sw.fr. 47. (in developing countries: Sw.fr. 32.90)

This book provides detailed technical information on the design, construction, operation and maintenance of the major types of on-site sanitation facilities, from simple pit latrines to aqua privies and septic tanks, with numerous practical design examples. The planning and development processes, and financial and institutional factors, are described in detail. Particular emphasis is given to the need to involve the community at all stages, from planning to evaluation.

4. *PHAST Step-by-Step Guide:*

A Participatory Approach For The Control Of Diarrhoeal Disease

S. Wood, R. Sawyer and M. Simpson-Hebert

1998, 126 pages (English, French in preparation)

Document WHO/EOS/98.3

Sw.fr 16. (in developing countries Sw.fr. 11.20)

This guide helps community workers to use a methodology for community hygiene behaviour change and to improve water and sanitation facilities, particularly for the prevention of diarrhoeal disease. The name of this methodology is PHAST (Participatory Hygiene and Sanitation Transformation). The participatory techniques used in the PHAST initiative have proved to be very successful and rewarding for communities and for facilitators.

5. *Food, Water and Family Health : A Manual for Community Educators*

1994, 100 pages (English, French)
Document WHO/EOS/96.24 WHO/UNDP
Sw.fr.16.(in developing countries Sw.fr. 11.20)

This manual is designed for educators, teachers, health workers, and other people involved in promoting healthy practices. Family members sharing knowledge with relatives, neighbours and friends are also among the most valuable educators. The manual provides practical advice on the issues of food, water, sanitation, selected health problems, family health issues and nutrition. It employs simple dialogue, messages, and illustrations. The arrangement of text and choice of language are aimed at making the manual accessible to people with a broad range of backgrounds and levels of literacy.

6. *Primary School Physical Environment and Health:*

WHO Global School Health Initiative
U.Winblad and E.Dudley
1997, 84 pages (English, French)
Document WHO/EOS/97.15
Sw.fr. 12. (in developing countries Sw.fr. 8.40)

This document provides suggestions for achieving a healthier school environment. It explains how the physical environment of primary schools can impact on the health of children and assists in identifying objectives for improvement. It describes a number of options that have been implemented in various school environments. More children than ever before are attending school, and schools could therefore do more than any other single institution to improve the well-being and competence of children and youth.

7. *Food, Environment and Health:*

A Guide For Primary School Teachers
T.Williams, A.Moon and M.Williams
WHO, 1990, 129 pages (English)
Sw.fr. 26. (in developing countries Sw.fr. 18.20)

This book is designed as a guide for teachers in primary schools – a foundation on which they can build teaching programmes that relate to the particular circumstances of their pupils. It deals with practical aspects of storing and handling food safely, making water fit to drink, disposing of wastes, and maintaining a healthy environment.

8. *Vector Control:*

Methods For Use By Individuals And Communities
Prepared by J.A.Rozendaal
WHO, 1997, 412 pages (English, French, Russian, Vietnamese; Portuguese and Korean editions in preparation)
Sw.fr. 132. (in developing countries Sw.fr. 40).

This is a comprehensive, illustrated guide to vector control methods suitable for use by individuals and communities. The manual aims to help non-professionals understand the role of vectors in specific diseases and then select and use control measures that are appropriate, effective, affordable and safe. Hundreds of simple, inexpensive and often ingenious techniques are presented and described.

C. The following can be ordered from:

Sida/Svensk Specialdistribution
Finspangsgatan 51
S-163 53 Spanga, Sweden
Fax: +46 8 760 58 95
E-mail: order@special.lagerhus.se

9. *Ecological Sanitation*

Swedish International Development Cooperation Agency (Sida),
1998, 92 pages (English)
Free of charge

This book discusses what is currently known about ecological sanitation options, as opposed to the “classical” water-borne sewage systems, and their strength and weaknesses. It gives advice on how to make such systems work with regard to the selection, design and management of equipment and on the promotion and support aspects so necessary to their success.



Fly control and prevention of Trachoma

Reduce fly density

Flies breed in scattered human faeces

- ☞ build latrines
- ☞ maintain them
- ☞ educate people to use them



Reduce contact of flies with trachoma germs

Flies pick-up the germs from infected people

- ☞ treat active cases (antibiotic eye ointment)
- ☞ educate ill people to seek care
- ☞ wash or clean faces several times a day



Reduce contact between people and flies

Flies transmit trachoma germs to healthy people landing on eyes

Common places

- ☞ meshes at windows
- ☞ fly traps

Houses

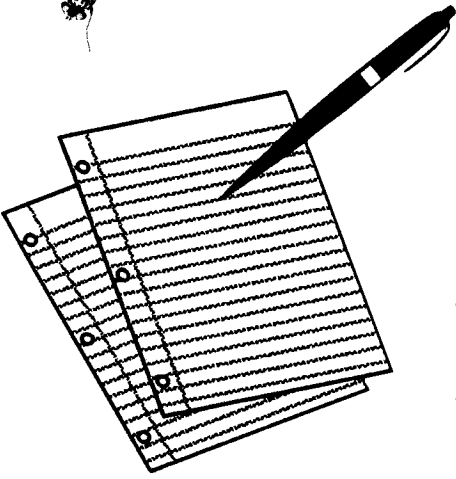
- ☞ meshes at windows
- ☞ door screens
- ☞ fly traps

Open spaces

- ☞ remove market wastes
- ☞ put food in fly-proof containers
- ☞ spraying if fly density is very high



Notes



A series of horizontal dotted lines for writing notes, starting below the word 'Notes' and extending down the page.

