Memorandum on the bed-bug and how to deal with it / Ministry of Health.

Memo. 180 Med.

MEMORANDUM ON THE BED-BUG AND HOW TO DEAL WITH IT

I.—INTRODUCTION.

Bed-bugs are well known as a common insect pest in this country. They differ from most other parasites of man in that they are not often carried by human beings, but normally live and breed in cracks and crevices in buildings and furniture, and feed mainly at night. Methods of control should comprise eradication of these insects from their hiding-places and prevention of reinfestation. It is essential that those engaged in this work should be able to recognise Bed-bugs in all their different stages and possess a knowledge of their life history and habits, and that they should secure the intelligent and active co-operation of the tenants, without which it is difficult, if not impossible, to deal with the problem successfully.

The following notes, and the accompanying drawings in natural colours, have been prepared with a view to assisting sanitary officers and others to deal with Bed-bugs. For fuller information on the subject reference should be made to the Report (Public Health and Medical Subjects, No. 72)

II.—THE COMMON BED-BUG (*Cimex lectularius*, Linn.).

Adults.

Appearance.—The adult Bed-bug is a flat, oval, wingless creature with a segmented body and three pair of legs. The beak or rostrum containing the organs for piercing the skin and sucking the blood is carried on the under surface of the head. The colour of the two sexes is the same—dark chestnut or mahogany brown. After feeding the abdomen becomes extended and domed, darker in colour, and the segments are more clearly distinguishable. The eyes are black. The breathing system consists of a number of air tubes leading directly to different parts of the body from a series of apertures, or spiracles, along the sides.

Habits.—Both the adult and young Bed-bugs emit from their "stink glands" a peculiar musty smell, by which their presence can often be detected. They are generally nocturnal in habit, feeding mostly at night and hiding in the daytime, but occasionally they may be seen at any time of the day or night in warm rooms in infested dwellings. They are more active in hot weather. Under natural conditions they feed only upon blood, and at the normal temperature in this country they seldom feed more than once a

week. They are capable of existing for six months or more without food, and after such fasts they are almost as thin as a piece of paper and much more transparent than when fed regularly. They can travel considerable distances in search of food, possibly from one house to the next.

Life.—The life of the adult Bed-bug varies from a few weeks up to four years or more, according to the food supply available, temperature, humidity, etc. Even without contact with human beings Bed-bugs may live for their maximum period, feeding presumably on the blood of rats, mice, or sparrows.

Eggs.

Appearance.—The eggs are small yellowish-white objects, about 1/20th of an inch long, and about 1/60th of an inch broad. They taper somewhat towards the top and may be slightly curved. At the apex is a collar, and a lid which the young insect pushes up in the process of hatching. A form of quick-drying cement is exuded by the female at the time of laying and by this means the eggs are attached to the surface on which they are laid.

Before hatching, the red eye of the enclosed insect can be seen distinctly, with the aid of a hand lens. When the egg has hatched the shell is white and iridescent and the lid usually has disappeared.

Eggs are laid singly or in batches, in the crevices of bedsteads, on mattresses, behind wallpaper, skirtings, and architraves, and in similar situations.

Under normal conditions, a female Bed-bug will lay two or three eggs a day and during her life-time may lay from 100 to 200 eggs, which may be laid at irregular intervals.

Life.—The eggs ordinarily hatch in from one to three weeks, but it is possible that this period may be considerably prolonged.

Young Bed-bugs (Nymphs).

Appearance.—When the egg hatches, a pale straw-coloured semi-transparent insect emerges which, though much smaller, resembles the adult. The young Bed-bug is distinguishable from the adult by its paler colour and by the fact that the antennae are stouter, the eyes are red, and the body is less flat. After each moult it becomes larger and darker in colour.

Life.—If food is available the young Bed-bug may feed at once, though it can exist for two or three months without food. Five moults take place before the insect is mature, and feeding is necessary between each of them. The cast skins are commonly found clustered together in the hiding-places. The time elapsing from egg to adult may under most favourable conditions be as short as six weeks, but the probable average period in this country is about ten weeks; scarcity of food and other unfavourable circumstances may prolong the period to a year or even longer.

Note.—Various factors, such as climate, food supply and habitat, may cause the period of development of any stage in the life history (egg, nymph or adult) to vary enormously.

III.—INDICATIONS OF THE PRESENCE OF BED-BUGS.

The presence of Bed-bugs may often be detected by the smell which is invariably present when a room is heavily infested. It is a musty, sour, unpleasant smell which is easily recognised.

Their presence may also be detected by the deposits of black excreta, which are in the form of individual small dark spots, and, if very numerous, often coalesce into larger black areas. Bed-bugs rarely deposit excreta on the surface on which they have been feeding, but wait until they return to, or near to, their normal hiding place. Excreta should be looked for on the walls, especially around nail holes, at the edges of cracks in the plaster and woodwork, and where the wallpaper is creased or loose.

IV.—WHERE TO LOOK FOR BED-BUGS.

When inspecting a dwelling for the presence of Bed-bugs attention must be paid both to the building itself and to the furniture. Generally Bed-bugs are to be found in hiding-places near to the surface.

In buildings the chief sites of infestation are usually in or on the walls, the ceilings and floors being seldom as heavily infested. Bed-bugs should be looked for :—

Behind wallpaper which has become detached, especially along the overlaps by the architraves of the doors, the mouldings of the windows, etc.

In any deep crack or groove in the woodwork itself and in the crevices of wooden partitions.

Behind architraves of doors, window mouldings, picture rails, wood blocks of lighting fittings, and skirting boards.

In cracks in plasterwork, in nail holes, or in the space behind partially flaked-off plaster, and in cracks in the mouldings of the ceiling.

Behind wooden battens used in connection with many types of sectional ceilings.

In cracks in uncovered wooden beams.

In the crevices between the floor boards, more especially where they cross the joists.

Behind overmantels or other permanent fittings.

In furniture special attention should be paid to the seams and leather " buttons " of stuffed mattresses, to the ends of wire mattresses, and to the joints and hollow ornamental brasswork in bedsteads. In upholstered furniture Bed-bugs will most frequently

be found where the upholstery is fastened to the framework, though there may be deeper penetration. Other common hiding-places are :—

Backs of pictures, especially under the paper.

The underside of seats of chairs.

Crevices and cracks in chests-of-drawers, wardrobes and the like.

Folds at the tops of curtains.

Trunks and boxes which lie undisturbed for some time.

V.—SOURCES OF INFESTATION.

The main sources of infestation and channels of distribution are :—

(1) Removal of infested furniture, bedding, etc. from house to house.

(2) Secondhand furniture, bedding, etc.

(3) Migration of Bed-bugs from room to room or from house to house.

(4) Firewood from infested premises.

VI.—PREVENTION OF INFESTATION AND METHODS OF EXTERMINATION.

In order to deal successfully with the Bed-bug problem it is essential that there should be close co-operation between the various departments and officers of the Local Authority, and that habits of cleanliness should be inculcated in tenants, without whose interest and active participation little can be done.

The appropriate method of extermination will depend mainly on the degree of infestation and whether the premises are in occupation or not.

General cleanliness.

Excellent results have been obtained by an organised system of cleaning and scrubbing carried out systematically with the active co-operation of the tenant.

If, on inspection, Bed-bugs are found to be present a thorough " spring-cleaning " should be instituted. It is here that a sound knowledge of the habits of Bed-bugs is necessary. There are no agents more effective in destroying Bed-bugs than soap and water to which a little soda has been added. Some disinfectant such as cyllin may be used with advantage, but not in place of soap and water. Fabrics and upholstery should be well brushed and beaten to dislodge Bed-bugs and their eggs.

The process should be carried out as far as possible by the tenants themselves. It must be explained and supervised and the

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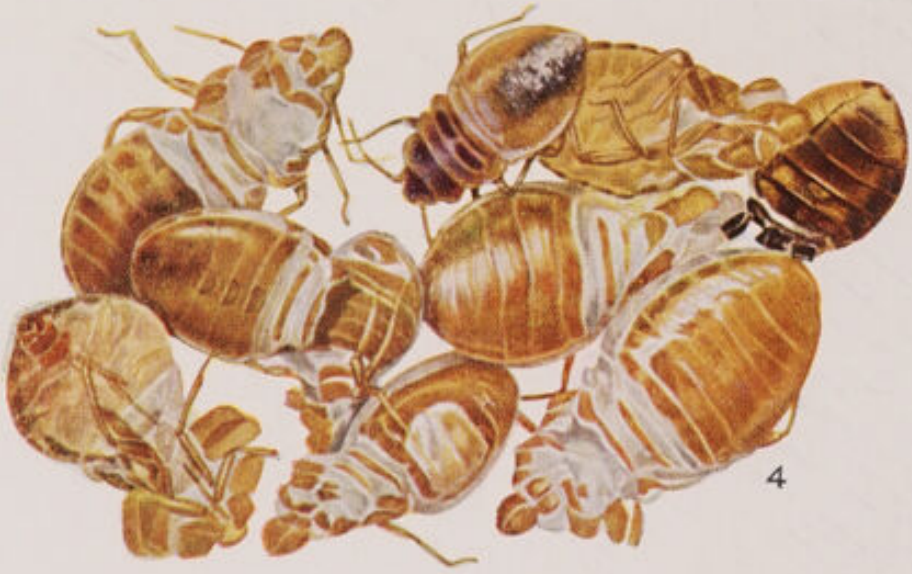

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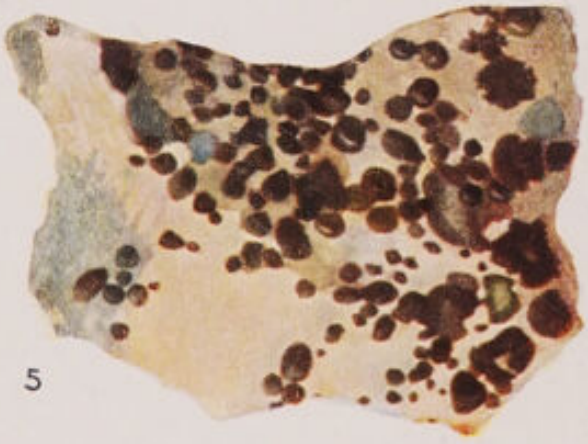

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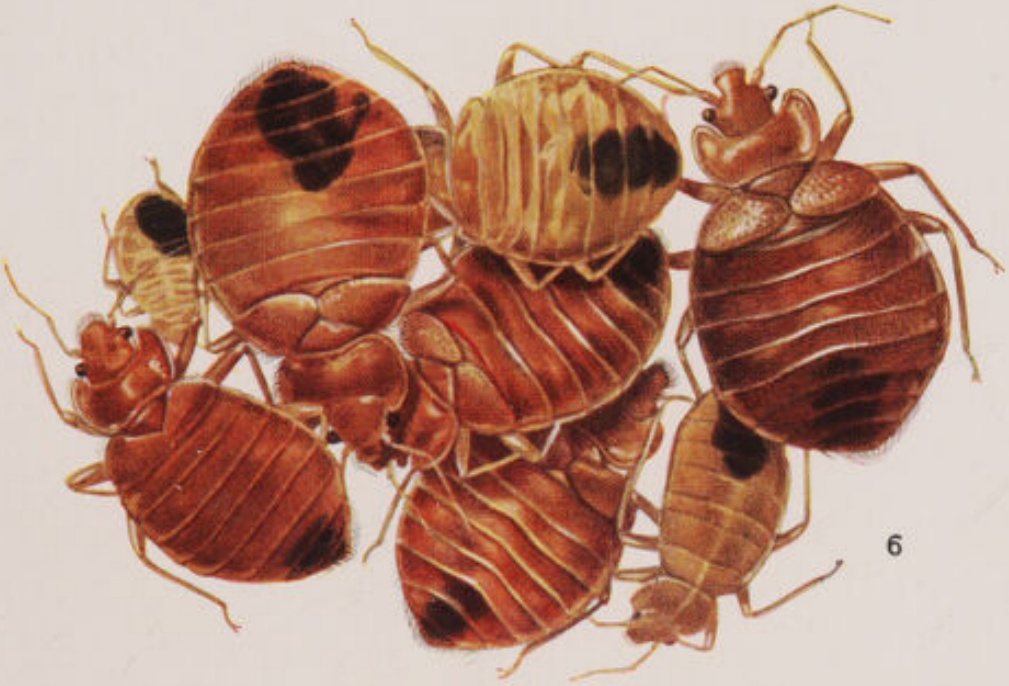
1. Fertile eggs (x 8).
2. Empty egg-shells (x 8). 2a. Natural size.
3. Young Bed-bug (first stage) (x 8).
4. Cast skins (different stages) (x 8).
5. Excrement on wallpaper (x 12).



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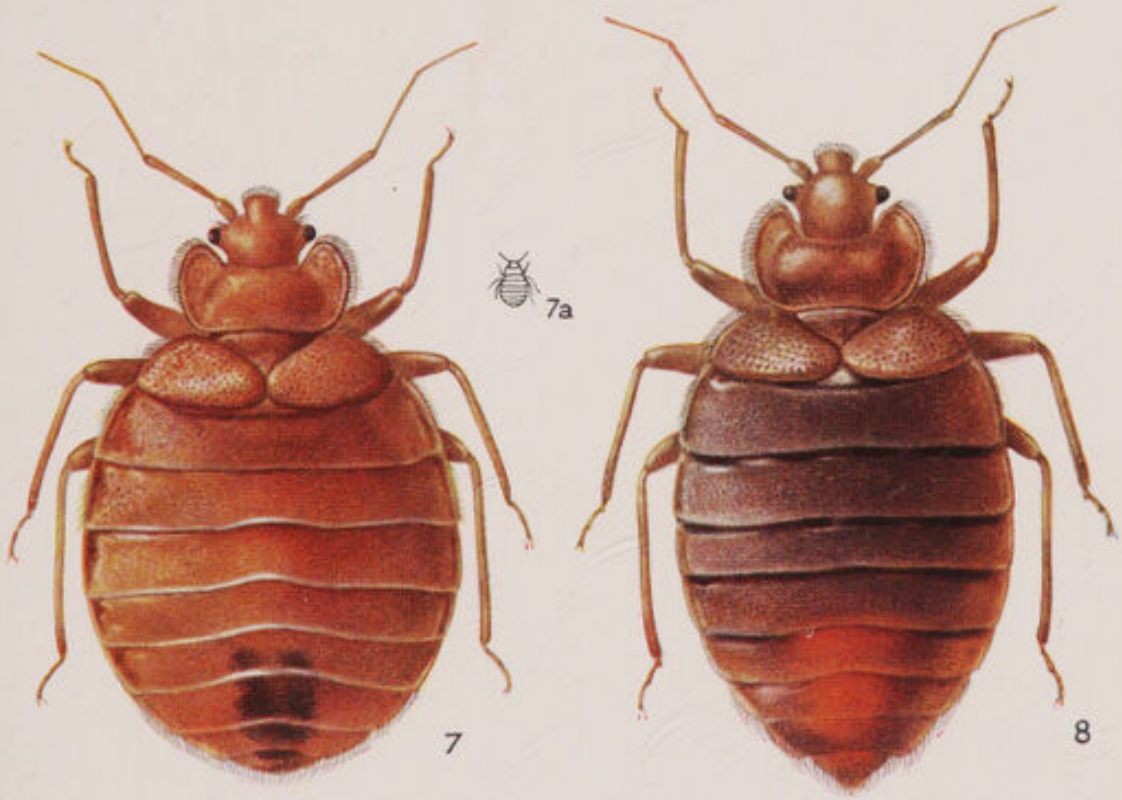

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6. A group of Bed-bugs in various stages (x 8).
7. Adult Bed-bug—unfed (x 12). 7a. Natural size.
8. Adult Bed-bug—after feeding (x 12).

results inspected in order to avoid half measures. It may be necessary to arrange for the destruction of valueless and useless articles of furniture, pictures, etc., which provide shelter for Bed-bugs, and tenants should be encouraged to discard such articles. Bedding should be treated in steam disinfectors. Heavily upholstered furniture, if badly infested, may have to be dealt with by fumigation.

As already indicated, furniture is not the only form of harbourage favoured by Bed-bugs. If there are indications that they are behind picture rails, architraves, skirting boards, window mouldings, etc., these should be detached and thoroughly cleaned.

Cracked and defective plasterwork must be dealt with and wallpaper, where loose or detached, repaired.

Bed-bugs are very sensitive to heat. In many cases it may be possible to destroy them in chinks and crevices by means of a steam jet or blow-lamp.

After the " spring-cleaning " is completed, efforts must not be relaxed. Tenants should be visited regularly and encouraged to deal promptly with any Bed-bugs which may be found. They should be specially warned against the danger of Bed-bugs being introduced in secondhand furniture.

It is obvious that this system demands knowledge, personality, tact and perseverance on the part of sanitary officers and others. With these factors it has been proved to be successful; without them it cannot be effective.

Contact insecticides.

Contact insecticides applied in the form of sprays may be used to supplement the organised scheme of cleaning outlined above where the premises are heavily infested, but it must be recognised that general cleanliness is essential and that there is no effective substitute for it. The following are the formulae of two preparations which have been found useful :—

(i)	Paraffin oil	50 gallons.
	Ortho-dichlor-benzene	2 gallons.
	Methyl salicylate	1 gallon.
(ii)	Paraffin oil (B.Pt. 170° C. to 240° C.) ...	1,000 parts.
	Oil of mirbane (Nitro-benzene)	2 ,,
	Cresol	2 ,,
	Pyrethrum flowers (ground)	10 ,,

The pyrethrum is soaked in the liquid for 24 hours, and the mixture then filtered clear.

Experiments carried out with undiluted ortho-dichlor-benzene applied in the form of spray have given promising results, but adequate precautions must be taken against the fumes.

Fumigation.

An important use of fumigation is the treatment of furniture in transit, preferably in the removal vans themselves. As far as is known at present, hydrogen cyanide (prussic acid gas) is the most effective gas for this purpose. It can be generated from (i) liquid hydrogen cyanide stored under pressure in metal cylinders, or stout glass bottles, (ii) liquid hydrogen cyanide absorbed in a porous medium (" Zyklon B "), (iii) calcium cyanide powder (" Cyanogas ") (iv) sodium cyanide and sulphuric acid. This gas at a concentration of 2 per cent. by volume with an exposure of three hours will usually penetrate into all ordinary types of hiding-place and kill Bed-bugs and their eggs. This concentration is given by 25 ozs. of liquid hydrogen cyanide or about 50 ozs. of sodium cyanide per 1,000 cubic feet.

Hydrogen cyanide is highly poisonous to human beings and domestic animals. Fumigation with this gas should be undertaken only by trained and responsible persons who have full knowledge of the nature of the gas and of the precautions which must be observed.

Special care must be taken to ensure that bedding, upholstered furniture and fabrics are completely free from all traces of gas before they are brought into use again. Ventilation of bedding is difficult and it may be necessary to keep it separate from the rest of the furniture and treat it in a steam disinfector for destruction of Bed-bugs.

Fumigation of houses with hydrogen cyanide calls for even greater care and experience, and only experts should undertake this work. In cases where it can be safely carried out, it is probably the most rapid, efficient and economical method of eradicating Bed-bugs.

Fumigation with sulphur, at the rate of 5 to 6 lb. of sulphur to 1,000 cubic feet, is sometimes effective but cannot be trusted to kill Bed-bugs in deep harbourages, or their eggs. The gas should be generated at as many points as practicable. Sulphur fumigation should be repeated after an interval of three weeks in order to kill Bed-bugs which have been hatched in the interval.

Formaldehyde and ethylene oxide have been used with some degree of success, but the comparative toxicity to Bed-bugs of these and other fumigants has yet to be determined.

VII.—REMOVAL OF TENANTS TO NEW PREMISES.

Shortly before a move takes place, the house should be visited and **thoroughly inspected. A cursory inspection is useless.** If Bed-bugs are found to be present, the tenants should be instructed in the methods to be adopted and should be encouraged to undertake the systematic cleaning of all furniture and effects in the ways already indicated.

Infested furniture removed from house to house is the most important channel of dissemination. If the tenants can be started in the new house free from Bed-bug infestation, a great deal will have been accomplished in the elimination of these pests.

It should be borne in mind that fumigation, though it may destroy Bed-bugs, does not prevent re-infestation, and after the removal is completed efforts should not be relaxed. **The inculcation of habits of cleanliness is the primary object.**

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