

METHODS OF PREPARATION AND DIRECTIONS for USE of the MATERIALS RECOMMENDED AT THE FIFTH CONFERENCE of the OFFICE of SCIENTIFIC RESEARCH and DEVELOPMENT on INSECT REPELLENTS and INSECTICIDES HELD on 28 SEPTEMBER 1943.

I. THAT A REPELLENT BE ISSUED TO THE UNITED STATES ARMED FORCES COMPOSED OF 6 VOLUMES DIMETHYL PHTHALATE, 2 VOLUMES 2-ETHYL HEXANEDIOL-1,3, AND 2 VOLUMES INDALONE. IF IT IS DESIRABLE TO ELIMINATE INDALONE, A MIXTURE OF 8 VOLUMES DIMETHYL PHTHALATE AND 2 VOLUMES 2-ETHYL HEXANEDIOL-1,3 MAY BE SUBSTITUTED FOR THE ABOVE FORMULA.

Method of Preparation: Ingredients are simply mixed mechanically.

Directions for use: Military personnel frequently moves so rapidly into territory infested with high populations of biting insects that it is impossible to control them by treatment of their breeding place. Likewise, in permanent situations effective control may not be practical. Under such conditions insect repellents issued to the Armed Forces can be used by troops to prevent or reduce annoyance and diseases caused by mosquitoes and other biting insects.

The repellent materials now issued to members of the Armed Forces vary in effectiveness depending upon the species of insect involved and the thoroughness of application. There is also considerable variation in protection time with different individuals. It was found that a mixture of the repellents was effective for a greater variety of insects than any one of the three used by the Armed Forces. For this reason a 6-2-2 mixture, which was found to be the most effective combination, was recommended to replace the present issue of repellents. A somewhat less effective mixture containing 8 parts of dimethyl phthalate and 2 parts formula 612 without Indalone was also recommended. The repellents must be uniformly distributed over the area to be protected as the insects will seek out and bite areas not treated or where applications are too thin, or where the material has been rubbed off. Care should be taken not to apply the materials too liberally around the eyes or on the forehead as the chemical causes a temporary stinging sensation if it gets into the eyes. The following directions for use against mosquitoes, biting flies and fleas are suggested:

"Shake about one-fourth teaspoonful into one hand, rub hands together and apply in a thin layer to all areas of exposed skin or to skin where insects are biting."

Although clothing treatment is the most effective method of treatment for chiggers (mites), fair protection may be obtained by skin treatment if the men are not lying down or crawling in infested areas. Under such conditions the following directions are suggested:

"For partial protection for periods of less than 24 hours, apply one-fourth teaspoonful to each arm or leg."

II. THAT REPELLENT LIQUIDS BE MADE AVAILABLE IN BULK TO THE U. S. ARMED FORCES FOR CLOTHING TREATMENT TO PROTECT AGAINST SUCH BITING INSECTS AS MOSQUITOES, BITING FLIES, MITES, AND TICKS.

Method of Preparation: Repellent to be shipped in bulk.

Directions for Use: The repellent materials now used are effective for several days when applied to clothing, whereas on skin they may repel insects for only a few hours. Very light applications of the repellents to the clothing where bites occur will give satisfactory protection. Either the 6-2-2 mixture or dimethyl phthalate may be used for clothing treatment. From a supply and cost point of view the dimethyl phthalate is superior. The following methods of application of repellents to clothing are suggested:

Hand application to clothing: Under field conditions where no equipment is available, good protection may be obtained by hand applications against chiggers, and against mosquitoes and flies biting through clothing. For chigger protection follow these directions:

"Draw mouth of bottle along cloth, applying a thin layer one-half inch wide along inside of all openings of uniform, including neck, fly and cuffs of shirt; waist, fly and cuffs of trousers, socks above shoes; and all edges of leggings. Clothing may be treated several days before it is worn and one application is effective until the uniform is normally changed for laundering."

For mosquito and biting fly protection follow these directions (use the same amount as with skin treatment):

"Apply lightly by rubbing hands on socks, shirts, or pants where bites occur. Clothing so treated may be effective for one or more days depending upon the species of insects involved and the amount of material applied."

Sprayer application to clothing: Probably the most satisfactory method of applying repellent materials to clothing is by means of a sprayer. Ordinary hand fly sprayers are satisfactory, but for large groups of men knapsack sprayers and paint spray guns are most desirable. In general, a sprayer that delivers a rather "wet" or large droplet type of spray is better for this purpose than the "fog" or small droplet type. An application of about 2 to 4 fluid ounces to fatigue coveralls or shirt and trousers is a desirable dosage. If more than this is applied the clothing may be slightly "oily" and have a tendency to pick up dirt. Two methods of sprayer applications are suggested:

First: If the sprayer is of the "wet" spray type, the men can be sprayed with their clothing on, taking care to protect the eyes and not to breathe the spray material.

Second: If the sprayer is of the "fog" type, there is considerable loss of material if sprayed on the clothing while on the men, but this loss can be largely avoided by spraying clothes while they are not being worn. This is rather rapidly done by spraying into garments that have been turned inside out and buttoned. One man can hold shut the openings of the sleeves and neck of the shirt and the bottom of pant legs of the trousers while another sprays into these bag-shaped garments. The "wet" type of spray may also be applied in this manner.

Solvent application: Repellents are very effective when impregnated in clothing by dipping the garments into solutions containing 5 to 10 percent of the repellent in alcohol or other suitable solvent. The concentration of repellent used depends on efficiency of the wringer as the amount of repellent per garment should be approximately the same as suggested for the spray applications. In order to handle this method a spinner wringer is suggested so that a minimum amount of material will be used.

III. THAT DDT (2,2-BIS-(P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE) BE MADE AVAILABLE TO THE U. S. ARMED FORCES IN THE FOLLOWING FORMS:

1. Commercially pure DDT:

Specifications for commercially pure DDT are to be prepared by the Division of Insecticide Investigations.

There is some indication that solutions of DDT may corrode metal containers. Until more is known about this care should be taken when such solutions must be shipped or stored in metal containers. Long storage in metal containers should be avoided whenever possible.

Some of the material now supplied contains traces of acid. Efforts should be made to have the manufacturers remove all acid from the product.

(a) Commercially pure DDT for use in kerosene at a concentration of not more than 5 percent for use as a residual type spray for the control of mosquitoes, flies and bedbugs. This spray to be applied by trained personnel.

Method of preparation: The recommendation presumes the use of crude kerosene for the purpose. If refined kerosene is used an accessory solvent such as cyclohexanone is required.

To prepare the 5 percent (w/v) solution, powdered DDT is dissolved at the rate of 5 gm. to 100 ml. of final solution, equivalent to 5 gm. DDT to 96.87 ml. of kerosene, or roughly 7 oz. DDT per gallon of kerosene. The mixture should be stirred at intervals until all the DDT is in solution (may require 24 hrs.). If facilities are available moderate heat may be applied to hasten solution. If the DDT used contains large particles of foreign matter the solution is filtered or allowed to stand and the supernatant liquid decanted for use.

Directions for use: The residue spray is used for application to walls, ceilings, and other places in tents, barracks and buildings where insects run or rest. An unusual characteristic of this new insecticide is that a deposit on walls, ceilings, beds, clothing and other objects remains toxic to insects for several weeks or months. Insects that attempt to rest or run about over the sprayed areas receive a toxic dose of the DDT by contact with the chemical on the treated surfaces. In applying this spray it is important to use a coarse or wet spray so that as much of the material as possible will remain on the surface to be treated. When the liquid volatilizes the active principle

remains on the surface of the sprayed object and acts as a residual contact insecticide. A knapsack sprayer or a power sprayer with nozzles adjusted for large droplets is recommended.

In an emergency a flit gun or any hand sprayer can be used, provided the sprayer is held close to walls and ceilings so as to obtain a deposit. If such sprayers are held too far from the object to be sprayed most of the spray will be lost in the form of a mist that may blow away or settle to the floor. The dosage rate should be about 200 mg. of DDT per sq. ft. A quart of 5 percent spray will cover approximately 250 sq. ft. of surface.

In areas where mosquitoes are a problem in barracks it is necessary to spray thoroughly (about 200 mg. of DDT per sq.ft.) the walls, doors, ceilings, screens and all places in the buildings where mosquitoes rest. Dark corners or other portions of buildings where mosquitoes are seen to rest in large numbers should receive an extra heavy spray application. In malarious regions all buildings within a radius of at least one mile of the cantonment area should receive a residue spray. Certain species, especially some of the anophelines, rest in buildings such as barns, chicken houses, and outhouses and fly into barracks at night. These, as well as mosquitoes that rest on the walls either before or after feeding, will be killed by contact with the DDT on the treated surfaces. Since these mosquitoes are likely to be infected with malaria, filariasis, yellow fever or other diseases, their destruction will prevent or retard the spread of these diseases.

Houseflies: Where flies are a major problem in mess halls and kitchens, it may be necessary to spray thoroughly the walls, doors, ceilings, cross beams, light wires, lamp cords, and other places where flies rest. Food, dishes, pots and pans should be covered before spraying. Painting door and window screens will result in the destruction of flies that land on the treated screens and this treatment alone will reduce the fly population. However, when flies constitute a major problem a higher degree of control can be obtained by treating all of the favorable resting places of flies inside and outside of buildings, thereby allowing greater opportunity for contact action. The spraying of garbage cans, loading platforms, storerooms and stables will aid in further reducing the fly population.

Bedbugs: From 4 to 6 ounces of spray are needed to treat thoroughly each bed, including the springs and mattress. Special attention should be given to crevices, corners and other favorable hiding places in a bed. Canvas cots should be sprayed also. In addition to a thorough application to the beds, cracks in

walls, uprights and walls of barracks should be sprayed also so that when the bugs, not killed by the spray, come out of hiding they are forced to remain in contact with the residual insecticide as much as possible. The insecticide is slow acting upon bedbugs but the residue remains effective for long periods and prevents reinfestations. For a thorough treatment it is estimated that a 70-man barracks will require about 4 gallons of spray. Often it may become necessary to spray inside duffle bags, laundry bags, foot lockers and blankets. Because of the possible injurious effects to rubber, gas masks should not be sprayed.

(b) Commercially pure DDT for use in petroleum oil solutions at a concentration of not more than 10 percent as an anopheline larvicide. The solutions to be applied by trained personnel.

Method of preparation: Ten percent (w/v) DDT is about the maximum that will dissolve in any straight petroleum oil; most petroleum oils dissolve less than this. The solution is prepared in a manner similar to that described in 1(a).

Directions for use: DDT dissolved in petroleum oils makes an effective larvicide. Petroleum products, such as kerosene, fuel oil, diesel oil and waste crank case oil either from automotive equipment or airplanes, are satisfactory. Heavy oils that do not spread may be thinned with lighter fractions of oil.

The concentration of DDT in the oil may be varied depending on method of application, i.e., whether poured on, sprayed on or applied from drip can, submerged porous materials, etc. It is recommended that oil solutions of DDT be applied at such a rate as to give 0.1 to 0.25 pound per acre of DDT. A 0.5 percent DDT solution applied at a rate of 0.1 pound per acre of DDT required approx. 8.5 gallons of oil per acre (at the same rate of DDT, a 5 percent solution would require 0.24 gallon). Since the effectiveness depends on the material reaching the larvae, sufficient oil should be used to permit coverage. The minimum amount which can be sprayed on an acre will vary with the type of spray equipment available. The amount of oil used will also depend on the density of vegetation. (In breeding places where the larvae are difficult to reach with a larvicide, heavier applications should be made. With heavier applications of DDT some residual toxicity from the DDT may occur after the oil has evaporated.) With DDT in oil less oil is needed for control than straight oil without added toxicant.

In running streams, open roadside ditches, and pools a 5 percent DDT in oil solution may be used. A 5 percent solution

is suggested since most petroleum oils will not readily dissolve and keep in solution a higher percentage. Applications to running streams may be made at widely spaced points along the stream allowing the flow of the stream to spread the larvicide. The amount and distance between points of application will vary depending on stream type, width and rate of flow. In places where drip cans and porous materials soaked in oil have been used suspended over or in streams to apply oils, the DDT may be added allowing a reduction in the amount of oil required. In calm waters a small amount should be poured on at different points in the breeding places. A squirt type oil can will facilitate application where several small places are to be treated. In larger places a lower percentage of DDT and a greater quantity of oil applied with spray equipment is recommended.

2. In powder form consisting of DDT milled with the minimum amount of talc required to make a powder having an average diameter of 5 microns or less.

The proportion of talc in this mixture should be held to a minimum to save shipping space. It is hoped that with the purer commercial product a mixture of 50:50 DDT:talc may be obtained that will not pack or lump in shipping. However, a higher proportion of talc will not interfere with its use for the purposes mentioned. The 5 micron size is somewhat arbitrary; larger sizes may be equally useful.

This is to be used as follows:

(a) For dilution with available diluents for application as anopheline larvicide dusts. These dusts may also be used in buildings to destroy adult mosquitoes and flies.

Method of preparation: In diluting the concentrated mixture with carrier to suitable concentration for use as a dust, care is taken to break up all lumps and the diluent is added gradually to the concentrate with mixing. When all the diluent has been added the product is mixed thoroughly for 20 to 50 minutes to insure uniform distribution of DDT. For large quantities a cement mixer, flour mixer, or tumbler may be used if available. Any available diluent suitable for dusting purposes may be used.

Directions for use: A dust with from 1 to 5 percent of active ingredient is suitable for practical application. The

addition of diluent to make a 1 percent dust does not impair the efficiency of DDT as compared to Paris green similarly diluted. Apply with hand dusting equipment at a rate of 0.1 pound per acre of native ingredient. In thick vegetation which will protect the dust film from wind and wave action, a residual kill by the DDT may be expected if applications of 1 pound per acre are made. Dusts with a percentage of DDT higher than 1 to 5 percent may be used in hand dusters when heavier dosages are applied. The time for additional treatments must still be based on dipping records to determine when retreatments should be made. As little as one-fourth pound of DDT dust blown into buildings such as barns, chicken houses, and outhouses with either a hand or a power duster is an effective means of killing the flies and mosquitoes in the buildings and there is also considerable residual action.

(b) In a water suspension with a suitable wetting agent for use as a residual type spray for the control of mosquitoes or flies.

Method of preparation: For use as a spray suspension the DDT-talc concentrate may be mixed with powdered sodium lauryl sulfate in the proportion of 5 parts DDT to 2 parts wetting agent and this made to a paste with a small amount of water until all lumps are broken and the powder is thoroughly wet. Sufficient additional water is then added to give the desired final concentration of DDT. For a 5 percent spray use sufficient concentrate to contain 7 oz. DDT and mix with one gallon of water. The wetting agent may be added to the water first and then the DDT-talc made to a paste with this solution and diluted as above. Prepared in this way ordinary laundry soap, Naccanol NR, or other wetting agents may also be used. A proportion of about 5 parts DDT to 2 parts wetting agent in the final suspension is suggested. This suspension must be kept agitated during spraying.

Directions for use: (Same as III, 1(a)).

3. As a concentrated solution consisting of the following ingredients: DDT 20 percent, Triton NE 20 percent, and xylene 60 percent.

The concentrated solution is prepared by dissolving the DDT (1 part by weight) in xylene (3 parts by weight) and adding Triton NE (1 part by weight). This equivalent to approximately 2 lb. 6-1/2 oz. each of DDT and Triton NE to one gallon xylene. This proportion of DDT will dissolve readily but solution may be hastened by warming if desired. This concentrate weighs approximately 8.08 lb. per gallon. In preparing aqueous

emulsions the concentrate is added slowly to the required volume of water with continuous stirring and the emulsion stirred thoroughly before use. The resulting emulsion is quite stable.

This concentrate to be diluted with water and used as follows:

(a) As a 1 percent DDT aqueous emulsion for louse proofing garments.

Method of preparation: For louse-proofing garments with an aqueous emulsion, 1 percent DDT was recommended. To prepare a 1 percent emulsion the concentrated solution is added to water with stirring as described above at the rate of 54.5 ml. concentrate per liter water or approx. 7 fl. oz. concentrate per gallon of water.

Directions for use: Under the conditions of the experimental tests described in reports on this subject, 1 percent emulsions or solutions of DDT gave about 10 gm. DDT per suit of regulation, 50 percent wool, 2 piece underwear. However, it is more important to specify the dosage per suit or better, the dosage per weight of cloth. Consequently under other conditions of wringing, etc., the concentration must be adjusted so that the proper dosage per suit is obtained. It is suggested that the DDT amount to 1.5 to 2.0 percent of the weight of the suit, whether the cloth be part wool or cotton. This would give 10 to 15 gm. per suit in the regulation, 50 percent wool, 2-piece underwear. The concentration is adjusted to give this dosage depending on the amount of emulsion retained by the garment under the conditions of the large scale impregnation.

To treat 1,000 suits of the part wool underwear at 2 percent of the weight of the suit (allowing some excess for residue at the end of the dipping) would require 155 lb. (19 gal.) of concentrate. This would be added to sufficient water so that the desired final dosage per suit is obtained under the conditions of treatment.

It should be pointed out that garments may be impregnated equally as effectively by treatment with solutions of DDT in Stoddard solvent or white gasoline.

Actual methods of treatment will depend on circumstances of use by the Armed Forces. If underwear is to be treated in the field the use of emulsions in the portable unit developed by Mr. Randall Latta is to be recommended. If impregnation

can be done in this country or at a central location in other countries, the use of Stoddard solvent solutions in established dry cleaning facilities should be feasible.

(b) As an aqueous emulsion for use as a spray residue type treatment for the control of mosquitoes and flies.

Method of preparation: (Same as under III, 3(a)).

Directions for use: (Same as under III, 1(a)).

(c) As an aqueous emulsion it has also been found effective for controlling anopheline and other mosquito larvae.

Method of preparation: (Same as under III, 3(a)).

Directions for use: The DDT emulsion is toxic to anopheline larvae in suspensions of 0.05 and 0.1 parts DDT per million of water. This larvicide is also effective against culicine mosquitoes, such as Culex and Aedes, some of which are important in the transmission of diseases. For a pool one acre in area with an average depth of 6 inches, take 11 ounces (305 ml.) of stock and mix with the desired amount of water (at least 5 gallons), agitating as the stock is added so that a smooth emulsion is formed. The emulsion should be sprayed on to insure fairly uniform distribution. If spray equipment is not available make emulsion as suggested above and apply by pouring on and dispersing the larvicide with an improvised paddle, larval dipper, or by wading through the water so as to agitate it. In static pools the emulsion may be applied at 1 p.p.m. of DDT to prevent breeding for longer intervals. Application of 5 to 10 parts per million may be used in places, such as rain barrels. Ten ml. of the stock solution stirred into 60 gal. of water gives approx. 10 parts per million.

At concentrations of over 0.1 p.p.m., the DDT is toxic to fish. Careful distribution will avoid overdosages in parts of a pool which will be detrimental to fish. As surface applications, DDT in dusts or in oils is harmless to fish.

IV. THAT EXTENSIVE FIELD TESTS BE MADE BY THE U.S. ARMED FORCES:

1. Of an aerosol for mosquitoes and flies containing 5 percent DDT, 10 percent cyclohexanone, 0.2 percent pyrethrins (1 percent pyrethrum extract containing 20 percent pyrethrins) and 84 percent Freon-12.

Method of preparation: In preparing the recommended aerosol the DDT and 20 percent pyrethrum extract are dissolved in cyclo-

hexanone at the rate of 5 parts DDT, 1 part pyrethrum extract, and 10 parts by weight of cyclohexanone. The proportion recommended will dissolve readily but solution may be hastened by application of moderate heat. The solution should be filtered to remove any foreign matter present in the DDT before placing in the bombs. Care must be taken to avoid evaporation and consequent change in concentration during the filtration.

It is imperative that the old style cap and not a controller cap be used because the DDT may precipitate between the capillary tube and opening of the controller cap and cause clogging. Because of the solvent properties of cyclohexanone on the lacquer of the bomb, it is necessary that the bomb be covered with baked enamel, wax or other material not readily dissolved by cyclohexanone.

Directions for use: This aerosol containing DDT does not produce as quick a knockdown as the standard pyrethrum formula now in use, however, sufficient pyrethrum has been added to give satisfactory knockdown properties. The addition of DDT results in an aerosol which is much more effective against flies than the formula now used. Because of the importance of flies as disease carriers and annoyance to troops, the indicated greater efficiency of the proposed formula is of great value. Aerosol bombs can be used in fox holes and gun emplacements successfully. Under a heavy cover of trees and brush, certain species of mosquitoes can be reduced effectively by carrying the bomb rapidly back and forth over an area, such as in a small bivouac area or gun emplacement. One bomb will effectively treat more than an acre.

The bomb will be handled in the same manner as the standard pyrethrum bomb and the same directions for use against mosquitoes and flies will apply. It is suggested that the following directions be printed in larger type than is on the present bomb: "This insecticide is very efficient. Only 4 seconds of spraying is required for a confined space of 1,000 cu. ft. (about 10 ft. by 10 ft.), 10 seconds for a pyramidal tent, and 3 seconds for a pup tent. Do not spray directly on insects as aerosol acts like a gas. It penetrates into cracks, etc., and should be released in the air."

2. Of a fly and mosquito spray containing 1 percent DDT in deodorized kerosene plus a knockdown agent (2½ percent Thanite or Lethane 384).

Method of preparation: One percent DDT dissolved in deodorized kerosene (at rate of 5 gm. to 100 cc.) with addition of 2½ percent thanite or lethane 384 by volume.

Directions for use: This material is an effective general-purpose spray - i.e., for use against cockroaches, bedbugs, flies and mosquitoes. It may be applied with any standard atomizer-type sprayer.

V. THAT THE SPRAY NOW USED FOR APPLICATION TO THE BODY FOR THE CONTROL OF LICE BE REPLACED BY THE FOLLOWING FORMULA:

BENZYL BENZOATE	10 PARTS BY WEIGHT
ETHYL P-AMINOBENZOATE (BENZOCAINE)	2 parts by weight
DDT	1 part by weight
ETHYL ALCOHOL (95%) Q.S.	100 parts by VOLUME

THIS FORMULA IS ALSO RECOMMENDED FOR THE CONTROL OF SCABIES.

Method of preparation: The ethyl p-aminobenzoate and DDT are dissolved in the benzyl benzoate in the proportion of 2:1:10 parts by weight. Moderate heat may be applied to increase the rate of solution if desired. The product may be shipped in this concentrated form for dilution with ethyl alcohol at point of use or may be diluted at point of preparation and shipped as final solution. The concentrate is diluted with 95 percent ethyl alcohol at the rate of 13 gm. of concentrate to 100 ml. of final solution. This is equivalent to approximately 13.5 ml. concentrate to 100 ml. 95 percent ethyl alcohol; or 17¹/₄ fl. oz. concentrate per gallon of 95 percent ethyl alcohol.

Directions for use: The recommended change from the pyrethrin to the DDT louse spray formula was due in part to the strategic importance of pyrethrum at this time and the additive value of ethyl p-aminobenzoate. Since benzyl benzoate has proved itself as a scabicide and was a good solvent for DDT, it was retained in the formula. The ovicidal and anesthetic properties of ethyl p-aminobenzoate make the material superior to 2,4-dinitroanisole. Both the pyrethrum and DDT formulas are not only effective in killing all forms of human lice but their residual or long-lasting qualities extend beyond the incubation period of the eggs. This residual action is extremely important in preventing reinfestations. Many other formulas no doubt fail for this reason.

Body lice: The method of application of this formula should follow closely that of the previously used pyrethrum formula. All hairy portions of the body, except the head, should be thoroughly covered or wetted with the spray. Treated individuals should preferably not change clothing for at least a few days, since the ingredients are absorbed from the skin by the garments and protect against reinfestation from any lice not contacted at the time of treatment.

Pubic or crab lice: In order to eradicate crab lice effectively it is absolutely necessary to treat all hairy portions of the body, since lice are often present on the legs, chest, and under the arms. All lice and nits are probably killed by an hour's exposure to the treatment but to guard against reinfestation the individual should not be allowed a bath for 24 hours.

Head lice: In instances where the hair is not clipped or cut short, one-third to one-half fluid ounces (10 to 15 cc.) are required per individual head, depending on the amount of hair present. An attempt should be made to distribute the material as evenly as possible. One application of this formula is sufficient to free an individual of lice and to keep that person free of lice for 2 or 3 weeks, providing, of course, the hair is not washed. Head lice are known to deposit eggs on backs of chairs, bed clothing, and especially in headwear. The incubation period of eggs laid in these environments in many instances is much longer than normal. For this reason it is desirable to avoid reinfestation from such sources. The DDT formular recommended will readily destroy lice and eggs within a few hours but in addition the DDT residual action will prevent reinfestation for 2 to 3 weeks. Troops mingling with louse infected civilians can prevent infestation by applying the treatment as a prophylactic at intervals of about 2 weeks. The value of the DDT formula probably lies as much in its long-lasting properties as in its initial toxicity to lice and nits.

Scabies: The benzyl benzoate in the louse spray is known to be an effective scabicide. Whether or not the DDT and benzocaine adds to the scabicial value has not been determined. The benzocaine should relieve itching and may serve as an ovicide for scabies.

The formula recommended may be applied by spray or sponge and should be applied to the entire body, paying particular attention to the infected areas. Approximately 50 cc. of the solution will be required for such a treatment. The treatment should be allowed to remain on the body for at least 12 hours. Application should be repeated after a week if needed.

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