



SOP: Preparation of experimental huts for evaluation of IRS

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Prepared by

Name	Role	Institution
Alex Wright	Author	Consultant to I2I
Graham Small	Author	IVCC
KCMUCo	Contributor	Kilimanjaro Christian Medical University College
CREC	Contributor	Centre de Recherches Entomologiques de Cotonou
IHI	Contributor	Ifakara Health Institute
Natalie Lissenden	Contributor	LSTM
Katherine Gleave	Contributor	LSTM

Timeline

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1	30/10/2020	Angus Spiers	I2I
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Version Control¹

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¹ Historical versions of SOPs can be found on the I2I website (<https://innovationtoimpact.org/>)

2	June-July 2022	Alex Wright, Katherine Gleave	Related documents, purpose, materials & equipment, data collection sheet information, health and safety, glossary of terms and references added.
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Related documents

- I2I Best Practice SOP Library, 30 October 2020 (<https://innovationtoimpact.org/>)

1. Purpose

Verandah-trap experimental huts are used to evaluate Indoor Residual Spraying (IRS) or Long-Lasting Insecticide Nets (LLIN) products under semi-field conditions against free-flying, wild populations of malaria vectors. Huts are made of brick walls plastered with mud or cement-concrete on the inside, with a corrugated iron roof and are built on concrete plinths surrounded by water-filled moats to prevent entry of scavenging ants. Ceilings made of plastic sheeting or woven thatched materials are provided. Prior to each experimental hut trial with an insecticidal product, the huts must be refurbished and thoroughly cleaned to prevent contamination from previous hut trial. This SOP guides the refurbishment and cleaning of experimental huts in preparation for a trial.

2. Background

IRS causes a level of “contamination” to the hut that greatly exceeds that of ITNs, and between trials it will be necessary for experimental huts to be completely cleaned and refurbished before each new trial. Refurbishing should include removing any sprayed surfaces such as plastering on walls, ceiling and doors, and disposing contaminated waste according to local regulations. After replastering the walls and replacing the ceiling the hut should be carefully cleaned, and absence of contamination demonstrated by appropriate bioassay tests.

Newly constructed huts should be allowed to sit for a few weeks before use for seasoning of mud plaster on walls. Attractiveness to mosquitoes and absence of scavengers in the hut is then checked.

3. Materials and equipment

3.1. Hut preparation.

- Petri dish
- 10 dead mosquitoes
- Bleach
- Spray bottle
- Broom
- Cotton wool
- 50 laboratory reared mosquitoes
- Chisel
- Biohazard bag
- Ant traps with sugar and boric acid

3.2. Preparation before first collection

- Gloves
- Rat glue or rat trap
- 10% glucose-soaked cotton wool
- Two calibrated data loggers
- Mattress for sleeper
- Broom to clean
- Soap and water

3.3. pH testing

- Scalpel

- Calibrated pH meter or litmus paper
- Deionized water

4. Procedure

4.1. Refurbishing and cleaning procedure

- 4.1.1. Removal of previous insecticide-treated/contaminated surfaces
- 4.1.2. Remove all mosquito traps from the huts.
- 4.1.3. Remove mattresses from the huts and lay them under the sun for four-five hours.
- 4.1.4. Wash trap netting and metal baffles in soap and water, rinse well and allow to dry in the sun.
- 4.1.5. Remove insecticide treated material from huts if they were used in a previous trial.
- 4.1.6. Ensure workmen are wearing respirators and goggles.
- 4.1.7. Wet walls with water thoroughly to reduce dispersal of dust and insecticide, if any.
- 4.1.8. Remove surface of concrete or mud from walls using a chisel or other chipping tool.
- 4.1.9. Remove floor lining from the huts and dispose of in the chemical waste store.
- 4.1.10. Sweep the chippings into a biohazard bag and put into the field waste disposal area.

4.2. Re-plastering the walls.

- 4.2.1. Walls can be plastered with mud, cement, plywood, or thatch depending on study design
- 4.2.2. Prepare the mud or cement in the appropriate ratio
- 4.2.3. Prepare the ceilings in the same way as the walls. If ceilings are to be left untreated as per protocol, cover with plastic sheeting.
- 4.2.4. Apply the mud or cement to the wall, approximately three inches deep.

- 4.2.5. Leave any fresh plaster to set and apply water to the concrete surface periodically starting one day after plastering and up to about three weeks to avoid cracking.
- 4.2.6. The surface should be allowed to set and harden before applying insecticide. Mud walls may need a few weeks to season.

4.3. General cleaning

- 4.3.1. Put on a pair of nitrile gloves.
- 4.3.2. Label all cleaning equipment according to treatment.
- 4.3.3. Allocate cleaning equipment to each treatment.
- 4.3.4. Sweep the floor using the allocated broom to remove dust.
- 4.3.5. Mix the water and detergent into a bucket.
- 4.3.6. Mop the floor thoroughly to remove any insecticide residues remaining from the IRS treatment application. Make sure that you do not splash any of the detergent onto the walls while mopping.
- 4.3.7. Disposal of wastewater and cleaning material used
- 4.3.8. As water used for cleaning huts will contain insecticide residue, wastewater should be disposed of according to procedure in study protocol.
- 4.3.9. All other disposable cleaning equipment such as mops and brushes should be disposed of according to study design.
- 4.3.10. Do not re-use cleaning equipment from one study to the next as this may lead to cross-contamination of huts with insecticides.

4.4. pH testing walls and final preparation.

- 4.4.1. Scrape approximately 5g of surface material into a petri dish.
- 4.4.2. Add 15 mL deionised water and mix with a spoon. Take a strip of litmus paper and dip in the solution for five seconds. Use the color chart on the litmus paper to determine the pH. The acceptable range for concrete/mud is pH 6-8. If the pH is above this range, test again after one week.
- 4.4.3. Search rooms, verandahs, and reinstated cleaned exit traps for ants. If ants are found put down clean petri dishes containing a mixture of boric acid and sugar

(50:50 ratio) in four corners for one-two days to kill them (See SOP Removal of ant infestations from experimental huts).

- 4.4.4. Search and remove spiders and spider webs.
- 4.4.5. Remove and clean any curtains separating room compartments.
- 4.4.6. Check the polyethylene plastic in the verandah for any holes. If holes are present, replace the plastic sheeting.
- 4.4.7. Repair any holes in the screened verandahs and fill any cracks or holes in the walls.
- 4.4.8. Check uniformity of the baffles in the "entry eave gap" and the "exit eave gap." The gap should measure 5 ± 2 cm when measured from inside of hut.
- 4.4.9. Clean the "sugar bowls" with 10% bleach and rinse with water.
- 4.4.10. Drain the water in the moat, clean the moat and then refill with clean water.

4.5. Post-spraying procedure (KCMUCo)

- 4.5.1. Once spraying is complete, leave the hut door open for ventilation for 24 hours.
- 4.5.2. The sprayer should be weighed to determine the volume consumed. and the volume of insecticide solution left in the tank should be measured using a measuring cylinder and the amount of insecticide solution used recorded.
- 4.5.3. Any unspent insecticide liquid is then sprayed on an outer eave of a house or disposed of according to national regulations.
- 4.5.4. The spray equipment should then be washed thoroughly following the appropriate SOP and prepared for the next insecticide treatment. Never leave the sprayer unwashed between IRS applications, as dried insecticide residues may be difficult to remove (leading to cross-contamination during the next study) and may also damage the sprayer and nozzle.
- 4.5.5. Leave the filter papers to dry on walls and then remove them using metal forceps and store each one individually in aluminum foil. Cut the filter papers in half so that one part can be sent for chemical analysis and the other half kept at the facility. Put the foil in a labelled plastic bag with necessary details (e.g. the

study number, insecticide name, dose, code, hut code, location etc). Store the papers at $+4 \pm 2$ °C until they are sent for analysis. Filter papers should be sent for analysis within 1 month of spraying.

4.5.6. After the ventilation period, remove all the plastic sheeting and place into the designated chemical waste storage.

4.6. Collection and reporting of data

4.6.1. Ensure the following data is recorded in the data collection sheets (checklist format – Yes/No)

- Removed old insecticide-treated wall
- Removed mosquito traps and washed
- Removed mosquito traps and washed
- Removed mattresses and washed
- Removed floor lining
- Replastered walls
- Let walls dry (record time here)
- Clean aspirators, cones
- Sweep floors
- Mop floors
- pH test new walls
- Search for ants and lay traps
- Lay rat traps
- Remove spiders and spider webs
- Clean the plastic sheeting and check for holes
- Repair cracks in walls
- Measure baffles
- Clean sugar bowls
- Drain and refill moat water

5. Health and Safety

For GLP-compliant laboratories, the following should be installed in the laboratory and field prior to semi-field IRS:

5.1. Field materials

- Spill kit for truck
- Mobile emergency shower
- Mobile emergency eye wash

5.2. Personal protective equipment (PPE)

- Spray suit coveralls
- Respirator mask (fit-tested for the specific individual spraying)- check AI MSDS for filter requirements
- Gloves
- Goggles and/or full-face Visor
- Over boots

6. Glossary of terms

AI	Active Ingredient
GLP	Good Laboratory Practice
I2I	Innovation to Impact
IRS	Indoor Residual Spray
KCMUCo	Kilimanjaro Christian Medical University College
LLIN	Long-lasting Insecticide Net
MSDS	Material Safety Data Sheet
PPE	Personal Protective Equipment
RH	Relative humidity

SOP	Standard Operating Procedure
WHO	World Health Organisation
WHOPES	World Health Organization Pesticide Evaluation Scheme

7. References

WHOPES guidelines- Testing mosquito adulticides for indoor residual spray and treatment of mosquito nets

