

## Isoptera II

### Control

Imperial College  
London

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## Termites (Isoptera)



- Taxonomy Families:
  - Mastotermitidae (Darwin's termite) \*
  - Hodotermitidae ➤ Harvester termites
  - Kalotermitidae ➤ Dry-wood termites \*
  - Termopsidae ➤ Damp-wood termites
  - Rhinotermitidae ➤ Subterranean termites \*
  - Serritermitidae (saw-tooth termite)
  - Termitidae ➤ "Higher" termites \*
  - (+ 2 extinct families)
    - Fungus growers,
    - Nasutitermitinae, etc.
- Practical classification (by termite habits):

## Some notorious pest genera:

- Kalotermitidae (dry wood)
  - *Kalotermes* (EU)
  - *Cryptotermes brevis* (W. Indian DW Termite)
- Rhinotermitidae (subterranean)
  - *Reticulitermes* (EU)
  - *Coptotermes*
- Termitidae (higher)
  - *Nasutitermes*



## Management of Termites

- In general termites are beneficial in that they recycle woody tissue and improve soils by increasing aeration, drainage fertility and mixing.
- They also are an important food source for their predators.
- However, about 50 species are serious pests of timber, buildings and crops.
- They may also damage non-cellulose materials such as plastic pipes that lie in their path.



## Cereal crop damage:

In Africa, maize is most often damaged by termites



Photo: Dr. Jean Nguya Kalemba Maniania

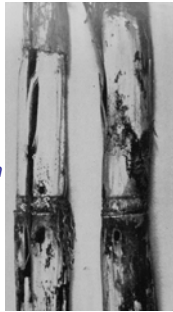
## Coconut palm attacked by *Neotermes rainbowi*



Photo: Dr. Michael Lenz

## Approaches to control

- Physical
  - barriers, colony destruction
- Cultural
  - habitat modification (e.g. sanitary measures in crops)
- Biological
  - pathogens such as fungi (*Metarhizium* spp. & *Beauveria bassiana*), Nematodes (*Steinernema* spp.), and various bacteria and viruses have been tested
- Chemical
  - soil treatments, wood treatments, baits, etc

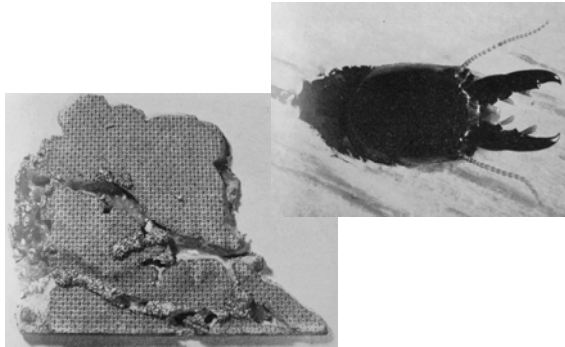


*N. costalis*

## Detection of termites

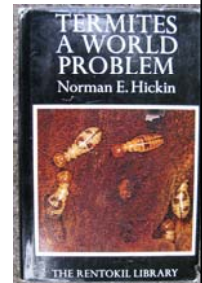
- **Why?** – early warning of potential problems, identification of species, evaluation of risk, development of management plan.
- **Indicators of termite presence** – Shelter tubes, 'earthen' workings, damaged timber or other materials, sounds of colony, alates, visible colonies/mounds.
- **Monitoring devices** – susceptible timber stakes, box or pipe traps, corrugated cardboard filled pipes, toilet rolls, commercially available monitoring/baiting systems

Much happens under the surface! ...



## Management and elimination

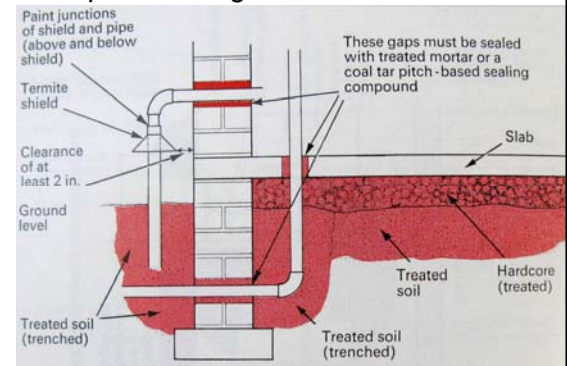
- **Preventative management** – for new and existing un-infested buildings. Building techniques and retro-fitting of barriers.
- **Curative management** – applied to existing infested buildings
- **Colony elimination** – aim to kill reproductive areas of termite colonies. Can be physical, chemical or biological.



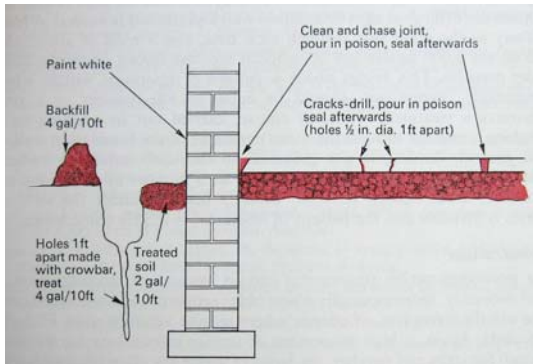
## Termite shields or guards

- Barriers, usually **solid metal skirts** at the base of buildings, to obstruct subterranean access by termites. These force them to build exterior runways which are spotted by regular monitoring.
- **Metal mesh barriers** (pore size 0.5mm) used at time of construction can be laid under whole building.
- **Rubberised asphalt membranes** (peel and stick or trowel applied) can be used to seal cracks or cover whole floors
- **Sand or gravel barriers** can be effective, but particle size and sharpness is species specific and critical.
- **Termiticide barriers** can be applied to soils as a liquid or placed as a soaked barrier (blanket or mesh) underneath new buildings

## Example: building controls



### Example 2: treating an existing building



### Chemical Insecticides

- borates (act as desiccants)
- toxic dusts e.g. arsenic trioxide
- pyrethroids, OPs, etc.
- chlorfenapyr, fipronil (replace older organochlorines)
- IGRs: hexaflumuron, diflubenzuron, noviflumuron
- fumigants: methyl bromide, sulfuryl fluoride

### Arsenic trioxide dust application (especially Australia, Malaysia)



... directly into termite galleries or nests. These slow-acting toxins are not specific and may be dangerous to mammals

### Principal Chemical Control Methods

- Soil treatment with organophosphates, pyrethroids, fipronil, etc.
- Wood treatment with preservatives (e.g. creosote)
- Fumigation (e.g. methyl bromide)
- Baits using growth regulators (e.g. methoprene, fenoxycarb) and chitin inhibitors (e.g. diflubenzuron, hexaflumuron)

### Other methods of colony destruction

- **Heat** – building is tented and propane heating units raise temperature to 50°C for 35 minutes – 1 hour. Good for drywood termite infestations, ineffective against subterranean termites. Can be a fire risk
- **Cold** – affected timber or soil temperature lowered with liquid nitrogen. Temperature must fall to -29°C for instantaneous mortality, or remain below -8°C for 4 days. Can be impractical & hard to evaluate efficacy in hard to reach areas.

### More methods of colony destruction

- **Electricity** – infested wood is exposed and an 'electro-gun' placed on one side of the wood, an earth lead on the other. Low current (0.5 amps), high voltage (90,000 volts) and high frequency (60,000 cycles) zaps through the galleries killing termites in its path..
- **Baiting** is now commercially available (using IGRs, fipronil, etc - which are **slow acting**). Workers feed on the bait containing insect growth inhibitors and transfer back to colony by trophallaxis.

### More methods of colony destruction

- **Microwave** generators mounted on poles 30 cm apart heat and kills the insects as they contain water. Potential fire risk is high.
- **TTR – trap-treat-release** similar to baiting, but uses insecticidal dusts on outside of workers bodies rather than ingested poisons
- **Fumigation** – building is tented and a toxic gas introduced. This is highly effective, but doesn't prevent re-infestation.

### Tent fumigation (dry-wood termites)



### Isoptera control: summary

- Identification (at least down to family) important: treatment of dry-wood termites different to soil-based spp.
- Prevention and chemical controls supreme
- Principal practical methods of management:
  - Prevention (e.g. building design)
  - Curative methods (treatments to galleries, soil drenches, etc.)
  - Colony elimination (baits, etc. with slow acting poisons)