

Public Health Problem Related to Mosquito

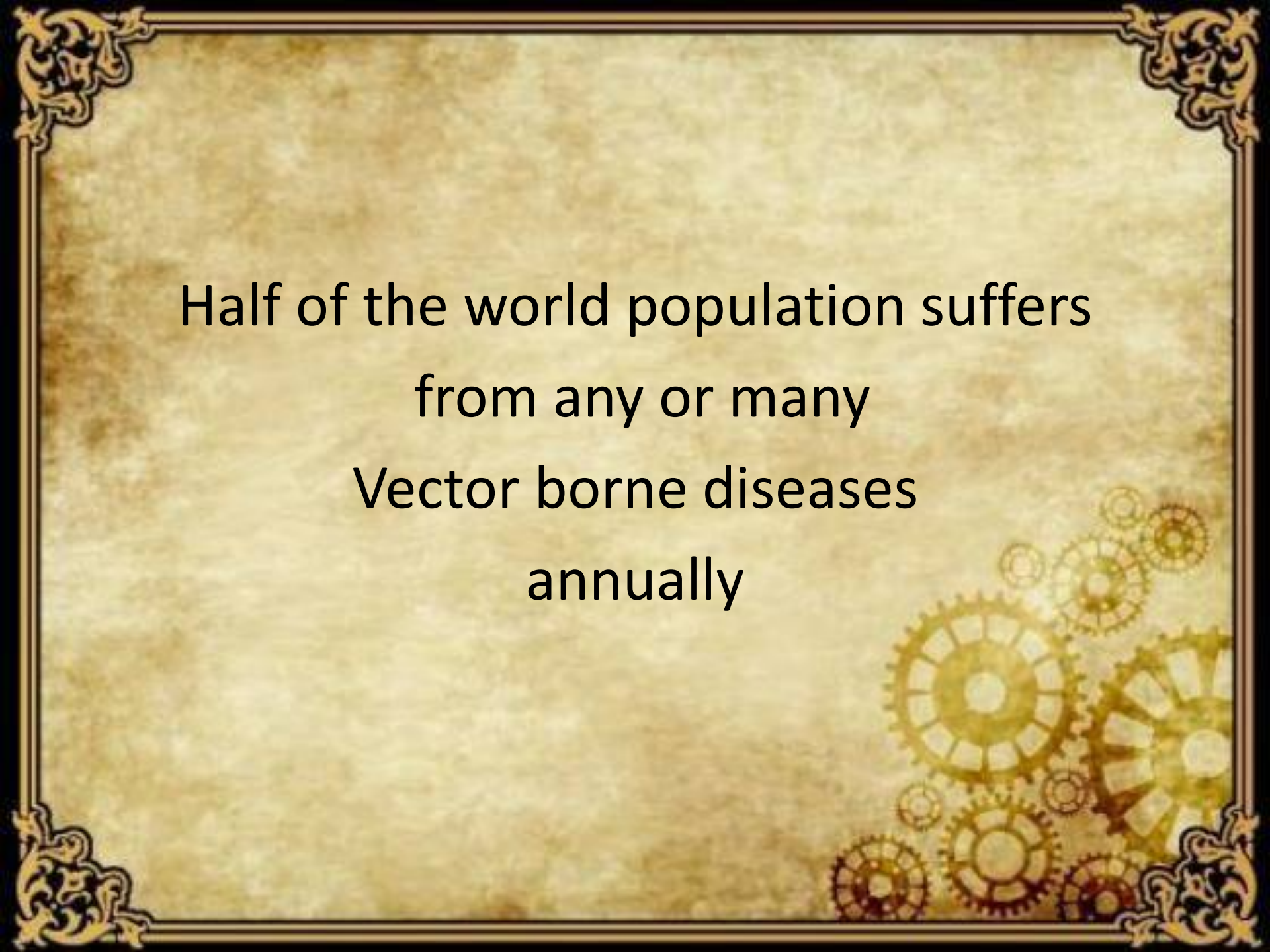
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Research Units**

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West Bengal
India**



Half of the world population suffers
from any or many
Vector borne diseases
annually



Mosquito



MOSQUITO

- Mosquito appeared nearly before 25 crores years (Ross 1959)
- Macca – Atharva Veda (1500 B.C.)
- Mosquito- Masak (Sanskrit)

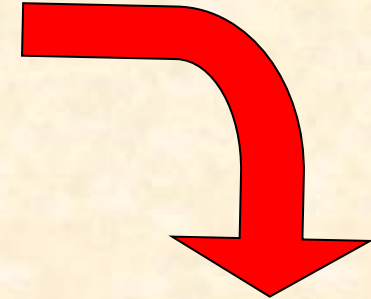
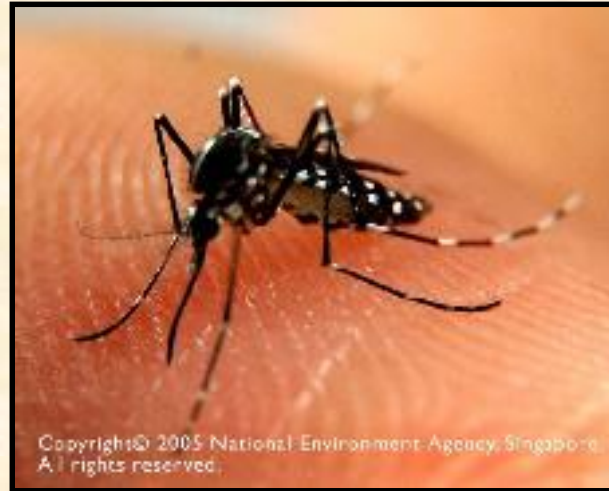
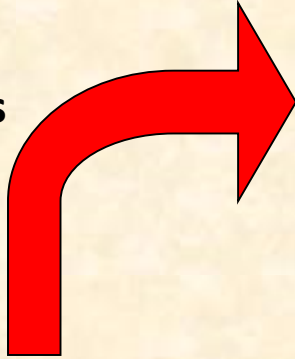
• Antagonistic Characteristics-

- 3600m high on Himalayas - 1157m below Earth Surface
- Sing and Dance Well - Bite Well
- Breed in Vast Water bodies - Small Containers
- In Dirty drains, Septic Tanks - Flower Vases, Flower tubs
- Take Rest in Palaces - Also in the Hut ments
- Suck Blood - Also feed on Fruit Juice
- Some species Bite at Night - Some species at Day Time
Some at Dawn and Dusk

- 4500 Species under 34 Genera

Life cycle of Mosquito

1-2 days



Pupae



4-5 days

Larvae

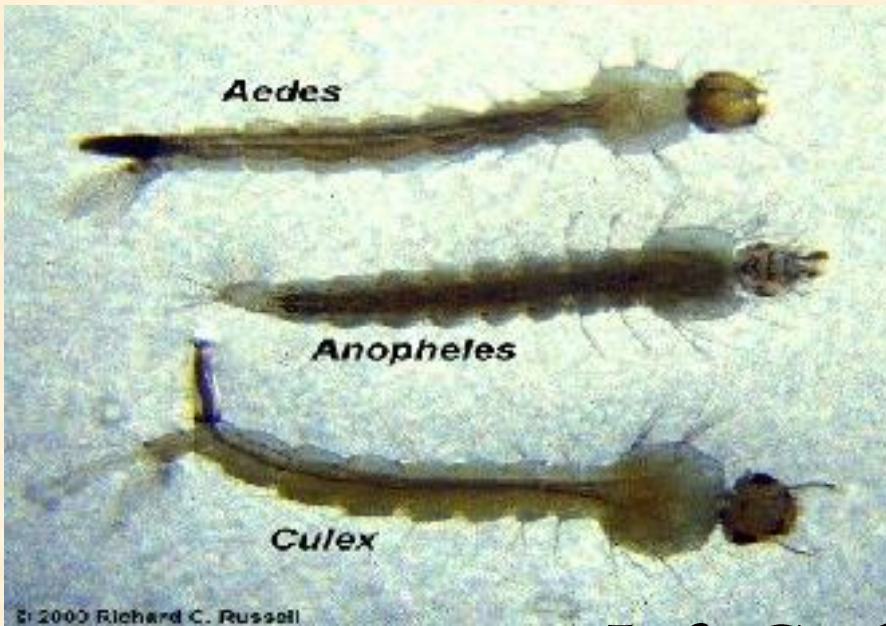
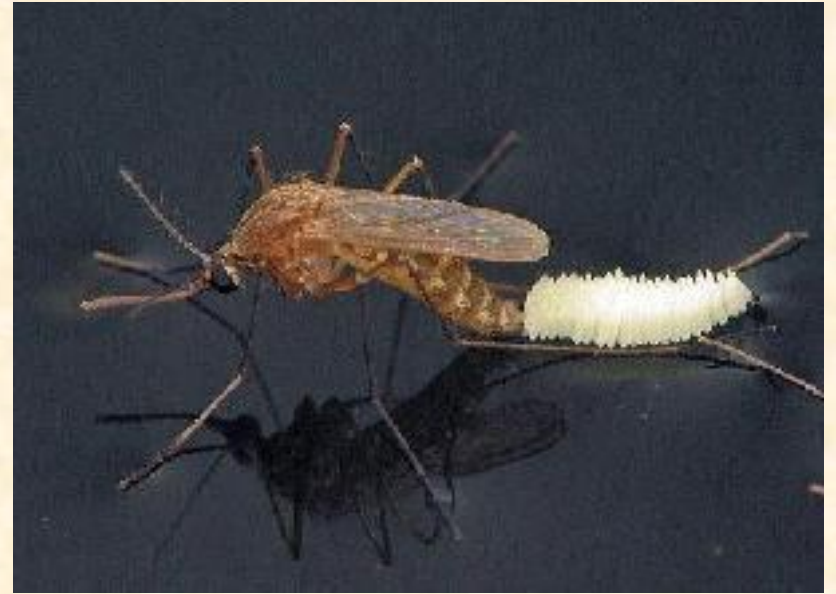


2-3 days

Eggs



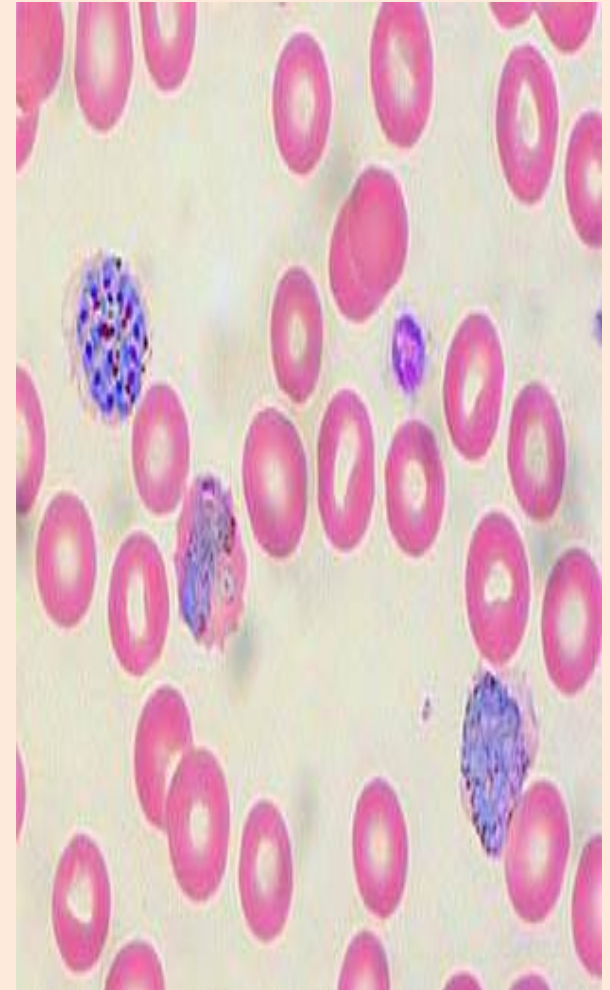
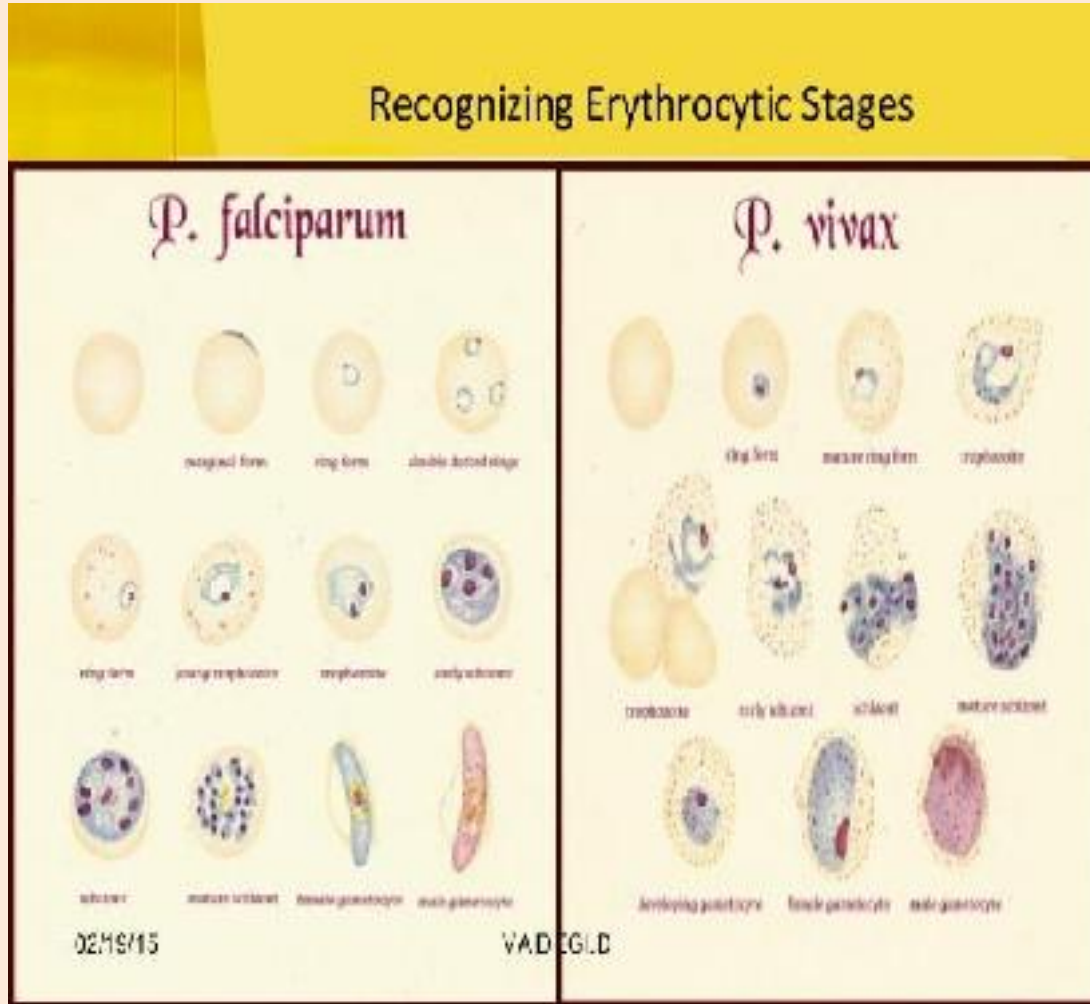
Stagnant water



Life Cycle Stages

Mosquito – borne Protozoan diseases

Malaria

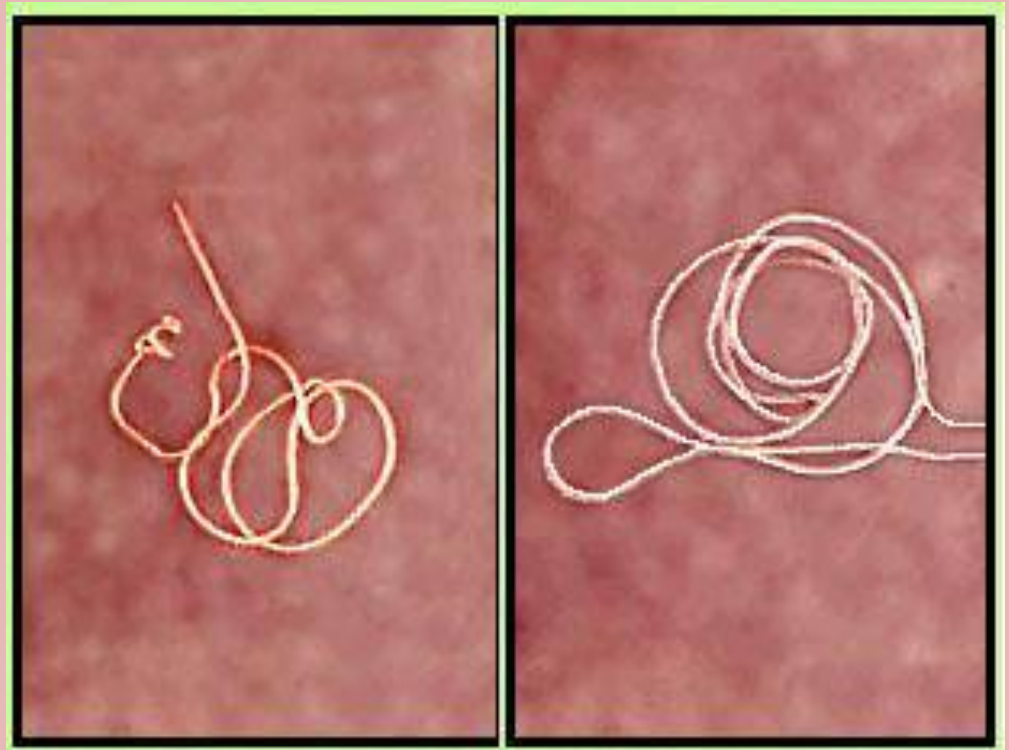


Mosquito – borne Helminth diseases

Filariasis



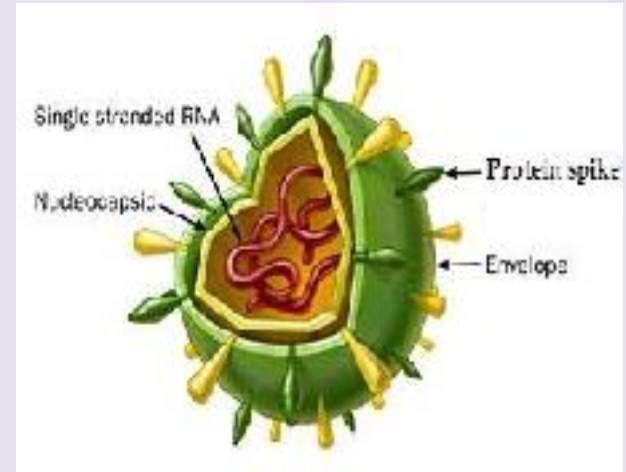
Microfilariae



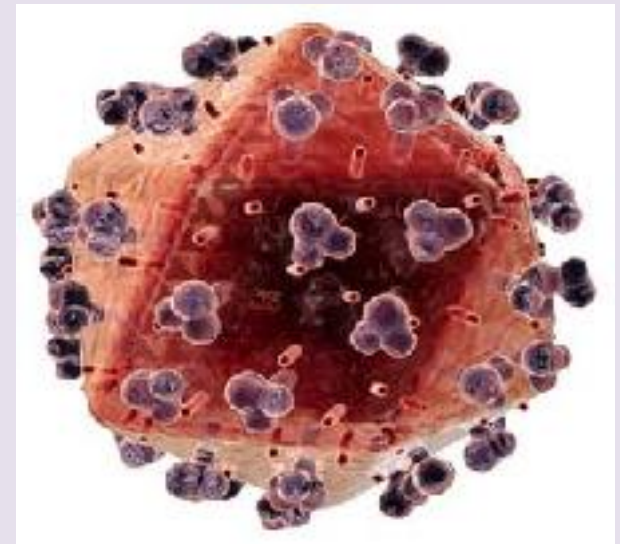
Wuchereria bancrofti* and *Brugia malayi

Mosquito – borne Viral diseases

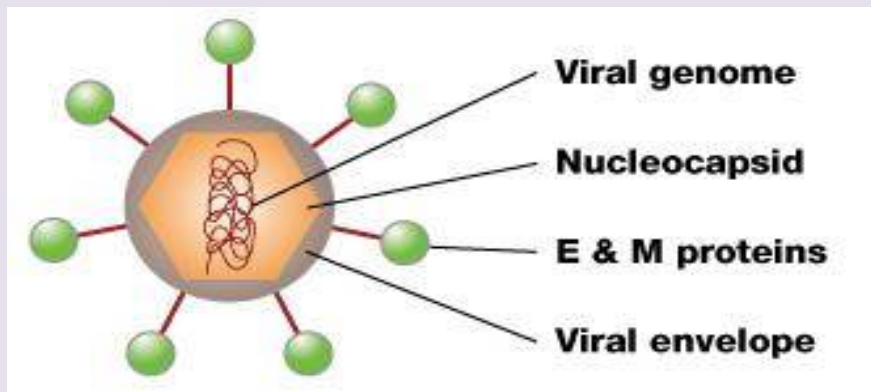
- Encephalitis (JE, EEE, WEE, VEE, MVE)
- Dengue & DHF
- Yellow Fever
- West Nile fever
- Chikungunya
- Bunyamwera
- Rift valley fever
- Zinga
- Sindbis
- O'nyong-nyong
- Itaque fever
- Ganjam
- Ilheus fever
- Tahyna fever



Japanese Encephalitis Virus



Yellow Fever Virus



Dengue Virus

Mosquito borne diseases



Malaria



Anopheles stephensi



Anopheles culicifacies

SYMPTOMS



- ✓ Abdominal pain
- ✓ Chills and sweats
- ✓ Diarrhea, nausea, and vomiting
- ✓ Headache
- ✓ High fevers
- ✓ Low blood pressure causing Dizziness if moving from a lying or sitting position to a standing position
- ✓ Muscle aches
- ✓ Poor appetite



M A L A R I A

**KILLS
3000
CHILDREN
EVERYDAY**

Mosquito net to avoid Mosquito bite



FILARIASIS



Culex quinquefasciatus



Filariasis symptoms



Lymphatic Filariasis



Filariasis



Mansonia annulifera



Filariasis ไลม์ฟิลาเรีย

West Nile Fever





Bull's eye patterned rash of West Nile Fever



Japanese Encephalitis



Culex vishnui



Children affected by Japanese Encephalitis

60 DIE IN 2 WEEKS
BENGAL ENCEPHALITIS
SPURT IN ENCEPHALITIS EVERY MONSOON SEASON IN NORTH BENGAL



Japanese Encephalitis infected patients



Anopheles barbirostris



Mansonia uniformis

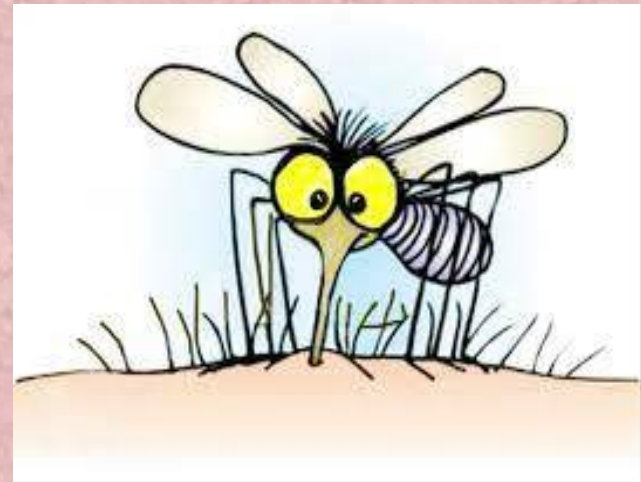


Mansonia annulifera and its Breeding Place



Aedes japonicas

DENGUE, CHIKUNGUNYA AND YELLOW FEVER

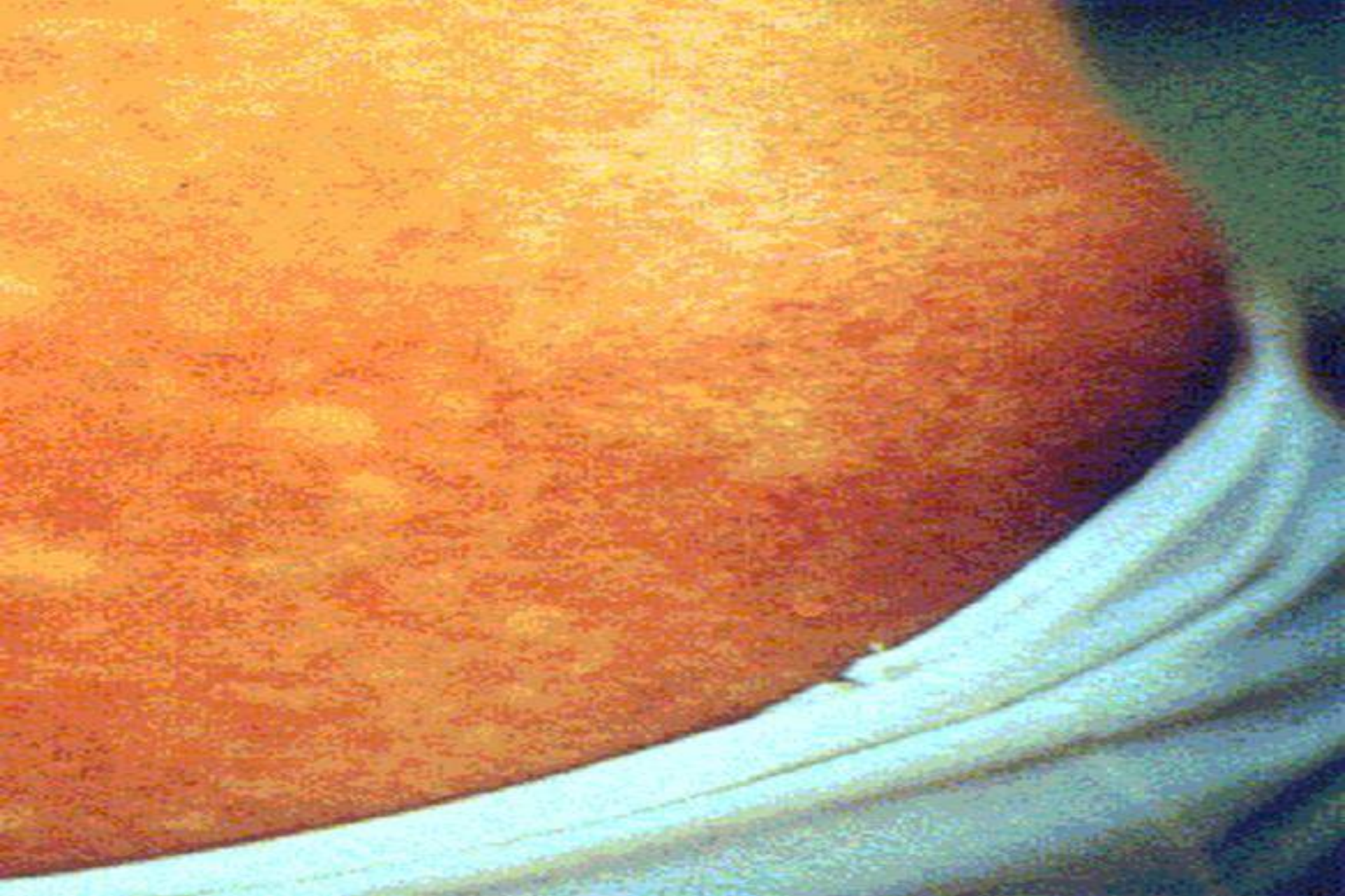




Aedes aegypti



Aedes albopictus



Example of a skin rash due to dengue fever



Dengue hemorrhage



Dengue Hemorrhagic Fever



Chikungunya Symptoms

RASH





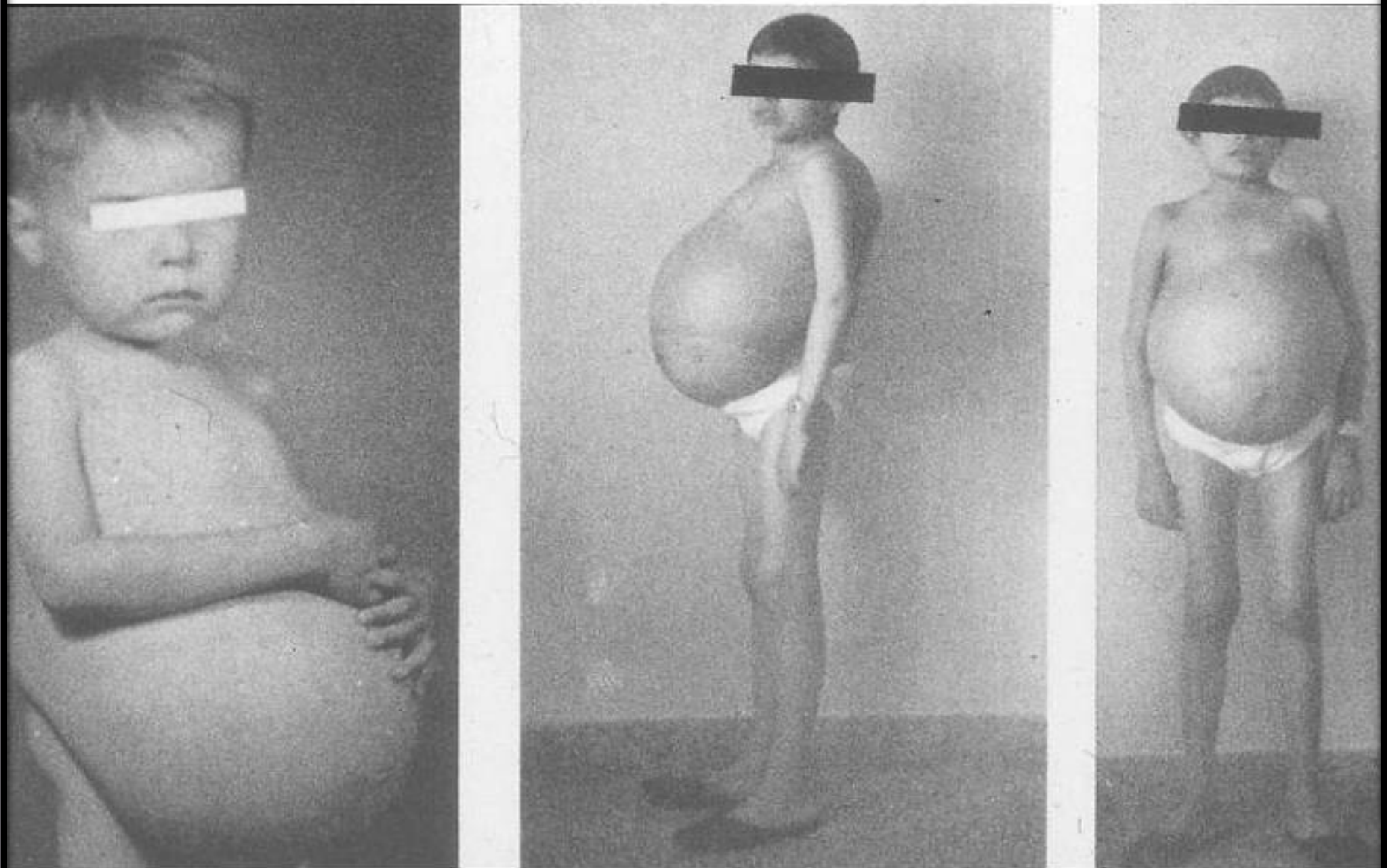
Yellow Fever Symptom



SAND FLY

**Vector of
Kala-azar**





Kala - azar

Put a stop to mosquito bite

1. Use of mosquito net during sleep
2. Use of insecticide impregnated bed nets
3. Fiberglass mosquito netting on the windows
4. Use of repellents
 - a) Synthetic– Odomos (N, N-diethyl-benzamide), pyrethroids like allethrin, deltamethrin etc.
 - b) Natural- Neem oil with mustard oil (Chatterjee, Banerjee and Chandra, 1996)

Mosquito control



1. Reduction of breeding places of mosquito and reduction of mosquito immatures in their breeding places
2. Spraying insecticides to kill mosquitoes
3. Environmental management
4. Biological control by different organisms

BREEDING PLACES



SUBMERGED FIELDS



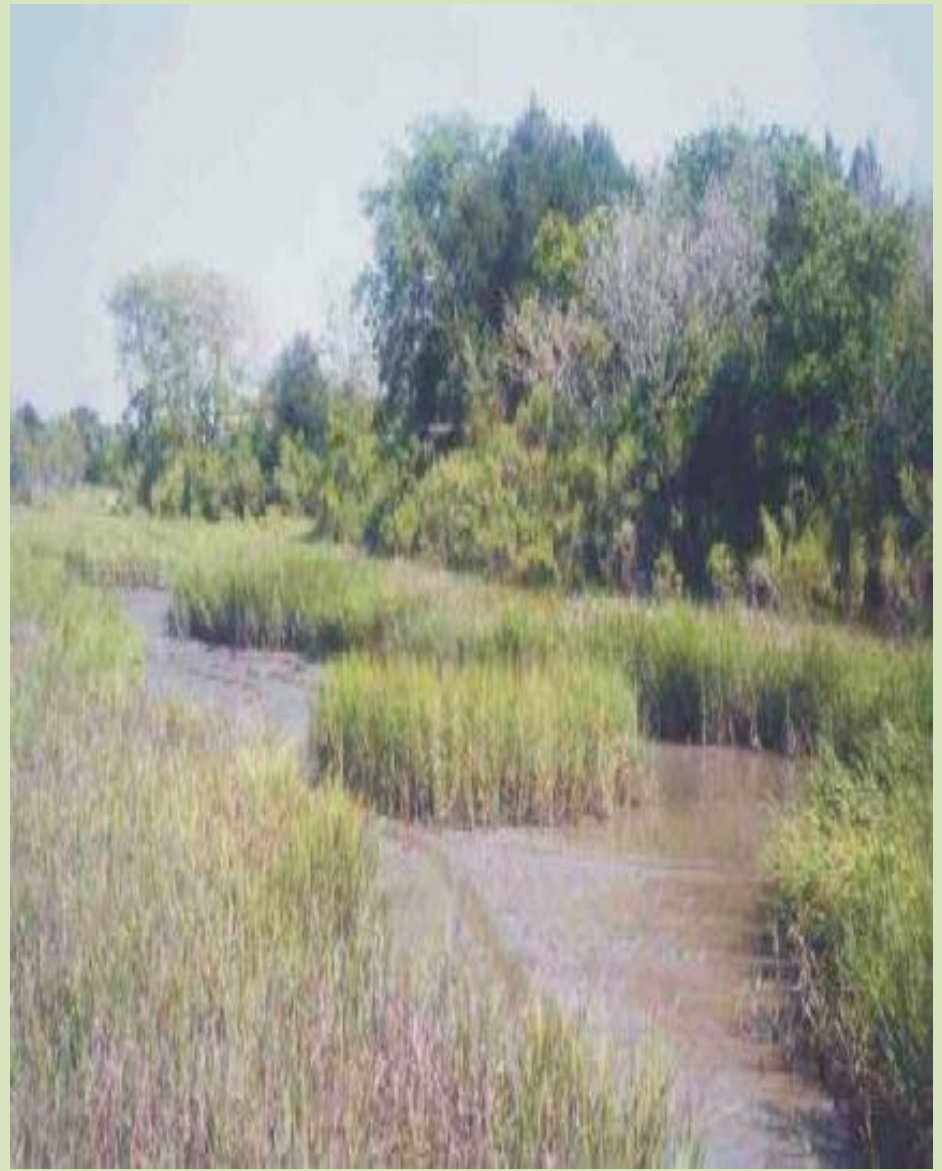
USED TYRES



Unused water holding containers with mosquito larvae

TEMPORARY BREEDING PLACE



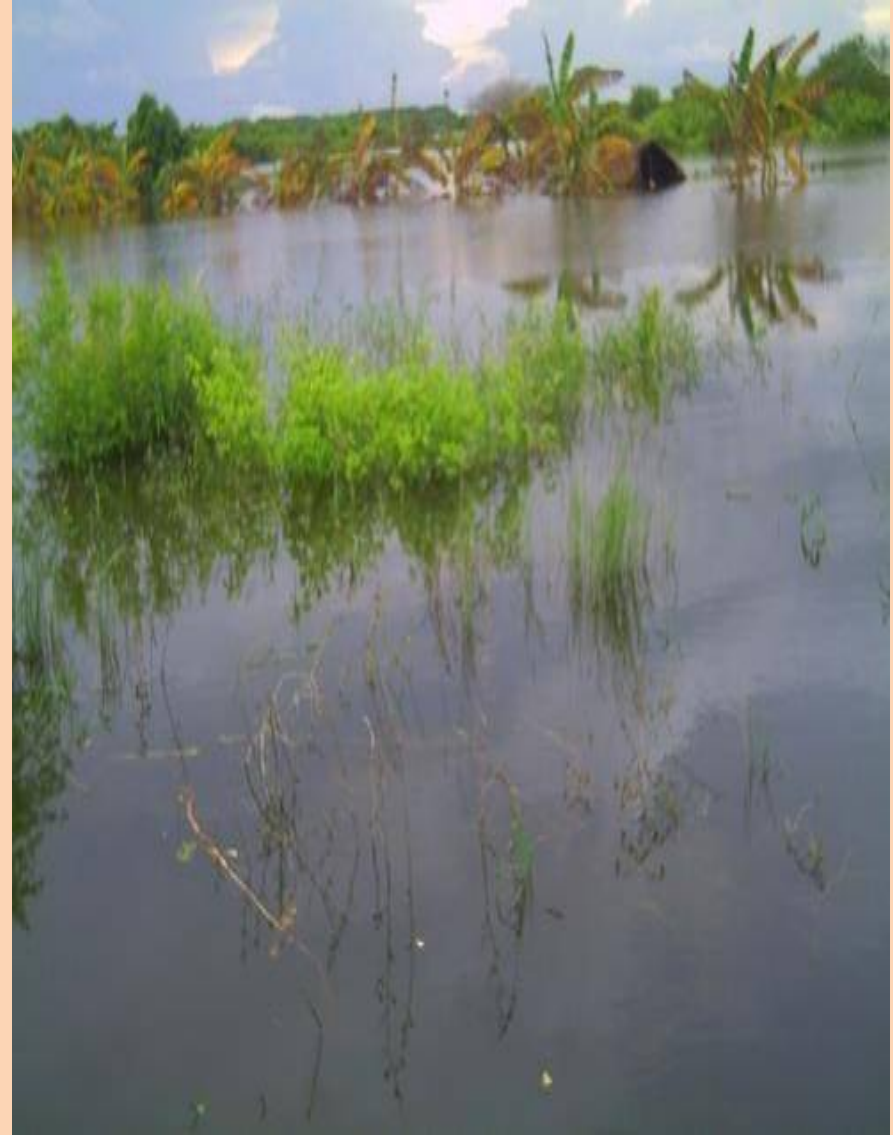


SALT MARSH

Mosquito Breeding



During Rain



During Flood



Cow feeding Pots





Mosquito Breeding in Foul Water





Tree Hole As Breeding Site





Coconut shells as another source of breeding place



Thrown away shoes as breeding ground





Open Tanks as Breeding Site





Cemented Tank in front of NKDA Office



Urinary Gutter



Leaf axil of banana plant- breeding site of *Aedes*



**Mosquito Breeding
Place**

Cover of sewage line





Larval Surveillance in N.K.D.A. Area

Mosquito collection during field study



Easy Steps 1



- **Change water in vases/ bowls every other day**

- **Add sand granular insecticide to water**

Easy Steps 2



- **Remove water from flower pot plates every other day**

Easy Steps 3

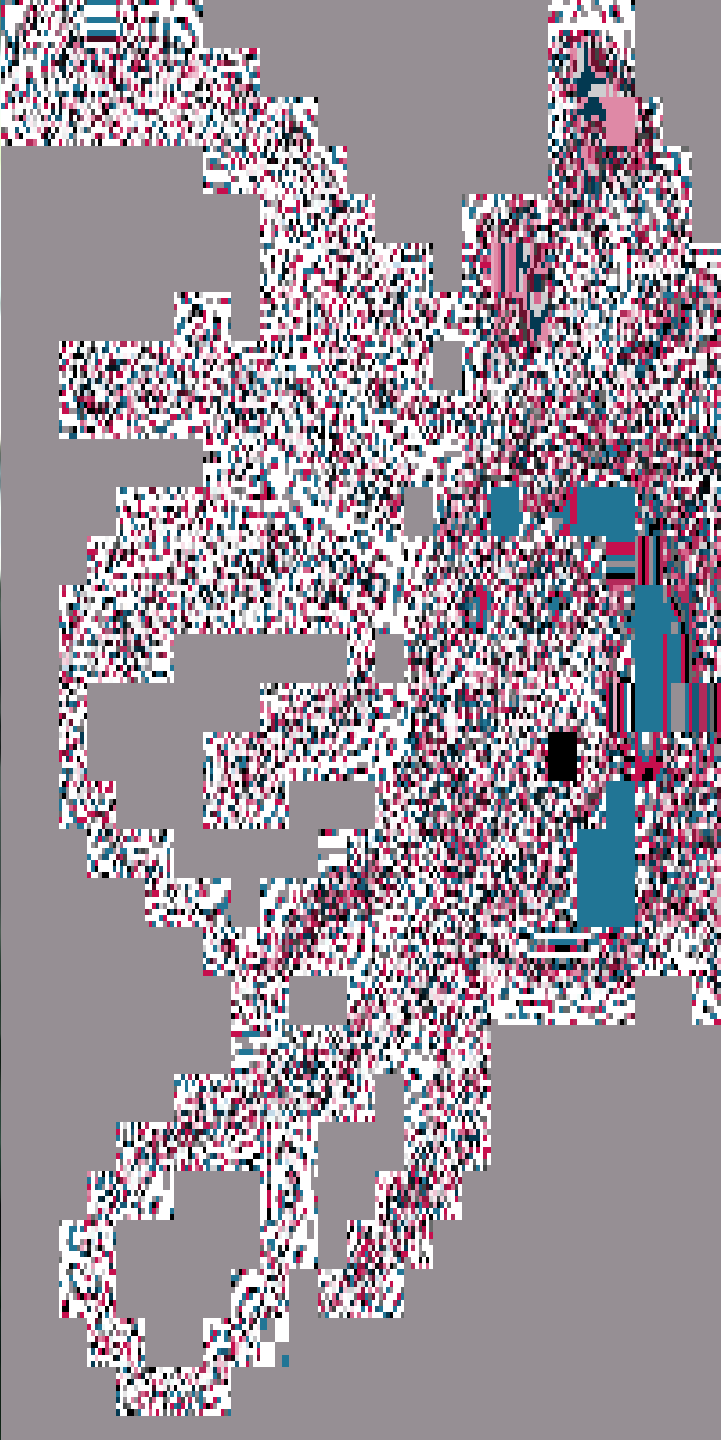


- **Turn over all storage containers**

If going on holiday..



- Cover all toilet bowls



Control of Adult vector mosquitoes

- **Fogging of pyrethroids like pyrethrum**
- **Spraying may be done at the resting sites of the vectors specially in the cow sheds, piggeries, bushes, gardens adjacent to human habitation etc.**

Environmental Management

Small manipulations in the
environmental set up

- Cleaning of weeds from the ponds to prevent the breeding of *Mansonia* mosquitoes.
- Introduction of weedivorous fishes like **Giant Gourami** (*Osphronemus gourami*) and **Grass carp** (*Ctenopharyngodon idella*) is very useful to keep clean the water bodies .





The incidence of *Mansonia* reduced where pistia (water weed) was replaced by *Salvinia* (fern).



Water fern *Azolla pinnata* reduce oviposition, egg hatchability of mosquito and ultimately control mosquito population.



Different bio-control agents of Mosquito



FISH



Carrasius auratus

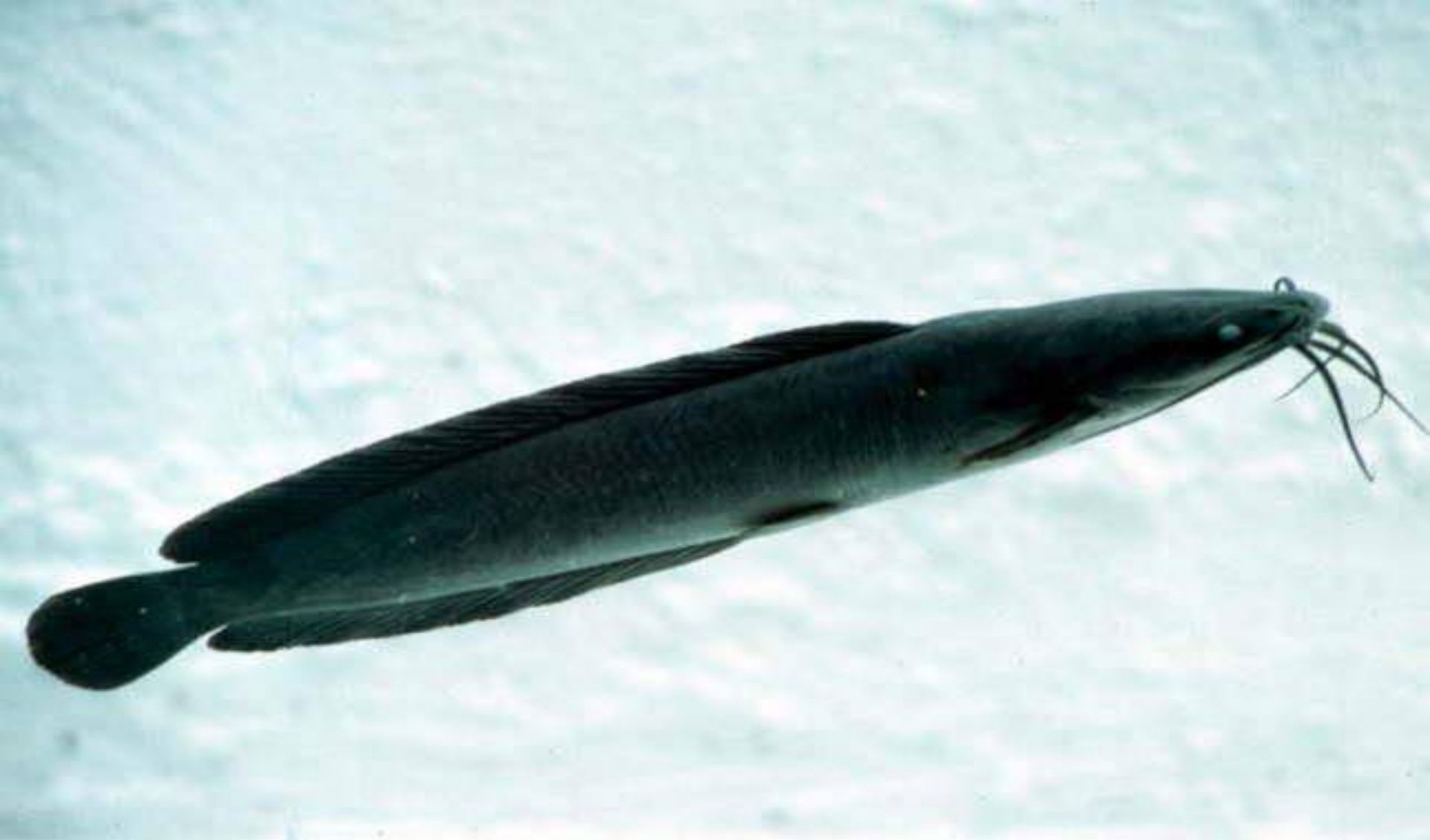
An. subpictus-193, *Cx. quinquefasciatus*-188, *Ar. subalbatus*-132

(Under Laboratory conditions)



Oreochromis niloticus niloticus

**Dip density reduced to 17.38 and 11.39 after 30 and 45 days
from initial value of 26.78(n=20)**



Clarias batrachus

Cx. quinquefasciatus - 43 (Under laboratory conditions)



Heteropneustes fossilis

Cx. quinquefasciatus - 46 (Under laboratory conditions)



Anabas testudineus

Cx. quinquefasciatus- 34



Gambusia affinis

An. subpictus - 65, *An. culicifacies* - 87 *An. freeborni*-95%,
An. pulcherrimus - 40% (larva in field conditions)



Xenentodon cancila

An. subpictus-31, *Cx. quinquefasciatus*-28,

Ar. subalbatus-21

(Under Laboratory conditions)



Poecilia reticulata

An. subpictus-32 (Under Laboratory conditions)

Dip density reduced to 13 from 65/
month-*An. subpictus*

Reduced breeding habit of *An. stephensi* and *An. subpictus* in containers by 86%

Fish Culture in Paddy Field





Aplocheilus panchax (Techokho)

Insects, Nematodes and Protozoans



DRAGONFLY

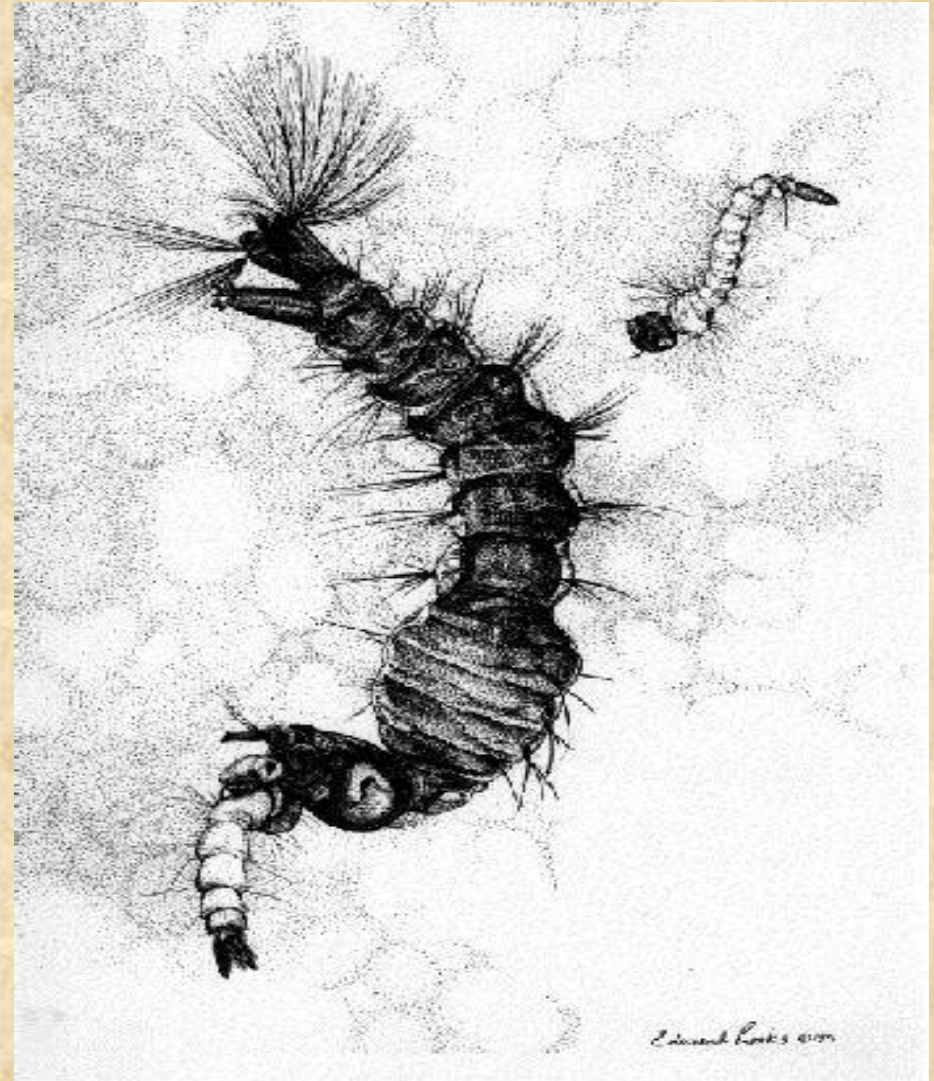


DAMSELFLY

Acilius sulcatus



Toxorhynchites larvae

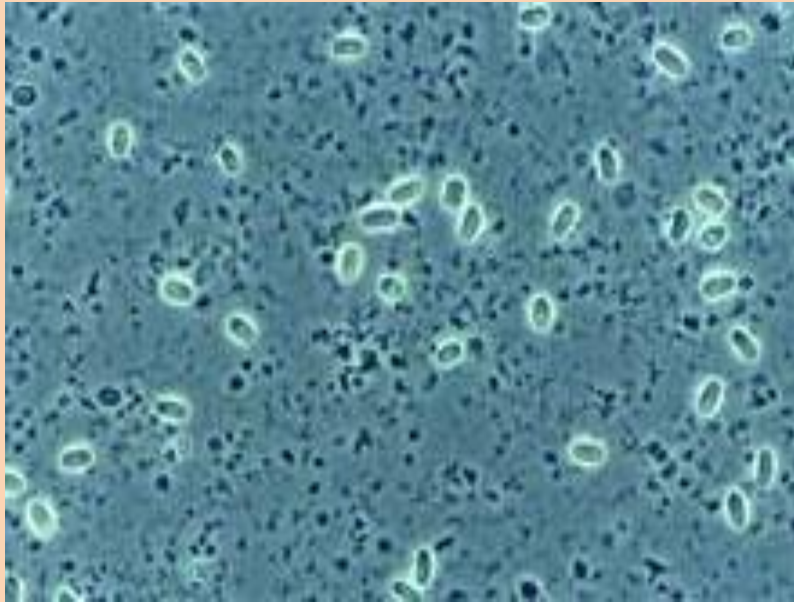




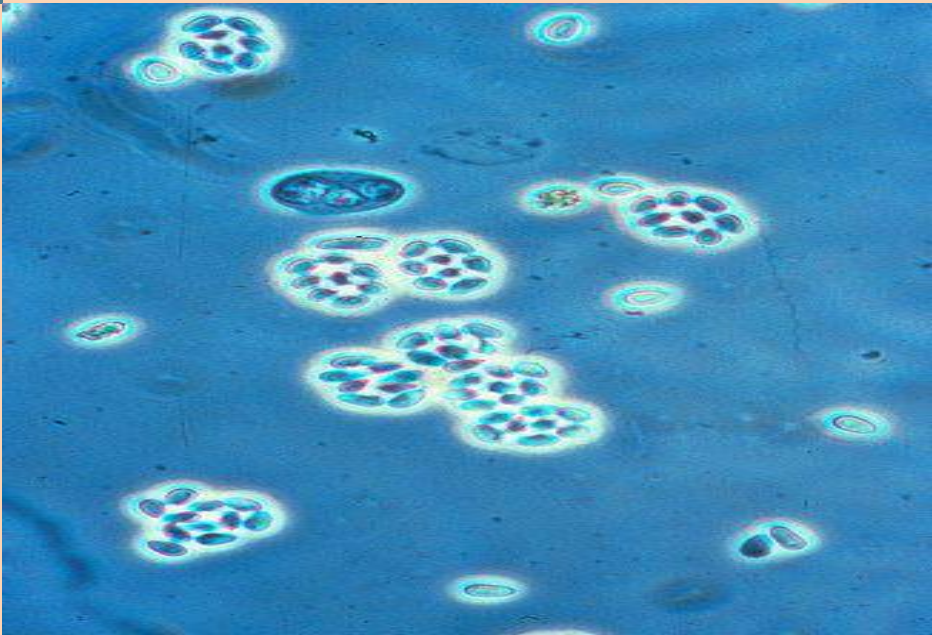
Adult Toxorhynchites



Romanomermis iyengari

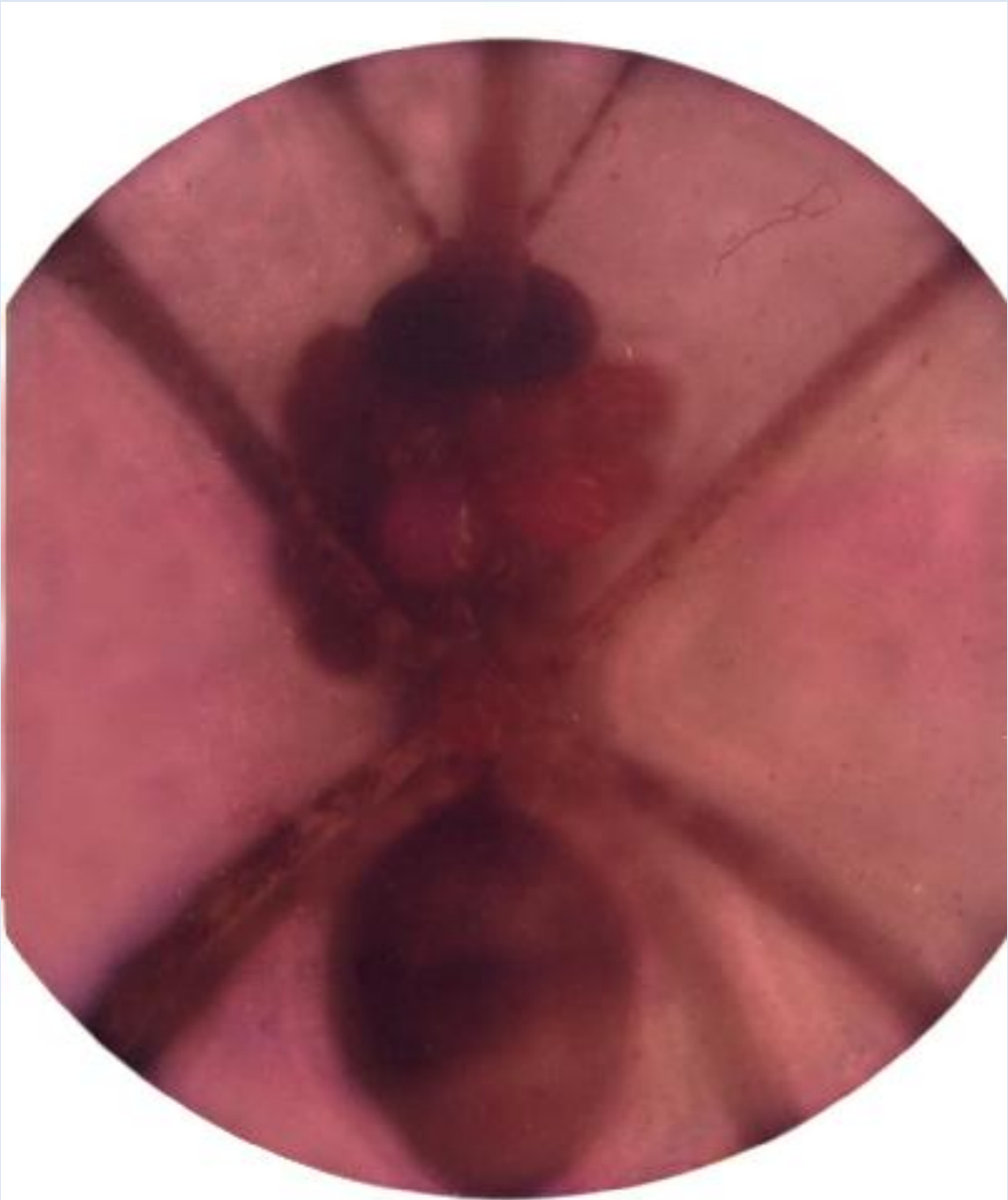


**Mosquito killing
Protozoa**



Coelomomyces





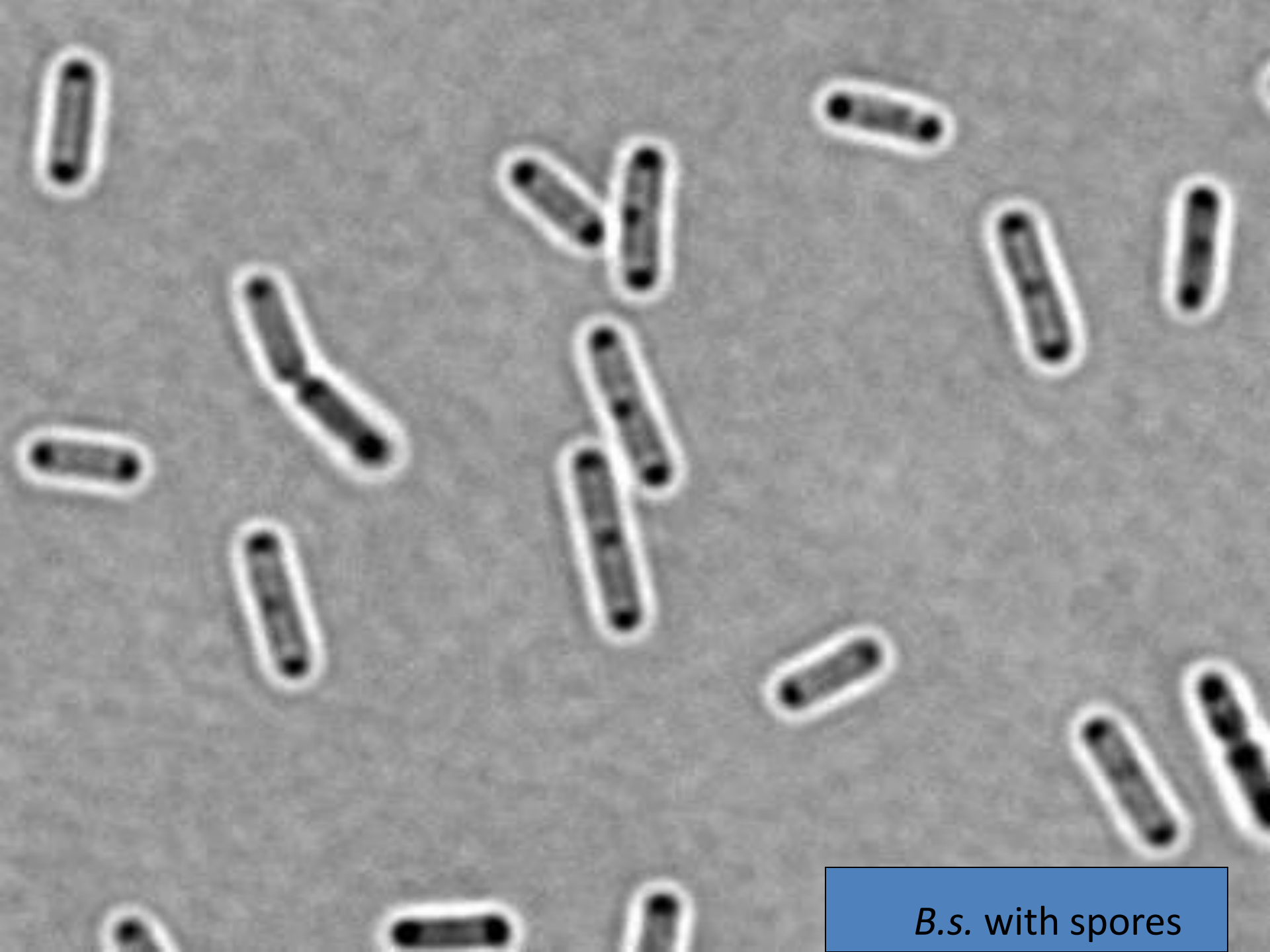




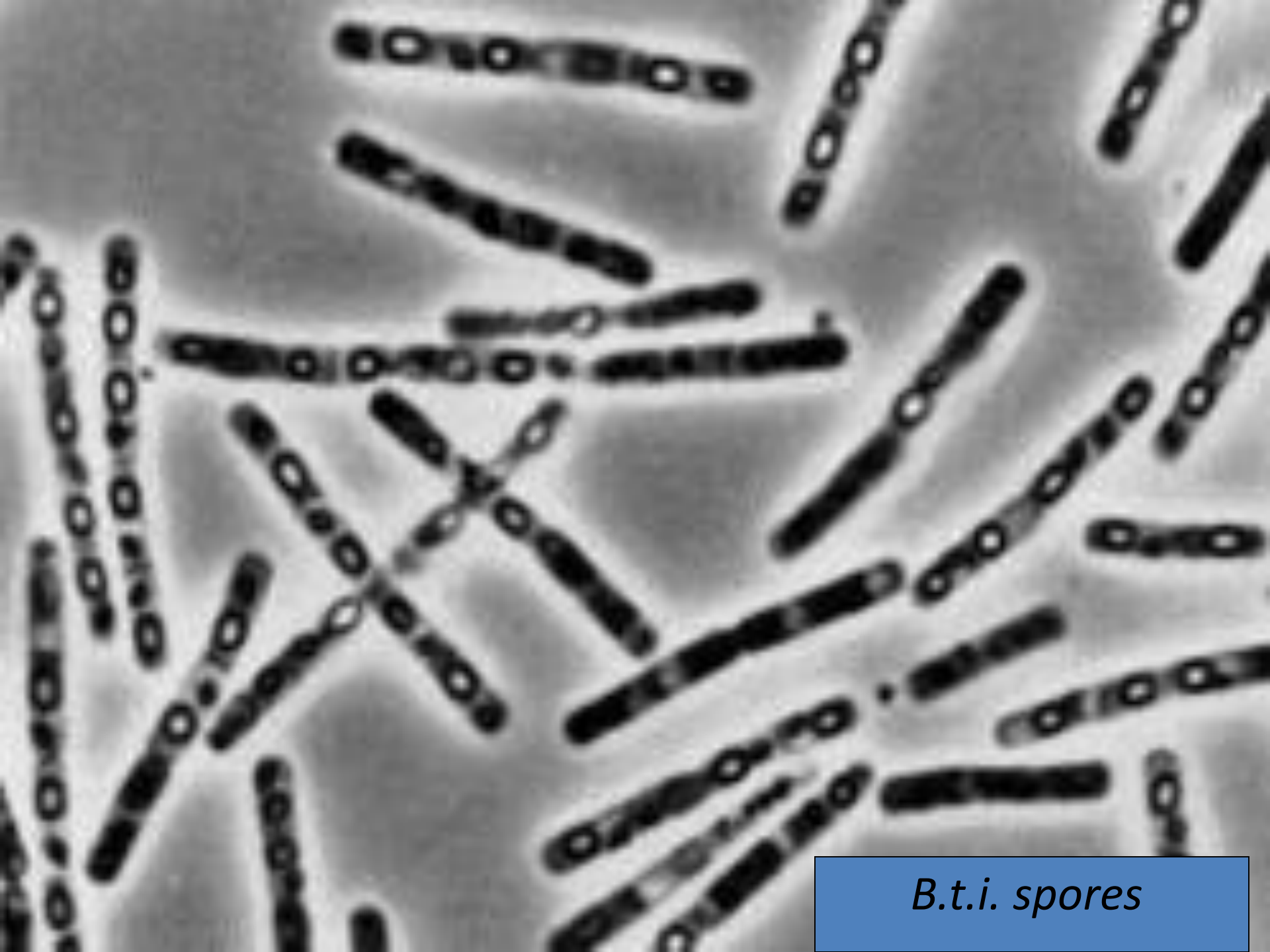




Bacillus sphaericus



B.s. with spores



B.t.i. spores

Bacillus thuringiensis var israelensis (Bti) is a bacterium that specifically targets mosquitoes in their larval stage, but is harmless to beneficial insects, wildlife, humans, pets or livestock

Bti is eaten by the mosquito larva

Bti can be applied to almost any aquatic habitat without environmental impact concerns



Some common Bti products

Dose of Different Bti Products

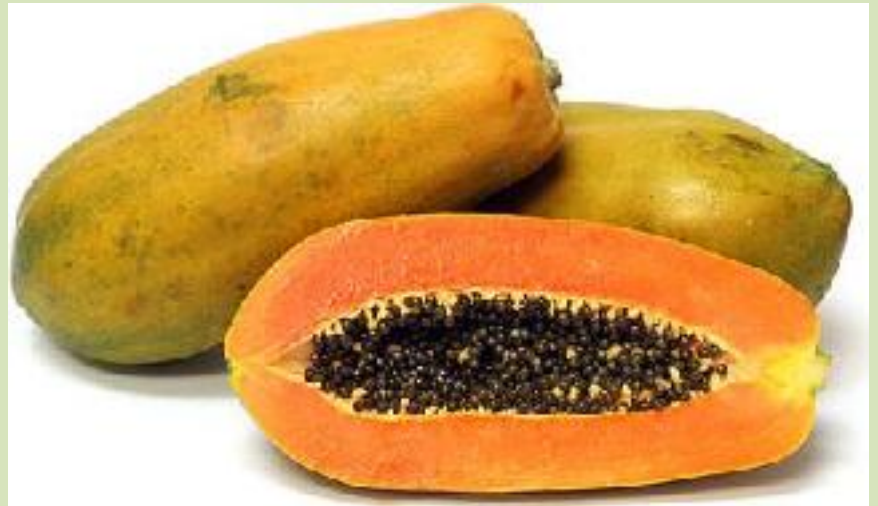
AQUABAC® 200G *Bti* - can be applied by hand broadcast or a hand spreader in smaller areas, or by standard ground or aerial dispersing methods for larger areas. Manufacturer recommends an interval of 7 to 14 days between applications



Mosquito Dunks

Mosquito Dunks- Use 1 dunk/100 sq. ft. of infested water. Mosquito Dunks also can be used as a pre flood treatment in areas expected to become breeding sources

Natural Products





V.B.D
Challenge →



Expert



Doctor



H. Worker



Technologist



Municipality



Common people



[We shall overcome
if we go together.]

Thank you
Thank you



Gary Byrde