Entomology for the clinician

Introduction and talk outline

What is entomology?

Recognition of disease vectors
- mosquitoes
- ticks and mites
- lice and bugs
- biting flies & myiasis

Envenomisation due to arthopods

Delusory parasitosis

What is entomology?

“The scientific study of insects”

Generally encompasses other arthropods:

- arachnids
- (snails)

Clinical relevance?

- disease vectors
- biting + stinging nuisance
- allergic reactions
- envenomation
- psychological issues

Mosquitoes

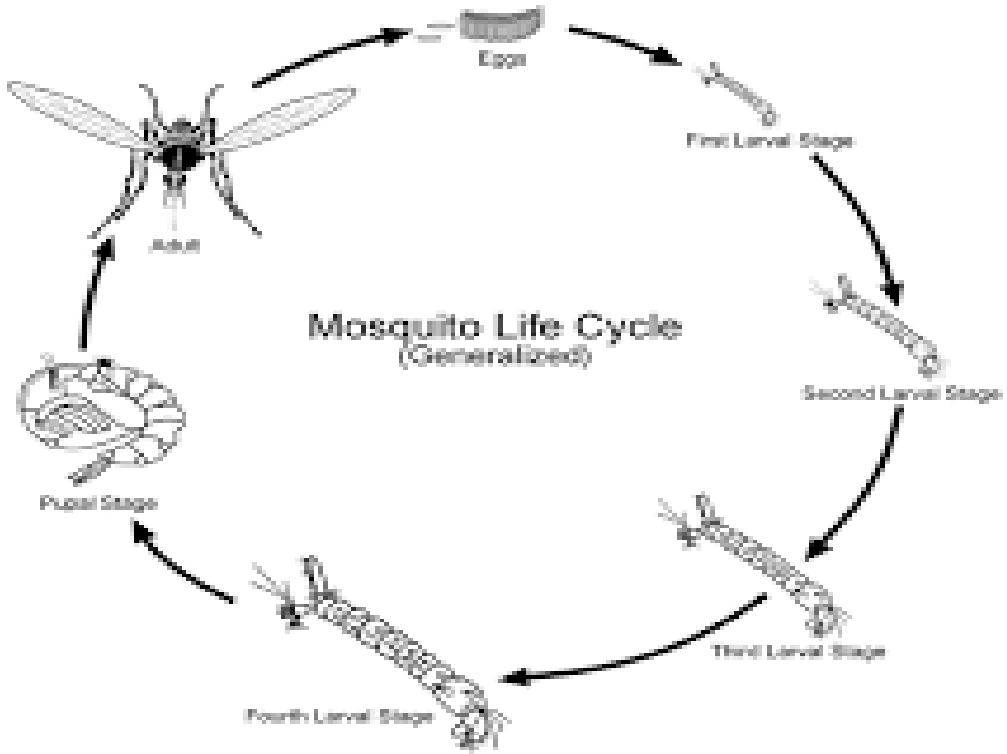
Major disease vector

- malaria
- dengue
- yellow fever
- filariasis
- Japanese encephalitis…

Large variability in species with different behaviour and ecology

- implications for disease control

We will look at *Anopheles*, *Aedes* & *Culex*



Note:
Each larval stage is larger than the previous one. Molting occurs between each larval and pupal stage.
Larval and pupal stages are aquatic.

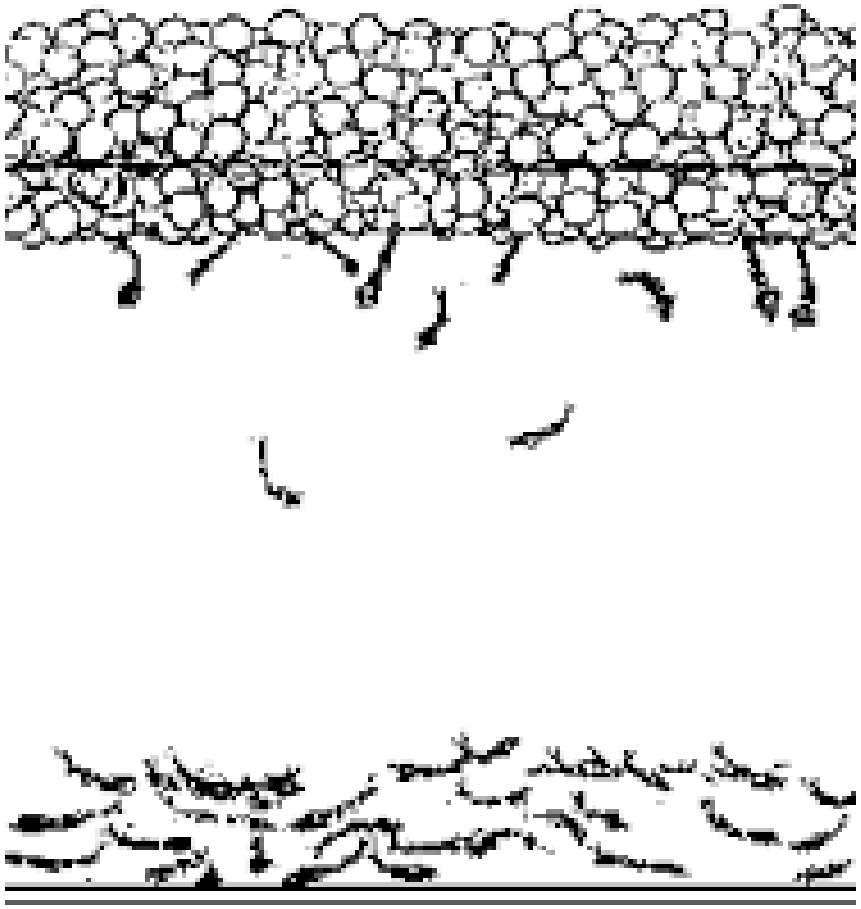
Anopheles sp.

Major malaria vector (*An. gambiae)*
“Abdomen in the air”
Typically bite at night
An. gambiae breeding sites difficult to target
Bed nets have had a major impact
Can also transmit filariasis

Culex sp.

Vector of JEV, WNV + filariasis
Biting nuisance
“Head out of line of body”
Plain brown body and unspotted legs
Commonly breed in stagnant dirty water (pit latrines etc)
Targeting breeding site can be successful

Culex control



Aedes sp.

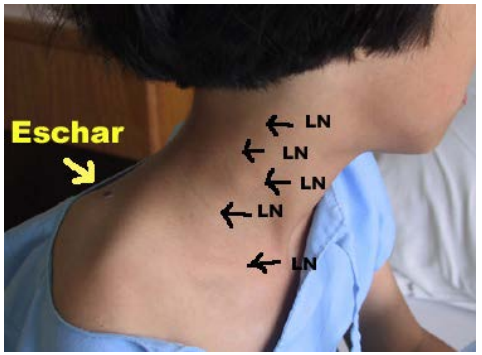
Vector for dengue, chikungunya and yellow fever
"Head out of line of body" (culicine)
Black and white patterns
Ae. aegypti vs. *Ae. albopictus*
Standing water in homes – breeding sites
Vector control – personal repellents
?Potential role of Wolbachia

Ticks

Small arachnids
Ixodidae (hard ticks) & Argasidae (soft ticks)
Wide range of diseases – Lyme, RMSF, babesiosis, Crimean Congo haemorrhagic fever…
Need to remove attached tick carefully
Tick control difficult - ?guineafowl…
Insect repellents (DEET) and appropriate clothing can help protect
Potential role for prophylactic doxycycline

Mites

Small arachnids
Range of diseases: scabies, scrub typhus
"Chiggers"
House dust mite implicated in allergy
Demodex mites may have a role in rosacea
Wearing long clothing and DEET-containing repellents can prevent bites



Lice

Small wingless insects
Cause Pediculosis
Head lice and pubic lice not implicated in disease transmission (cause itching)
Body louse: epidemic typhus, trench fever, louse-borne relapsing fever
Delousing – malathion, permethrin

Bugs

Hemiptera or “true bugs”
Bed bugs: biting nuisance and spreading problem
- theoretical risk of hepatitis B transmission

Reduviid bugs (assassin bugs or kissing bugs) vector of Chagas disease (*Trypanosoma cruzii)*

Other biting flies

Simulium (black fly) – vector of onchocerciasis
Tsetse fly – vector of human African trypanosomiasis
Sandfly – vector of leishmaniasis

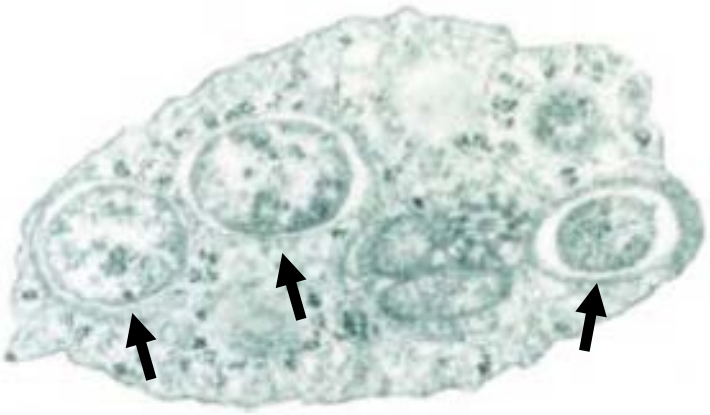
Bite prevention

DEET-based (N,N-diethyl-3-methylbenzamide) repellents best
- 10-35% probably OK for most instances
- 20% picaridin is an alternative (but less effective)
- use of permethrin-treated clothing
- regular inspection of skin for ticks important
- Botanical devices and electronic devices not effective

Bed nets

Antihistamines and topical corticosteroids for bite reactions

Wolbachia – common intracellular bacteria infecting invertebrates



***Wolbachia* bacteria within an insect cell**




Specific to invertebrate host
Normally symbiotic
Spread from mother to offspring

Article

Cell

A *Wolbachia* Symbiont in *Aedes aegypti* Limits Infection with Dengue, Chikungunya, and *Plasmodium*

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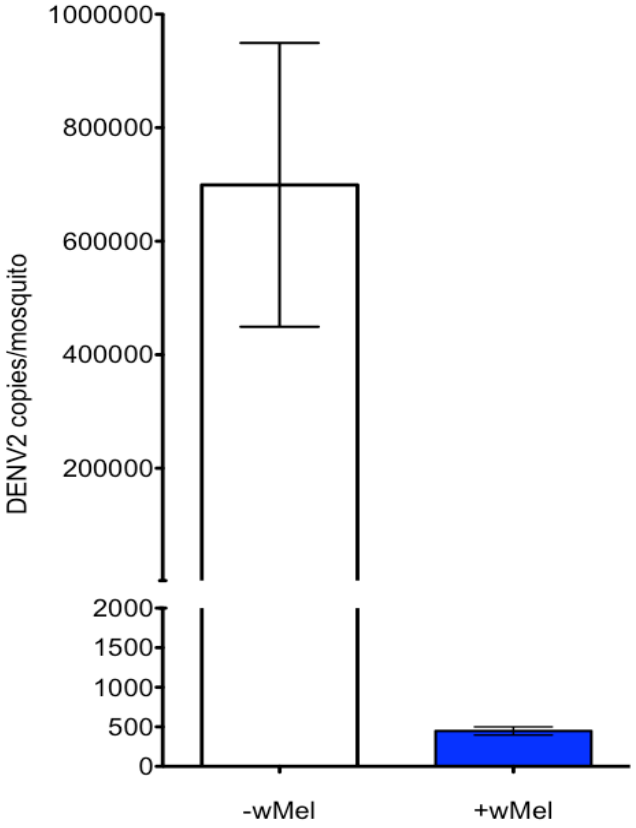
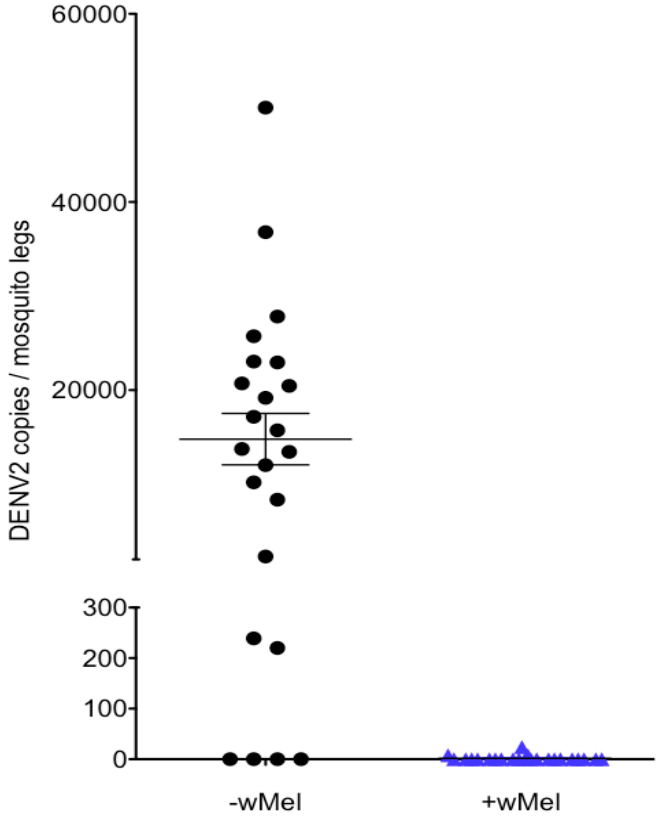
Summary

Wolbachia are maternally inherited intracellular bacterial symbionts that are estimated to infect more than 60% of all insect species. While *Wolbachia* is commonly found in many mosquitoes it is absent from the species that are considered to be of major importance for the transmission of human pathogens. The successful introduction of a life-shortening strain of *Wolbachia* into the dengue vector *Aedes aegypti* that halves adult lifespan has recently been reported. Here we show that this same *Wolbachia* infection also directly inhibits the ability of a range of pathogens to infect this mosquito species. The effect is *Wolbachia* strain specific and relates to *Wolbachia* priming of the mosquito innate immune system and potentially competition for limiting cellular resources required for pathogen replication. We suggest that this *Wolbachia*-mediated pathogen interference may work synergistically with the life-shortening strategy proposed previously to provide a powerful approach for the control of insect transmitted diseases.



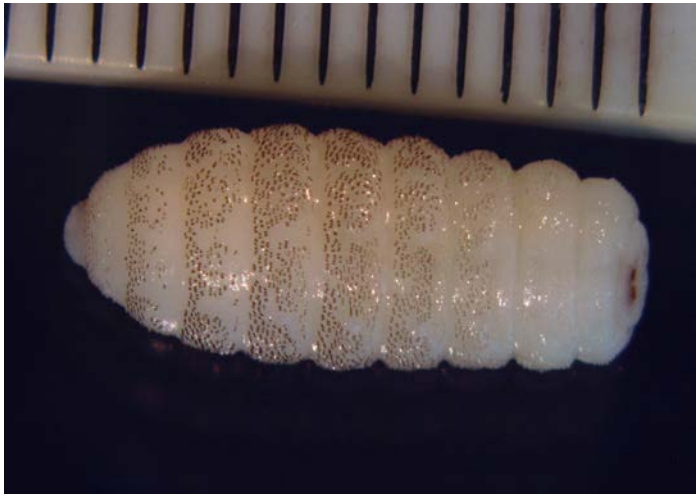
Total DENV levels for *w*Mel-infected females is ~1500 fold fewer than wildtypes



Overall disseminated virus levels in the legs of *w*Mel-infected females were ~2600 fold lower than in wildtype mosquitoes:

A 40 year old man presents to your hospital

- Usually fit and well
- 1 week of an itchy swelling on his forearm
- Saw GP: prescribed flucloxacillin – not better
- Day before presenting extracted a “maggot” from his arm…
- No travel outside London for 1 year
- What else do you want to know?
- What would you do?



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Case Report

The dangers of an adventurous partner: *Cordylobia anthropophaga* infestation in London

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ABSTRACT

We describe a case of cutaneous myiasis caused by *Cordylobia anthropophaga* acquired in the UK from contact with another person's clothes. We propose that this diagnosis should be considered in both returning travellers and also their household contacts.

1. Introduction

Cutaneous myiasis is occasionally seen in travellers from endemic areas.[1] We report a case of cutaneous myiasis acquired in the UK after contact with clothes of a returning traveller. We propose that this diagnosis should be considered both in travellers with skin lesions and also their household contacts.

2. Case report

A previously healthy 40-year-old man presented to our tropical medicine clinic on 29 April 2009 after extracting a maggot from his forearm. In the week prior to presentation he had developed an itchy swelling with associated erythema on his right forearm. He attended his local emergency department where it was thought that he had scratches from gardening that had become infected. He was prescribed flucloxacillin which did not help his symptoms. The following day he saw his general practitioner (GP) and was given a tetanus booster and advised to place the forearm in hot water to help the swelling. After taking his GP's advice he was alarmed to see a maggot protruding from his forearm. Remaining calm he used a pair of tweezers to extract the intact maggot, which he took to his doctor. His GP had seen similar cases when he lived in Africa and referred him to the Hospital for Tropical Diseases. The maggot was identified as a third instar larva of *C. anthropophaga* (Figure 1). On review of our patient's travel history he had been no further afield than Italy. However his partner had recently returned from a trip to rural Uganda. She had washed her clothes but had not ironed them.

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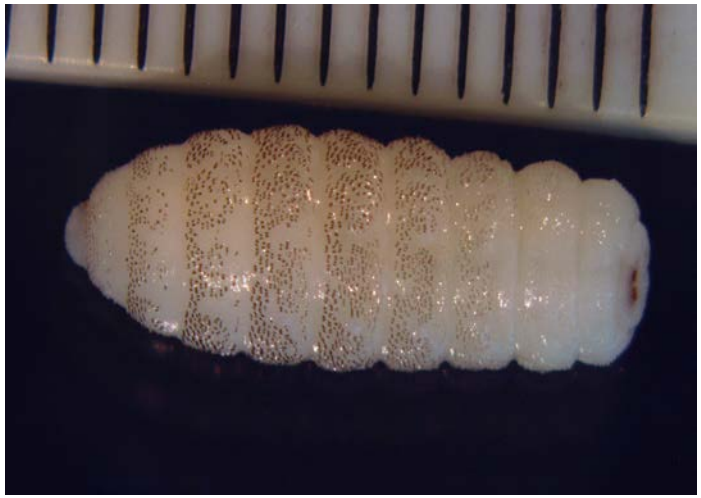
Myiasis

Parasitic infection of the body by fly larvae
Cutaneous myiasis quite common
Other forms rarer – associated with necrotic wounds
Tumbu fly myiasis prevented by ironing clothes
Tumbu larvae can be removed by applying petroleum jelly and use of tweezers; bot fly larvae more difficult to extract…
Myiasis = major problem in agriculture (screw worm)



Delusional parasitosis

Delusional belief that the sufferer is infested with parasites

Form of psychosis – also called Ekbom's syndrome

Prominent symptom is "formication" – sensation that something is crawling on the skin

"Matchbox sign"

Can be treated with antipsychotic drugs but patients may resist the diagnosis

Insect/arachnid envenomation

Scorpion envenomation

Mild envenomation: analgesia, cleansing of sting site, tetanus booster + observation

Severe envenomation: restlessness, muscle fasciculation, cranial nerve dysfunction and hypersalivation

Severe disease – intensive care management; antivenom for severe envenomation

Management of spider bites

Medically important spiders: widow spiders, recluse spiders, Australian funnel web spiders

Most bites just require analgesia and supportive care – recluse spider bites can become necrotic

Widow spider bites cause severe muscle pain – severe abdominal pain with rigidity can mimic acute surgical abdomen (latrodectism)

Widow antivenom can reduce pain and need for hospitalisation