


Biomedical Parasitology

Mites



Prof Peter O'Donoghue

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MITES

Over 30,000 species described
 Many free-living, some parasitic on plants/animals

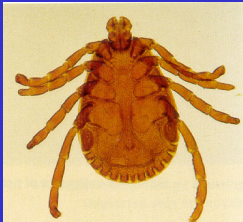
Species parasitic on animals may:

- feed on skin debris or suck lymph (anaemia)
- burrow in skin (dermatitis, mange/scabies)
- live in hair follicles (alopecia)
- live in ear canals (otitis)
- common cause of allergies (eczema)

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ARACHNIDS
 (two main assemblages)

TICKS



macroscopic in size
toothed, exposed hypostome

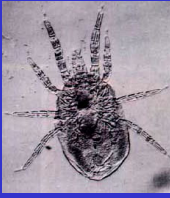


MITES



microscopic in size
unarmed, hidden hypostome

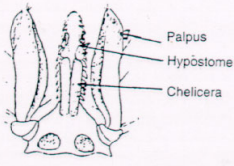
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MITES

MESOSTIGMATA	PROSTIGMATA	ASTIGMATA
		
lateral respiratory spiracles (stigmata)	anterior respiratory spiracles	respire through tegument

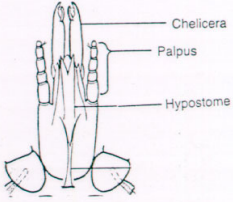
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TICKS



macroscopic in size
hypostome toothed
hypostome exposed

MITES


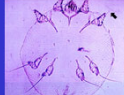


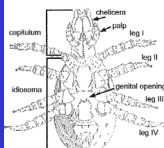


microscopic in size
hypostome unarmed
hypostome hidden

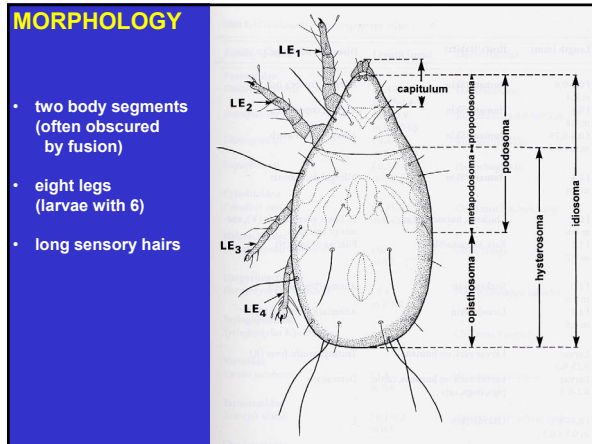
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General morphology

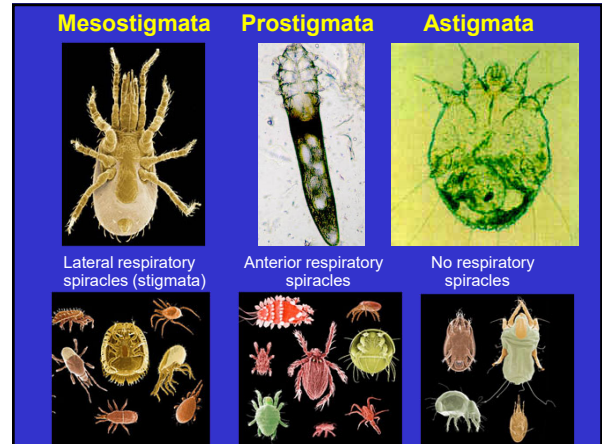
- Mites are small (<1mm) arachnids (subphylum Chelicerata) related to spiders
- Two body segments:
 - Capitulum: mouthparts & sensory palps
 - Idiosoma: abdomen, legs, eyes, anus, etc
- No wings, no antennae; simple eyes or no eyes
- Adults & nymphs have 4 pairs of legs
- Larvae have 3 pairs of legs

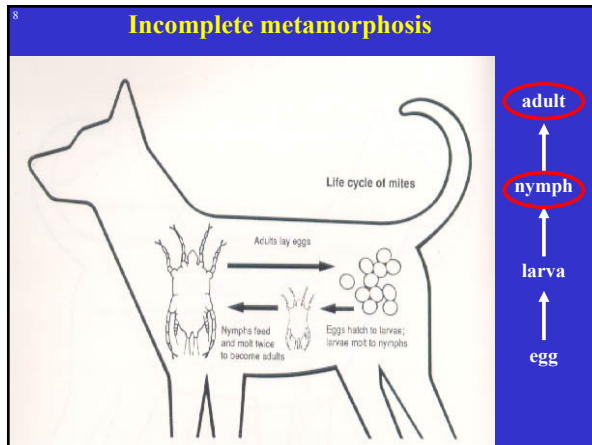
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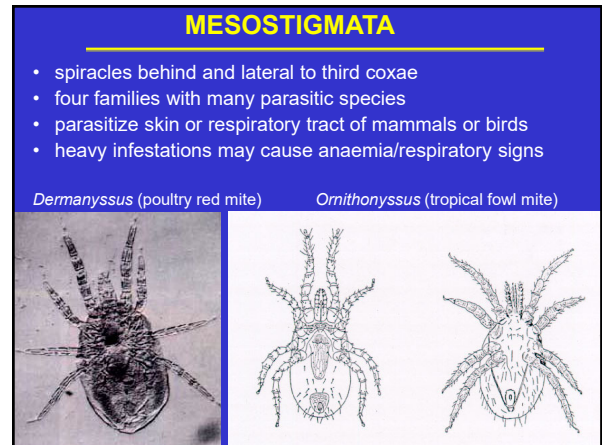
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Diversity of mite fauna

- Extremely abundant & diverse
> 50,000 species described
- Most mites are free living
- Some are plant pests
- Some are parasitic on animals
- Parasitic species are in all 3 suborders:
 - Mesostigmata
 - Prostigmata
 - Astigmata

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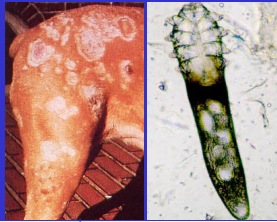
PROSTIGMATA

- spiracles anterior between chelicerae or on dorsum
- tips of palps modified into 'finger-and-thumb' claws
- five families with most species parasitic
- infest skin of mammals and birds (sometimes in feathers)
- heavy infestations may cause pruritis/dermatitis
 - *Demodex* (dog follicle mite)
 - *Psorergates* (sheep itch mite)
 - *Syringophilus* (poultry quill mite)
 - *Trombicula* (itch mites)

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Demodex

- demodectic mange
- mites in hair follicles and sebaceous glands
- intense irritation
- hair loss
- thickened wrinkled skin
- abscesses (secondary infections)
- difficult to eliminate



Eggs	Larvae	Nymphs I	Nymphs II	Adults

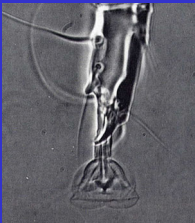
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Eggs	Larvae	Nymphs I	Nymphs II	Adults

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ASTIGMATA


- lack tracheal systems, respire through tegument
- lack claws but have suckers at end of legs
- four families with many species parasitic
- infest skin of mammals and birds
- cause range of severe skin infections
 - *Psoroptes* (psoroptic mange)
 - *Chorioptes* (chorioptic mange)
 - *Otodectes* (otodectic mange)
 - *Sarcoptes* (scabies/sarcoptic mange)



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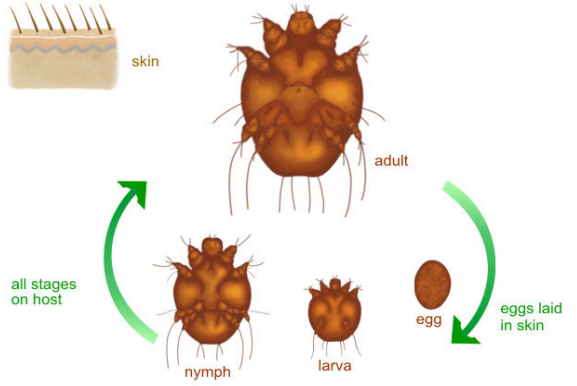
Host specificity

- Mites infest mammals, birds, reptiles, amphibians, insects and spiders



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Mite life-cycle: incomplete metamorphosis



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red bee mite



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Animal parasites

- Most parasitic mites infest a broad range of hosts
- Live on/under skin, in hair follicles or in respiratory tract
- Many species, both parasitic & free-living, bite humans if opportunities arise
- Feed only on fluids - external digestion, sucking blood, lymph or predigested skin
- Spread via close contact

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Mites of vet. importance

- *Demodex* spp. - dog follicle mites
- *Psoroptes* spp. - psoroptic mange mites
- *Chorioptes* spp. - chorioptic mange mites
- *Dermanyssus* spp. - poultry red mites
- *Ornithonyssus* spp. - tropical fowl mites
- *Psorergates* spp. - sheep itch mites
- *Syringophilus* spp. - poultry quill mites
- *Trombicula* spp. - itch mites

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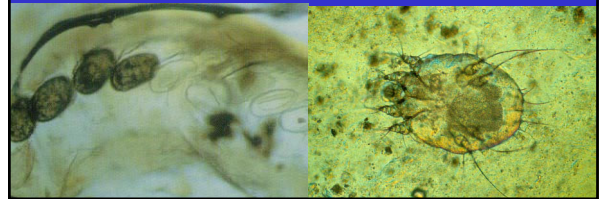
Effects on hosts

- Itching, annoying
- Bites of some species can be sharp and painful
- Skin diseases - mange & scabies
- Heavy infestations cause:
 - Production loss in animal industry
 - Death through blood loss in birds
- Predispose to secondary infection
- Vectors of diseases (protozoa, bacteria & viruses)

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Sarcoptes scabiei

- circular mites
- all legs are short
- parasites of homiotherms
- subspecies apparently host-specific
- infest horny layer of skin
- cause sarcoptic mange (animals), scabies (humans)



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Mites of medical importance

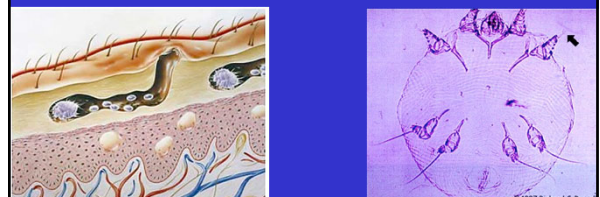
- Human itch mite, *Sarcoptes scabiei* - scabies
- Chiggers, *Leptotrombidium* spp. - scrub typhus
- House-dust mites - >20 species, cause allergies and asthma, affect 50-100 million people worldwide - not parasitic



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Sarcoptes scabiei

- Astigmata
- 7 subspecies parasite human and domestic animals (subspecies apparently host specific)
- Round body shape, short legs
- Burrow into skin; spend entire life cycle on host
- Cause scabies in humans & sarcoptic mange in animals



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Sarcoptic mange

- female mites burrow in skin
- lay eggs in tunnels
- mites puncture skin
- feed on lymph and skin cells
- irritation, intense itching/scratching, dermatitis
- exudate coagulates and dries to a crust
- hair loss, skin thickened, wrinkled
- weight loss, emaciation, death



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Sarcoptic mange

- Often in sheep and dogs
- Intense itching and crusting
- Host scratching cause hair loss and skin damage, weight loss, death



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Scabies in humans

- epidemics in 20 year cycle (esp. in times of war/famine)
- interdigital spaces, backs of hands, elbows, groin, breasts, umbilicus, penis, back, buttocks
- intense itching (nocturnal)
- scratching may cause weeping, bleeding
- characteristic rash (use ink to demonstrate burrows)
- vesicles and crusts form
- thickening of skin
- septic pustules can develop (secondary infections)




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A street dog in Bali, Indonesia suffers from sarcoptic mange



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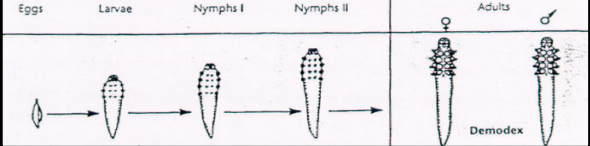
SCABIES – topical problem in nursing homes



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Demodex spp.

- Prostigmata
- 65 species (2 on humans, 1 on dogs)
- Worm-like body shape
- Live in hair follicles and sebaceous glands
- Cause demodectic mange
- Intense irritation, hair loss, thickened skin

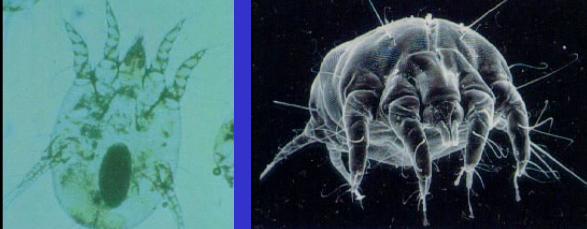



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Psoroptes spp.


- parasitic on various domestic animals
- oval mites
- short rear legs with long setae
- cause psoroptic mange



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Psoroptic mange

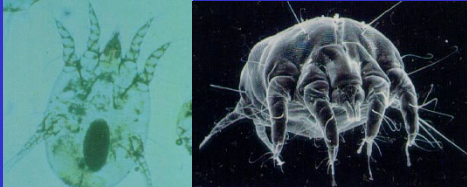
- Often called sheep scab or cattle scab
- Worse than sarcoptic or chorioptic mange
- Extreme itchiness, followed by scabbing & crusting
- Weight loss, decreased milk production, increased susceptibility to other diseases
- Calves may die if not treated



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Psoroptes spp.

- Astigmata
- 5 species recognized
- Parasitize cattle, sheep, goats
- Oval body shape
- Short rear legs with long setae




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Chorioptes spp.

- infest various domestic animals
- resemble *Psoroptes* but smaller and live on lower body
- short posterior legs with long setae
- cause chorioptic mange




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Psoroptic mange

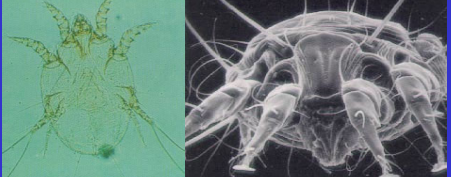
- mites do not burrow
- pierce skin
- suck exudates at bases of hairs
- cause severe inflammation
- host fluids congeal forming scabs
- provide cover for mites



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Chorioptes spp.

- Astigmata
- 5 species described
- Infest cattle, sheep, goat, horse, camel, & wild herbivores (e.g. giant panda, elephant)
- Short posterior legs with long setae
- Cause chorioptic mange




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Chorioptic mange

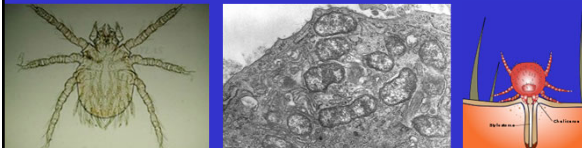
- milder disease than psoroptic or sarcoptic mange
- mites feed on skin debris and lymph
- scabs/scales develop on lower body and legs
- infestations common around:
 - base of tail in cattle
 - legs of horses (leg mange)
 - scrotum of sheep (itchy balls)



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Leptotrombidium deliense


- Prostigmata
- Trombiculids live in heavy scrub vegetation
- Only larvae bite people, inject enzymes to digest cellular contents, and then suck up slurry
- Do not burrow into the skin or suck blood
- Transfer *Orientia tsutsugamushi* - scrub typhus
- Mortality 5-60% without treatment



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Chorioptic mange

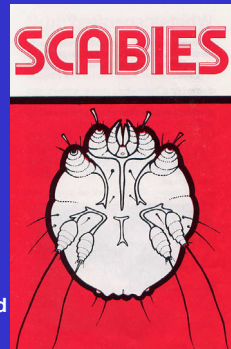
- Milder disease than sarcoptic and psoroptic mange
- Mites feed on skin debris and lymph - not burrowing
- Scabs/scales develop on lower body and legs
- Infestations common around:
 - Base of tail in cattle
 - Legs of horses (leg mange)
 - Scrotum of sheep (itchy balls)



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TREATMENT


- conventional insecticides
 - malathion
 - benzene hexachloride
 - crotamiton for infants
 - benzyl benzoate
- new generation drugs
 - flumethrin (trombiculid mites)
 - amitraz (demodectic mites)
 - phoxim (chorioptic mange)
 - moxidectin (psoroptic mange)
 - ivermectin (sarcoptic mange)
 - rotenone shampoo (scabies)
- topical steroids must not be used
- improved hygiene
- education



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Dermanyssus spp. & Ornithonyssus spp

- Mesostigmata
- ~50 species infest birds and rodents
- Significant parasites for poultry industry and pet birds
- Blood suckers
- Parasitize skin or respiratory tract
- Heavy infestations may cause decrease in egg production, anaemia & respiratory signs



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SUMMARY

MITES

- microscopic parasites in skin
- feed on host lymph/blood/skin

Mesostigmata (lateral spiracles)

- bird mites *Dermanyssus*
- feather loss, anaemia

Prostigmata (anterior spiracles)

- itch mites *Trombicula*, *Demodex*
- intense pruritis

Astigmata (no spiracles)

- mange mites *Chorioptes*, *Psoroptes*, *Sarcoptes*
- scabies in humans *Sarcoptes*
- pruritic dermatitis

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