Arthropods in Dermatology
• Arthropods are nature's joint-footed animals that possess a hard, armor-like outer skeleton.
• The arthropods comprise about 95% of all known animal species.
• Arthropods include:
  ■ Insecta
  ■ Crustacea (water-dwelling crabs, shrimp, crayfish and lobsters, and land-dwelling isopods or sowbugs)
  ■ Diplopoda [dip-low-POH-dah] (millipedes)
  ■ Chilopoda [ki-low-POH- dah] (centipedes)
  ■ Arachnida (mites, ticks, spiders, and scorpions)
  ■ Xiphosura (horseshoe crabs)
  ■ extinct class Trilobita (trilobites).
Principles of Animal Classification

- All living organisms can be divided into groups (classified) for purposes such as identification.
- The creation of artificial categories helps us achieve a better understanding of the relationships among the many types of living organisms.
Postal Classification
Nation—US
State—Michigan
City—Lansing
Street—Peggy Place
Number—1915
Surname—Dunn
First Name—Gary

Insect Classification
Kingdom—Animalia
Phylum—Arthropoda
Class—Insecta
Order—Diptera
Family—Muscidae
Genus—Musca (fly)
Species—domestica
Classification

- King = Kingdom
- Phillip = Phylum
- Came = Class
- Over = Order
- From = Family
- Germany = Genus
- So? = Species
Key to Major Classes of Adult Arthropods

- **Insects**
  - Typically with **three pairs of legs**, with or without wings, and three distinct body regions.

- **Arachnids**
  - **Four pairs of legs**, no antennae, and head and thorax fused into one large cephalothorax.

- **Millipedes (diplopoda) [dip-low-POH-dah]**
  - More than ten pairs of legs
  - Body cylindrical, long, and wormlike
  - Two pairs of legs on each segment
  - One pair of antennae which is short
Major Classes

- Centipedes (Chilopoda) [ki-low-POH-dah]
  - More than ten pairs of legs
  - Body more-or-less flattened
  - One pair of legs per segment
  - One pair of antennae which is long
Insects (Insecta)

- Members the phylum Arthropoda
- All but 5% of the arthropods are insects.
- Insect bites and stings are prevalent throughout the world.
- Insects are important disease vectors worldwide.
- Insects that bite are the orders:
  - Anoplura (lice)
  - Diptera (flies, mosquitoes)
  - Hemiptera (bedbugs, kissing bugs)
  - Siphonaptera (fleas)
- Insects that sting are of the order:
  - Hymenoptera (ants, bees, wasps)
Pathogenesis

- Immediate reactions of insect bites are commonly related to **histamine, serotonin, formic acid, or kinins**
- Delayed reactions are secondary to the host’s immune response to proteinaceous allergens
- Delayed reactions may lead to papular urticaria in children
- Secondary infection is common.
Clinical features

- Pruritus is significant.
- Lesions are grouped or disseminated 1-4mm urticarial erythematous papules.
- Papular urticaria can be generalized following bites or stings or can be restricted to the area of bite.
- Excoriations are often seen.
Arthropod Bites

- Nodules and vesiculobullous reactions may occur.
- Commonly only one member of a family is affected.
- Most manifestations relate to the immune response rather than the bite or sting.
- Exaggerated papulovesicular and nodular lesions resembling bites have been described in patients with CLL.
Arthropod Bites

- Exaggerated bites/bullae may appear months after the diagnosis of leukemia (CLL)
- Occasionally these exaggerated bites precede the diagnosis of leukemia
- Thus, patients with unusual arthropod reactions should be evaluated for leukemia
- Atrial arrhythmias have been reported with bee stings
- Killer bee attacks can cause myoglobinuria or hemoglobinuria and ATN
Histopathology

- **Wedge-shaped perivascular** lymphoid infiltrate with **eosinophils**.
- Endothelial prominence and overlying **spongiosis** or focal epidermal necrosis.
Papular Urticaria

- Originally described in 1813 by Bateman.
- Term used to describe chronic or recurrent
  - Eruption of pruritic papules
  - Often grouped in irregular clusters
  - Frequently with a seasonal incidence
  - Predominately affects children ages 2-7
- Now believed to be a hypersensitivity reaction to arthropod bites
- They are small 3-10 mm pruritic, urticarial papules, sometimes surmounted by a vesicle
Papular Urticaria

- Lesions generally persist for 2-10 days
- May last from weeks to months or years
- May result in temporary hyperpigmentation
- Form in clusters, characteristically on extensor surfaces of arms and legs
- Pruritus leads to excoriations/scarring secondary to scratching
Papular Urticaria

- Often individuals living in the same household as affected patients will be unaffected
- Suspected causes of papular urticaria include:
  - Digestive disturbances and food allergies
  - Psychologic factors
  - Nasopharyngeal infections
  - Parasites (including arthropods)
Papular Urticaria

- The link to arthropods occurred secondary to:
  - Lesions appearing in the summer months
  - The disease being more common in lower socioeconomic groups
  - The papular urticaria being seen with greater frequency among households with pets
  - The disease being cured by admission to the hospital
Papular Urticaria

- Histologic appearance is the same as persistent insect bite reactions
- The primary lesion starts as an erythematous wheal and is followed by a brownish-red papule
- It is an **allergic hypersensitivity reaction** to arthropod bites
- Therefore, one must be **sensitized** to the parasitic antigen
- With repeated exposure **hyposensitization** occurs and children outgrow the condition
- In adults wheals form but no persistent papule forms
- This condition does not commonly occur in neonates
Papular Urticaria

- Arthropods most commonly linked to papular urticaria are:
  - Cat flea (Ctenocephalides felis)
  - Dog flea (C canis)
  - Human flea (Pulex irritans)
  - Bedbug (Cimex lectularius)
  - Flies and mosquitoes
  - Mites
Differential Diagnosis

- Early varicella
- Scabies
- Prurigo
- Delusions of parasitosis
- Atopic dermatitis
- Papular drug reaction
- Id reaction
- Miliaria rubra
- Allergic contact
- PMLE
Treatment

- Topical steroids -- symptomatic
- Antihistamines
- Oral antibiotics for secondary infection
- Disinfection of pets
- Fumigation of home
- Insect repellent to skin
Lice (Anoplura)

- Pediculosis can be divided into three conditions:
  - Pediculosis capitis (head lice)
    - *Pediculus humanus var. capitis*
  - Pediculosis corporis (body lice)
    - *P. humanus var. corporis*
  - Phthiriasis pubis (pubic lice)
    - *Phthirius pubis*
- Lice range from 1.5 to 4.5 mm in length.
Pediculosis Capitis

- All lice are bloodsucking wingless insects belonging to the order **Anoplura**
- Over 12 million cases in the USA per year
- **Resistance** to standard treatments is rising
- Head lice have been present for thousands of years
  - Nits have been found on hair of both Egyptian and Peruvian mummies
Epidemiology

- Found worldwide
- Higher incidence in:
  - Crowded conditions
  - Children aged 3-11
  - Girls
- African Americans are almost never affected secondary to hair structure
  - African American hair is coarse and curly and does not allow correct oviposition of the female to lay her eggs
Pathogenesis

- Highly host-specific
- They feed on the host blood every 4-6 hours
- The female louse lives 30 days and lays 5-10 eggs per day
- Eggs are laid close to the scalp for warmth
- In warm climates nits can be found larger distances from the scalp
- Nits are attached to the human hair by a proteinaceous matrix.
- Lice will rarely live over 24 hours from the host without a blood meal
Lice

- In the appropriate temperature and humidity nits can hatch up to 10 days from the host
- Head lice are transmitted by
  - Direct contact with fomites such as combs, hats, and bedding
  - Head to head contact
  - Static electricity from combing or removing a sweater can eject the lice the distance of 1 meter!!!!
Lice

- Skin findings are limited to the scalp
- The classic symptom is intense pruritus
- The first infestation can take 2-6 weeks before pruritus is evident
- This is due to development of the body’s immunologic response to the irritant components of the lice saliva or excreta
- In future infestations pruritus begins in the first 24-48 hours
- The diagnosis is made by identification of the nits or adult louse
Lice

- Viable eggs are tan to brown
- Hatched eggs are clear to white
- Hatched eggs must be differentiated from hair casts, dandruff, hair gel, and white piedra
- Patients can present with fever, LAD, and secondary infection
- It is the most common cause of pyoderma of the scalp in some parts of the world
Treatment

- Treatment depends on
  - Efficacy
  - Potential toxicity
  - Louse resistance patterns in the geographic area
- Pediculicides are the mainstay of treatment
- Two applications one week apart are advisable to kill nits that survived
- Fine toothed comb should be used to remove nits
Pyrethrin

- Derived from a natural extract of flower heads of Chrysanthemums
- Crude pyrethrin is expensive
- Thus, piperonyl butoxide (PBO) is added as a synergist to provide the same activity with less pyrethrin
- Name of the combination is **RID**
- PBO slows the biotransformation of pyrethrin by partially inhibiting insect’s cytochrome P450 enzymes and prevents or slows down resistance via the mixed function oxidase (MFO) pathways.

**Patients allergic to chrysanthemums, ragweed or related plants (sesquiterpene lactone) may experience wheezing and dyspnea**
Lice Treatment

- This product is OTC
- Formulated into lotions, shampoos, foam mousse, and cream rinses
- Pyrethrin is applied to the head for 10 minutes then rinsed
- It is **pediculocidal**
- Treatment resistance as high as 88% has been reported
**Permethrin (Elimite, Nix)**

- **Synthetic** pyrethrin
- Has residual activity for 2 weeks following a single 10 minute dose
- 1% permethrin (liquid cream rinse) is available OTC
- It is applied for 10 minutes and rinsed
- It also comes in a 5% cream and is currently the preferred scabicide
- Can be used during pregnancy if needed, but only leave on for 2 hours
- Resistance in increasing
Lindane

- It is a chlorinated hydrocarbon
- It is slow killing
- Comes in 1% lotion, shampoo, or cream
- 1% shampoo should be applied for 4 minutes
- **Resistance is high**
- **Neurotoxicity** is a potential complication in children secondary to prolonged application times, percutaneous absorption in damaged skin, or accidental ingestion
- Should not be used in children below 2 or pregnant or breast feeding women because of possible CNS toxicity
- Contraindicated in scabies with secondary infection or crusting due to increased absorption
Malathion (Ovide)

- An organophosphate that inhibits cholinesterase
- Placed back on the market in 1999
- Ovide is the trade name
- 8-12 hour application time is recommended
- Resistance is increasing in the United Kingdom
- It is the fastest killing pediculicide and ovicide in the US
- It is effective against lice resistance
- FLAMMABLE
Carbaryl

- It is a cholinesterase inhibitor
- Available in a .5% lotion and shampoo
- Not available in the US
- Potentially more toxic to patients than Malathion
Ivermectin

- Antiparasitic agent
- Blocks neurotransmission across nerve synapses that use glutamate or gamma-aminobutyric acid (GABA) as their neurotransmitters
- These nerve synapses are found in **peripheral** motor nerves in insects
- GABA and glutamate are neurotransmitters in the human cerebral cortex
- The **blood-brain barrier and placenta** protect from human toxicity
Ivermectin

- 1% concentration can be applied to scalp for 10 minutes
- 250 ug/kg at two separate times one week apart for resistant cases
- Children less than 15kg or under 2 years of age, pregnant females, or breast feeding mothers should not receive ivermectin
- Can be used topically or orally
Table 84.2 Treatments for head lice. All treatments should be given on two separate occasions, one week apart.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Group</th>
<th>Administration</th>
<th>Risk factors</th>
<th>Efficacy</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permethrin (1%)</td>
<td>Synthetic pyrethroid</td>
<td>10 minutes</td>
<td>None</td>
<td>Fair</td>
<td>Worldwide resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permethrin cream (5%)</td>
<td>Synthetic pyrethroid</td>
<td>10 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrethrins, synergized</td>
<td>Natural botanical</td>
<td>10 minutes</td>
<td>Allergy to chrysanthemums and related plants</td>
<td>Fair</td>
<td>Worldwide resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malathion (0.5%)</td>
<td>Organophosphate, cholinesterase inhibitor</td>
<td>8–12 hours*</td>
<td>Isopropyl alcohol base is flammable</td>
<td>Excellent</td>
<td>Resistance in UK and France</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbaryl (0.5%)</td>
<td>Carbamate</td>
<td>8–12 hours</td>
<td>Cholinesterase inhibitor</td>
<td>Fair</td>
<td>Good, but not approved in the US</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lindane (1%)</td>
<td>Organochlorine</td>
<td>10 minutes</td>
<td>CNS side effects, pregnancy</td>
<td>Poor</td>
<td>Worldwide resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topical ivermectin</td>
<td>Avermectin</td>
<td>10 minutes</td>
<td>None</td>
<td>Appears promising</td>
<td>None noted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral ivermectin</td>
<td>Avermectin</td>
<td>Oral (250 μg/kg)</td>
<td>Avoid if body weight &lt;15 kg, pregnancy</td>
<td>Very good</td>
<td>None noted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* A 10-minute treatment may be sufficient.
Pediculosis Corporis

- It is becoming less common in the general population.
- Body lice is associated with
  - Overcrowding
  - Poor hygiene
  - Poverty
  - Wars
  - Natural disasters
- Body lice are similar to head lice except larger in size.
- *P. humanus corporis* measures 2.4 to 4 mm in length.
- They are found worldwide.
- This is the only louse associated with a lack of cleanliness.
Pediculosis Corporis

- Pediculosis corporis is caused by infestation of humans and their clothing
- They hide in the seams of clothing
- It is not usually on skin except when feeding
- Nits adhere to fibers of clothing
- The back, neck, and waist areas are commonly involved
- Small pinpoint red macules, papules, crusts, and excoriations are seen
- **Maculae ceruleae** can be seen which are bluish brown hemosiderin-laden macules
Pediculosis Corporis

- What is maculae ceruleae?
- Intradermal hemorrhage at sites where lice have fed
- Secondary infection and LAD may occur
- Pus, blood, and fecal pellets often stain clothing and bedding
Pediculosis Corporis

- Body lice are a vector for
  - Epidemic typhus (Rickettsia prowazekii)
  - Trench fever, endocarditis (Bartonella quintana)
  - In immunocompromised patients
    - Chronic bacteremia and Bacillary angiomatosis (B. quintana)
    - Relapsing fever (Borrelia recurrentis)
- Transmission of these diseases is secondary to scratching the feces of the louse into the bite not from the bite itself
- They can also be transferred by inhalation of dry, powdery louse feces from infected bedding and clothing.
Treatment

- The **clothing** rather than the patient requires treatment
- **Disinfestation** of all clothing and bedding is required
- Clothing can be fumigated or heated to temperatures of 65 C for 15-30 minutes
- Hot ironing of seams of couches and coats should be done
- Re-exposure to infested items should be avoided for 2 weeks
- In crowded large populations delousing can be done by dusting powders
Crab Lice

- Crab lice date back to prehistoric times
- Incidence is slightly higher in men
- The highest prevalence is in homosexual men
- Most frequently seen in the 15-40 age group secondary to increased promiscuous sexual activity
Crab Louse (Phthirus pubis)

- Transmitted by sexual contact, clothing, or infested hairs
- They are not limited to the pubic regions
- Can be found on other short hairs
  - Body hair
  - Eyebrows
  - Scalp line
  - Eyelashes (pediculosis ciliaris)
  - Mustache
  - Beard
  - Short hairs of the ankle
Pathogenesis

- As many as 60% with pubic lice also have crab lice in other hair-bearing areas
- The eggs are viable for up to 10 days
- The adult louse can live up to 36 hours from the host
- **Phthirus pubis** has a wider, shorter body than head or body lice
- They resemble tiny crabs
- They are about 1mm in length
Clinical features

- The most common presentation is pruritus in the pubic region
- Thirty days can elapse before pruritus manifests
- Physical Exam:
  - Visualize crab lice or its nits
  - Erythema around the hair follicle
  - Excoriations
  - Secondary infection
  - LAD
  - Maculae ceruleae
- Signs of other STD’s may be present
Treatment

- Similar to head lice
- Can shave pubic hair
- Most commonly 1% permethrin or pyrethrin shampoos
- 5% permethrin cream and 1% lindane shampoos can be used
- All topicals should be applied on two occasions one week apart
- 5% permethrin cream is the safest and most effective topical treatment if applied overnight to all possible infested hairy areas
Treatment

- Malathion lotion can be used but can get stinging and burning secondary to high alcohol content
- Oral ivermectin 250ug/kg is used when topicals are unsuccessful
- Pediculosis ciliaris should be treated with occlusive ointment for 10 days
- Sexual contacts should be treated
Table 84.3 Treatment for crab lice. All crab lice treatments should be given on two separate occasions, one week apart

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Administration</th>
<th>Risk factors</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permethrin (1%)/synergized pyrethrin shampoos*</td>
<td>10 minutes topically</td>
<td>None</td>
<td>Fair</td>
</tr>
<tr>
<td>Permethrin cream (5%)</td>
<td>8–12 hours topically</td>
<td>None</td>
<td>Good</td>
</tr>
<tr>
<td>Lindane shampoo (1%)</td>
<td>4 minutes topically</td>
<td>CNS side effects, pregnancy</td>
<td>Poor</td>
</tr>
<tr>
<td>Ivermectin</td>
<td>Oral (250 µg/kg)</td>
<td>Avoid if body weight &lt;15 kg, pregnancy</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

* Available over the counter.
Psocoptera (Book Lice)

- Psocoptera are primitive lice-like insects
- They have a large head, mouth, and abdomen with a narrow thorax
- Paired antennae are long with many segments
- They feed on decaying matter, tree bark, stored grain, and mildewed books
- Sometimes called “book lice”
Psocoptera

- Psocids commonly infest cereal grains and are usually found in stored foods.
- Human infestation can occur usually with infestation of a pet or a library.
- Psocids may feed on paste in books.
- Treatment is elimination of the environmental source.
Flies and mosquitoes

- The order diptera consists of two winged or true files
- Its members are collectively responsible for the transmission of more disease worldwide than any other arthropod order
- *Anopheles* mosquito transmits Malaria
- *Aedes* mosquito transmits Dengue fever and yellow fever
- *Culex* mosquito transmits Filarial disease and encephalitis virus
Anopheles

Transmits malaria
Culex Transmits filarial disease and encephalitis.
Aedes

Transmits dengue and yellow fever.
Diseases caused by flies and mosquitoes

- Cutaneous myiasis
- Malaria
- Yellow fever
- Dengue fever
- Viral encphalitis
- Onchocerciasis
- Leishmaniasis
- Sleeping sickness
- West Nile fever
Aedes mosquito

- In the US the **female** Aedes mosquitoes are responsible for the majority of bites
- Males do not bite since they do not have piercing mouthparts
- Clinically pruritic wheals and papules are seen
- These clinical lesions are in response to irritating salivary secretion secreted to anticoagulate blood
- Bites can be urticarial, vesicular, eczematoid, or granulomatous
- Mosquitoes are attracted to **scents and bright colors**
Mosquitoes

- The most effective repellent is **Diethyltoluamide (DEET)** 10-30%
  - Deep Woods OFF! 25%-98% DEET depending on the formulation
- If prolonged time is spent outdoors then 40-50% diethyltoluamide is recommended
- Concentrations of **less than 7%** should be used on **children**
- Oral antihistamines can be given to prophylactically reduce wheal formation
Mosquitoes

- Mosquitoes cause West Nile virus (arbovirus) in the US
- First detected in the US in New York City in 1999
- **Culex** mosquitoes are the principal maintenance and amplifying vectors
- It is maintained in a bird-mosquito-bird cycle
- West Nile fever develops in 20%
West Nile Virus

- Patients get a flulike illness
- They can get an erythematous macular, papular, or morbilliform eruption of the neck, trunk, and extremities in 20%
- Meningitis and encephalitis are rare
- Advanced age is the most important risk factor for fatal outcome
- Therapy is supportive
Flies (Diptera)

- Biting flies include
  - Midges
  - Horse flies
  - Deer flies
  - Black flies (Simulidae)
    - Onchocerciasis (African river blindness)
    - Tularemia
  - Botfly
    - Cutaneous myiasis
  - Sand fly (phlebotomus)
    - Vector for leishmaniasis
  - Tsetse fly (Glossina)
    - Vector for trypanosomes that cause sleeping sickness
Myiasis

- Myiasis is an infestation of the skin by developing larvae (maggots) of a variety of fly species within the order Diptera.
- The two main clinical types are:
  - Furuncular
  - Wound
Myiasis

- Maggots have been used therapeutically for surgical debridement since American Civil War times
- Myiasis occurs worldwide with seasonal variation
- The prevalence is related to latitude and the life cycle of the various species of flies
- Incidence is higher in tropics and subtropics of Africa and the Americas
Myiasis

- The most common flies worldwide causing human infestation are
  - **Dermatobia hominis** (human botfly)
  - **Cordylobia anthropophaga** (tumbu fly)
- The routes of transmission differ among species.
Myiasis

- D hominis lays her eggs on mosquitoes which deposit them on mammals
- Cordylobia anthropophaga deposits eggs on moist clothing, soiled blankets, and in sand
- Larva can live 15 days without feeding
- When in contact with the host it penetrates the skin
- Any body area can be affected
- The incubation period in adults ranges from 1-12 weeks
Clinical findings

- **Furuncular cutaneous myiasis**
  - Caused by both human botfly and tumbu fly
  - Causes boil like lesions
- **Tumbu lesions are on the trunk, thigh, and buttocks**
- Botfly lesions are on exposed areas of the body the scalp, face, forearms, and legs
- A pruritic papule occurs in 24 hours of penetration
- It enlarges to 1-3 cm and almost 1 cm high
- They become painful
Myiasis

- **Wound myiasis**
  - The larvae are deposited in a suppurating wound or on decomposing flesh
  - Cochliomyia hominivorax, a screwworm, is the most common cause in the Americas
  - Chrysomyia bezziana is seen in Africa, Australia, and Asia
- Creeping myiasis can be seen in
  - Cattle workers (Hypoderma bovis)
  - Horse workers (Gasterophilus intestinalis)
Myiasis

- This form resembles cutaneous larva migrans
- It is a self limiting disease
- The larva should not be forcibly removed because its spines and hooks prevent simple removal
- Surgical debridement is curative
- Occlusion/suffocation with petrolatum, liquid paraffin, bacon strips, etc. over the central punctum can cause the larva to come out
- The aerobic larva surfaces for air and can be captures with forceps
Wound Myiasis

- Wound myiasis requires irrigation with debridement.
- An alternative is oral ivermectin and the larva will naturally be sloughed in 2 weeks.
- Prevention is by avoiding damp clothing, resting in sandy areas, and using insect repellents.
• Diptera bites should be cleansed with soap and water.
• Short course of topical steroids and antihistamine for pruritus.
Midges

Midges are available to the fish all year. Adults look like mosquitos with fuzzy antenna. Midges are most plentiful in spring and fall. If no adults are on the water, fish a nymph. If you see large mating clusters of midges on the water, fish a Griffiths Gnat dry fly. Dry flies should be fished by drifting the fly over feeding fish. If you see fish rising but don’t see insects, fish a wet fly. Wet flies should be fished with small twitches, working the fly just below the surface.
Deer fly
Black fly
Phlebotomus sand fly
Tsetse fly
Bees, Wasps, and Ants

- The order **hymenoptera** includes
  - **Bees**
  - **Wasps**
  - **Ants**
- Many of these insects have evolved poison glands for defense and overcoming prey
- Their stings can cause anaphylaxis
- Initially immediate burning and pain, followed by intense, local, erythematous wheal
- This reaction subsides in several hours
- Intense reactions can lead to induration lasting as long as 7 days
The local reactions are likely due to venom-specific IgE antibodies.
A cell mediated immune response has also been implicated.
Treatment is cool compresses, shake lotions, mild analgesics, and oral antihistamines.
Anaphylaxis occurs in .4-3%.
It occurs twice as frequently in men.
Treatment is with subcutaneous epinephrine and benadryl and other supportive measures.
They should always carry an epinephrine syringe.
Hymenoptera

- **Always remove the stinger!!!!**
  - This should be done with the edge of a butter knife or even a credit card
  - Grabing with your fingers or tweezers can squeeze additional venom into the patient
  - The honeybee will leave a barbed ovipositor and paired venom sac in the victom
  - Attached musculature continues to pump venom if not removed
- **The honeybee dies after it stings**
- The wasp and bumblebees do not have barbed stingers and can sting repeatedly
Imported Fire Ants

- Imported fire ants (*Solenopsis invicta*) were originally from Brazil.
- They are now in the SE US first noted in Mobile, Alabama in 1930’s.
- They are found in more than 12 states.
- They attack in groups when their anthills are disturbed.
Fire Ants

- Swarm and sting with a venomous apparatus at the base of their abdomen
- Stings initially are an intense inflammatory, wheal and flare reaction
- They then become a sterile pustule
- The pustule sloughs over 48-72 hours
- Sensitized persons can develop bullous reactions
Fire Ants

- The pustules tend to form in the shape of a ring
- The ring shape forms secondary to the ants biting the flesh and then pivoting and stinging in a circular pattern
- Each ant can sting multiple times
- Up to 3000 stings on one person is not uncommon!!!!!
Hemiptera

- Most hemiptera (or true bugs) feed on plants.
- Cimicidae family includes
  - Bedbugs (Cimex lectularius)
- Reduviidae family includes
  - Kissing bugs (Triatoma species)
- These two feed on humans.
Bedbugs

- **Cimex lectularius** continues to be a problem in tropical and subtropical area of developing countries
- The bedbug is very flat dorsoventrally and has an oval, broad body
- They have widely separated compound eyes, a retroverted labium, and semicircular to triangular scutellum (dorsal sclerotic plate)
- They are red brown in color
- Forewings reduced to sclerotic pads; hind wings are absent
- Antennae with four segments
Bedbugs

- On the distal extremities, the tarsus is composed of three segments with claws.
- The abdomen has 11 segments, and when engorged, the intersegmental membranes are exposed.
- The insect is 3-6 mm in length and wingless.
- It is incapable of flying or jumping, however, it can rung rapidly with its six legs.
- It is a nocturnal feeder.
- It comes out of hiding after the victim has gone to bed.
Bedbugs

- When not feeding it hides in the cracks and crevices of headboards and furniture, behind loose wallpaper, in picture frames, or any dark place
- They are spread in clothing and baggage of travelers and visitors, secondhand beds, and laundry
- The bites are painless
- It does not remain on the body after feeding
- It only requires 4-12 minutes to complete a meal
Bedbugs

- Bites are usually multiple arranged in linear or irregular fashions
- **They occur in rows of three sometimes called “breakfast, lunch, and dinner”**
- Bite reactions are wheals and papules with a small hemorrhagic punctum at the center
- Flecks of blood may be seen on the bedsheets
- Sensitized individuals may develop papular urticaria
- Bullous reactions may occur
Bedbugs

• The bedbug has been shown to transmit hepatitis B to laboratory rabbits and guinea pigs raising the possibility of spread to humans.
The kissing or assassin bugs (*Triatoma species*) belongs to the family Reduviidae of the order Hemiptera, or “true bugs”.

They are distinguished by their triangular shape on their backs, just behind the head, formed by the meeting of the membranous wings.

All are bloodsuckers and have piercing mouthparts.

The *labium (sucking mouth piece)* is straight and composed of three segments with four pairs of stylets.

Frequently tan and dark ‘tiger stripes’ on abdomen.
Reduviid bug

- There are 4000 species of Reduviidae mostly found in the Americas.
- **They spread** *Trypanosoma cruzi*.
- *T. cruzi* affects 15-20 million people in South and Central America.
- **Kissing bugs** commonly bite near the lips.
- They feed then immediately defecate.
- The trypanosomes are inoculated when the victim scratches the feces into the wound.
Chagas Disease

- It is the leading cause of heart disease in South and Central America leading to ¼ of all death in 25-44 age group
- It can also affect the esophagus, colon, and nervous system.
- Kissing bugs are found in SW US especially from Texas to California
- Vectors for American trypanosomiasis
- **Unilateral eyelid swelling is Romana’s sign**
- Cardiomegaly, megacolon, and megaesophagus develop in Chagas disease
Pulex irritans (Human flea)
Xenopsylla cheoposis
Rat flea—
Bubonic plague
Endemic Typhus
Ctenocephalides
Dog flea
Fleas (Siphonaptera)

- Exclusive bloodsuckers belonging to the insect order Siphonaptera
- They are small 3mm long wingless insects.
- They can jump up to 7 inches
- Rat fleas (Xenopsylla cheopis and X braziliensis) transmit bubonic plague and endemic typhus
Fleas (Siphonaptera)

- They have laterally compressed bodies with large hind legs
- *Pulex irritans* is the human flea
- Cat and dog fleas belong to the genus *Ctenocephalides*
- Bites often present as pruritic papulovesicles of the lower extremities.

- **They are vectors for**
  - Endemic typhus
  - Bubonic plague
  - Brucellosis
  - Melioidosis
  - Erysipeloid
Fleas (Siphonaptera)

- **The most common flea is Ctenocephalides**
- It has two ctenidia (combs) that resemble a mane of hair (pronotal comb) and mustache (genal comb)
- C. canis, the dog flea, has eight hair bearing notches on the dorsal hind tibia
- C felis has six
- X cheopis is a vector of plaque and endemic typhus
Fleas (Siphonaptera)

- The mouthparts pierce the skin and siphon blood
- Saliva is secreted to prevent coagulation
- Saliva is antigenic and produces the pruritic papular rash
- They are one of the most common causes of papular urticaria
- Flea allergies are common
- **Lufenuron**, an agent that prevents fleas from reproducing, is effective oral formulation for cats and dogs
- **Fipronil** is effective as a topical agent
Tungiasis

- The burrowing flea, *Tunga penetrans*, is the causative agent
- The impregnated female burrows into the upper dermis and engorges to 1 cm in diameter
- This leads to a lesion resembling an abscess with a black center
- It eventually discharges eggs from the black center
- It was first reported in 1492 by crew members on Christopher Columbus’s ships
Tungiasis

● It occurs in anyone exposed to the flea
● Areas of high incidence include
  ■ West Indies
  ■ Caribbean basin
  ■ Africa
  ■ India
  ■ Pakistan
  ■ Latin America
● It is a wingless flea 1 mm in size
● It has poor jumping ability thus the bites are usually on the feet
Tungiasis

- The male obtains a blood meal and the female burrows
- Within 3 weeks of burrowing over a hundred eggs are discharged
- After reproducing the female dies
- Initially the burrowing is asymptomatic
- Eventually pain or pruritus occurs
- **The first sign is a small black dot**
- The dot enlarges to an inflammatory papule and then to a nodule
- A central punctum is always maintained
- The majority of cases resolve without sequelae
Tungiasis

- Major complications are tetanus, gangrene, and amputation of a digit.
- The most common sites affected are the soles, toe webs, thighs, perineum, and genitalia.
- Inflammation with the impregnated flea can be seen on pathology.
- Treatment includes surgical removal or topical chlorophenothane, clofenatane, 4% formaldehyde solution, chloroform, and turpentine.
- If multiple sites oral niridazole can be used.
- Tetanus prophylaxis should be considered.
Puss caterpillar
Moths, Caterpillars, and Butterflies

- **Lepidoptera order**
- The lepidoptera have irritant and allergenic properties secondary to hairs (**setae**) of caterpillars, moths, and butterflies
- **Lepidopterism** is a broad term encompassing the range of adverse reactions to caterpillars, cocoons, butterflies, or moths
- 50-150 species of lepidoptera are thought to produce lepidopterism
- The larva, cocoon, and adult are all capable of producing skin lesions
- Theories of the pathophysiology of lepidopterism include
  - **Mechanical irritation** by pointed setae
  - **Cell mediated hypersensitivity** to the setae
  - **Toxin injection** through hollow setae
- No single hypothesis adequately explains the variety of reactions.
Lepidopterism

- Warm spring weather leads to increased incidence
- **Setae can be windblown** and house pets can carry them on their fur
- The setae can be removed by adhesive tape.
- Cutaneous findings vary from papules and urticaria to edema and hemorrhage
- Pain can also be present
- Severe systemic reactions may occur with some species
- **Caterpillar hairs are an important cause of ophthalmia nodosa**
- Treatment is symptomatic
- **Pruritus** is characteristic of caterpillar stings
- Some caterpillars such as Latin America’s Lonomia achelous, can cause fatal bleeding diathesis
Lepidopterism

- Acute abdominal pain and HTN has been described after Israeli pine caterpillars
- Pine moth caterpillars in China have been associated with fever, rigors, HA, dermatitis, and arthritis
- Gypsy moth (tent) caterpillars (Lymantria dispar) are common in NE US
- Erythematous papules or urticaria can occur from outdoor contact or from clothing dried on a close line.
- The **io moth caterpillar** and the **saddleback caterpillar** (Sibine stimulea) are important causes of caterpillar dermatitis in the US
- The **woolly asp or puss caterpillar** produces immediate pain and characteristic railroad track pattern of hemorrhage
  - It is most common in Central Texas
Lepidopterism

- Hairs penetrate the skin and inject venom
- It is found from Maryland to the eastern seaboard of Florida to the Gulf of Mexico
- **Pain out of proportion to the size of the lesion is the hallmark of the asp or puss caterpillar (Megolopyge opercularis)**
- The pain may require narcotics
- Ocular lesions resemble those caused by tarantula hairs ophthalmia nodosa
- They include acute toxic inflammatory responses, chronic mechanical keratoconjunctivitis, subconjunctival nodules, iritis, and vitreoretinal involvement
IO Caterpillar
Saddleback Caterpillar
Caterpillar squashed on shirt then shirt put on
Beetles (Coleoptera)

- There are more than 250,000 species of beetles.
- **Coleoptera** ("sheathed wing") is the largest order in the animal kingdom
- Blister beetle dermatosis is a seasonal vesiculobullous skin disorder
- Blister beetles have oblong bodies with a wide variety of color and patterns
- Antennae are composed of multiple short segments
- They produce cantharidin which is found in hemolymph and is discharged from leg joints in adults
- Blister beetle include members of the families Meloidae and Staphylinidae
Blister Beetles

- **Histology shows acantholysis of suprabasal keratinocytes**
- Bullae may be produced by more than 200 species of beetles
- **The Spanish fly, *Lytta vesicatoria*, is the most famous in southern Europe**
- Several others are found in central and SE US
- **Blisters occur when cantharidin is rubbed into the skin after the beetles are crushed**
- Carpet beetles are found in the US
- Black carpet beetle (*Attagenus megatoma*)
- Common carpet beetle (*Anthrenus scrophulariae*)
- They can produce allergic papulovesicular dermatitis in response to the larvae not to the beetle itself
- The larvae feed on wool, hide, and other organic materials
Arachnids (Arachnida)

- Many species of toxic spiders are found worldwide
- Most bites result in local toxic reactions
- The bite of the Phoneutria wandering spiders in Brazil can be fatal in children
- Many species in the US were not native to North America
Widow Spiders (Theridiidae)

- **Latrodectus mactans** is the most common black widow spider in North America
- Its range extends to the West Indies
- Widow spiders can be found worldwide
- They are common in woodpiles, shoes, and under outhouse seats
Black Widow

- Bites occur when the spiders environment is disturbed and is trapped or pressed against the skin
- They are large shiny black spiders with a large round abdomen
- A variety of black, brown, and red widow spiders exist worldwide
- *Latrodectus mactans* has an hourglass design on the abdomen
Pathogenesis

- The venom contains **latrotoxins**
- **Latrotoxins act by depolarizing neurons, increasing intracellular calcium and stimulating uncontrolled exocytosis of neurotransmitters**
- Depletion of acetylcholine at motor nerve endings and release of catecholamine at adrenergic nerve endings
- This leads to agonizing abdominal pain and muscle spasm
- **Symptoms of acute surgical abdomen** can occur and may include rhabdomyolysis
- Acute pain and edema occurs at the bite site
- The degree of morbidity of the spider bite depends on
  - Species
  - Age
  - Sex
  - Amount of venom injected
  - Area involved
Treatment

- Antivenin can produce rapid relief as long as 90 hours after the bite.
- Benzodiazepepines and IV calcium gluconate can be helpful.
Brown Spiders (Loxoscelidae; Sicariidae)

- Loxosceles spiders are found worldwide
- **They have a small body and long legs**
- A dark brown to black **fiddle pattern** is present on the cephalothorax
- In the US the following are found
  - **Loxosceles reclusa**
    - L laeta
    - L rufescens
    - L deserta
    - L arizonica
Loxoscelidae (Sicariidae)

- Cause skin necrosis!!
- Many other spiders are also capable of producing dermonecrotic or systemic reactions
- The diagnosis can be confirmed by
  - Enzyme immunoassay to detect Loxosceles venom in a skin biopsy
  - By passive hemagglutination inhibition test as long as 3 days after envenomation
Loxoscelidae (Sicariidae)

- Most commonly found in South Central US, from Tennessee and Missouri to Oklahoma and Texas
- They are found in woodpiles and attics
- The brown recluse spider has a small body and long legs
- Dark brown fiddle pattern on cephalothorax
- Systemic reactions can include shock, hemolysis, renal insufficiency, and DIC
Pathogenesis

- **Sphingomyelinase D** is the major toxin in brown recluse venom and interacts with serum amyloid protein
- Hyaluronidase allows eschars to spread in a gravity dependent fashion
Clinical features

- The majority of bites do not cause serious reactions.
- Dermonecrotic reactions are dry, necrotic eschars or ulceration.
- Upper airway obstruction by bite at the neck has been reported.
Histopathology

● Early
  ▪ Neutrophilic infiltrate
  ▪ Later
    ● ‘mummified’ coagulative necrosis of the epidermis, adnexal epithelium, and superficial dermis.
The optimal treatment remains elusive.

- **Rest, ice, and elevation**
- **Polyclonal anti-Loxosceles Fab fragments** have been shown to attenuate necrosis in *animal models* if given within 4 hours.
- **Hyperbaric oxygen therapy** can decrease the final size of the ulcer.
- **Dapsone and prednisone** have been inconsistent and often disappointing.
Funnel Web Spiders (Lycosoidae: Agelenidae)

- They are large, hairy, aggressive spiders, found in dark, moist areas, especially basements
- They are common
- The most dangerous species are found in the NW US and Canada, Europe, and Australia
- **Tegenaria agrestis** (hobo spider, aggressive house spider) is 4-5 cm in diameter
- **Tegenaria agrestis** is the leading cause of necrotic arachnidism in pacific NW
Funnel Web Spiders

- They produce funnel shaped webs.
- Bites are typically not painful.
- Ensuing necrosis can lead to amputation.
- Systemic symptoms include HA, nausea, and weakness.
- Hemolysis and thrombocytopenia can occur.
- Treatment is supportive.
Typically large, hairy spiders located throughout the world

- They can measure up to 15 cm in diameter
- They are usually non-aggressive
- Most bites do not produce severe systemic toxicity
- They possess urticating hairs on the dorsal abdomen
- These hairs are used in a defensive fashion to drive predators from their burrow

Tarantulas (Lycosoidae: Theraphosidae)
Tarantulas (Lycosidae: Theraphosidae)

- Vibrations of the hind legs are used to flick hairs at the attacker
- Pruritus can persist for several weeks after exposure
- Urticating hairs can be seen in the stratum corneum and epidermis and may extend as deep as the reticular dermis
- Urticating hairs are thrown at the skin and eyes
Tarantulas and Ophthalmia Nodosa

- Hairs that penetrate the cornea cause ophthalmia nodosa, a chronic granulomatous reaction that results in loss of vision
Spiders (Name;Toxin)

- Black widow
- *Latrodectus mactans*; alpha-latrotoxin
- Brown recluse
- *Loxosceles reclusa*; sphingomyelinase D
- Wolf spider
- *Lycosidae*; Histamine
- Jumping spider
- *Hidippus*; Hyaluronidase
- Sac spider
- *Chiracanthium*; Lipase
Scorpions (Arachnida: Scorpionida)

- Many toxic scorpions exist worldwide.
- They have
  - large anterior claws
  - Long tail curved upward to sting when threatened
  - Blunt thorn on the tail of Centruroides species is specific to this scorpion
- They are frequently found under table tops, wood piles, and in shoes.
- They sting when disturbed or trapped.
Scorpions

- Local and systemic symptoms of stings are typically out of proportion to the degree of erythema or edema.
- Cutaneous signs and symptoms are not typically a prominent feature.
- Centruroides exilicauda (sculpturatus) is the most toxic scorpion in the US.
- It produces an immediate sharp, burning pain followed by numbness extending beyond the sting site.
Scorpions

- Possess a powerful neurotoxin that produces muscle spasticity, excessive salivation, nystagmus, blurred vision, respiratory distress, and slurred speech
- Possibly fatal in infants and all children should be admitted to the PICU
- Rarely associated with deaths
- Deadly stings are more common in India
Centipedes and Millipedes (Chilopoda, Diplopoda)

**Centipedes**
- Have long, flattened worm-like bodies up to 20 cm long, with 17 or more segments.
- Each segment, except the last, has **one** pair of legs.
- Centipede bites produce pain, edema, and erythema at the bite sites.
- This is due to a **neurotoxic venom** injected from the venom ducts in the jaws.
Millipedes

- Have long, cylindrical, worm-like bodies, with many segments
- Each segment has two pairs of legs and two pairs of respiratory spiracles
- They do not bite but secrete noxious substances, resulting in chemical dermatitis or burn-like reactions
- Millipede burns frequently involve the eyes
- In line-dried clothing can produce widespread dermatitis mistaken for childabuse
Millipedes; Centipedes

- Symptomatic treatment
- Children often state they were bitten by a snake
- In centipede bites, the edema is minor and a characteristic chevron shape of the centipede bite can be helpful.
- Ingestion leads to systemic toxicity.
- Rarely causes rhabdomyolysis and renal failure.
Tick bites (Arachnida: Acarina)

- Ticks are divided into two groups.
  - Hard bodied
    - Amblyomma
    - Dermacentor
    - Ixodes
  - Soft bodied
    - Ornithodoros
- The 3 main body parts of the tick are the
  - **Body**
  - **Scutum**
  - **Capitulum**
    - The capitulum of a soft bodied tick is concealed by the scutum.
    - It is the hypostome that is inserted into the flesh of a warm blooded animal
Ticks

- Most hard ticks have a ‘three host life cycle’
- **Larval ticks**, so called ‘seed ticks’ have **Six legs and feed on small animals in nature**
- The nymphs and adults feed on larger animals
Ticks

- Nymphs resemble small adult ticks
- They have eight legs but are **sexually immature**
- Hard ticks have a hard dorsal plate or scutum
- They account for most medically important ticks
- Soft ticks such as Ornithodoros lack scutum and have retroverted mouthparts.
  - This is the vector for relapsing fever
Clinical Features

- Hypersensitivity reactions at the site are common
- Papular, nodular, and vesiculobullous reactions occur
- Tick bite granuloma can occur days to months after a bite and can persist for months to years
- Pseudolymphomas can occur
- Treatment is tick removal and control of pruritus with topical steroids
- Tick removal should be done at the mouthparts with forceps
- Vaseline, squeezing the body of the tick, alcohol, and burning the ticks should be avoided as the tick can regurgitate
Amblyomma Ticks

- Also called the lone star tick
- They are common in the American South, particularly Texas
- This and the white dorsal spot of the female A. americanum gave rise to the common name the lone star tick
- The male has ornate markings often in the shape of a horseshoe on the posterior portion of the dark scutum
They have prominent eyes and festoons, and long anterior mouthparts.
They tend to attach to the lower extremities.
Papular, nodular, and bullous lesions are common.
They are the most important vector of Ehrlichia chaffeensis, the agent of human monocytic ehrlichiosis.
They are also implicated in tularemia, Missouri Lyme disease, and RMSF.
Dermacentor Ticks

- Dermacentor ticks have prominent eyes and festoons but small anterior mouthparts.
- *D variabilis* and *D andersoni* both have brown legs, and coxa 1 (attachment base for the first pair of legs) is bifid.
- Coxa 4 is enlarged in males.
- Males have no ventral plates.
- The hard dorsal plate in the female is smaller.
- It has an ornate hard dorsal plate (scutum) with deep puncta.
- It is a large tick.
Dermacentor Ticks

- The preferred attachment site is the head, neck, and shoulders.
- This is unlike Amblyomma which prefers the legs, buttocks, and groin.
- The peak season is April and May.
- Commonly found in areas of low bushy vegetation and scarce in heavily wooded areas.
- D. variabilis is found throughout the US except the Rock Mountain states.
- D. andersoni is generally confined to the Rocky Mountains.
- **D. variabilis is the major vector for RMSF in the US.**
Dermacentor Ticks

- Dermacentor andersoni is also a vector for Colorado tick fever, Q fever, and tularemia.
- Dermacentor ticks can cause tick paralysis
  - Ascending motor weakness caused by neurotoxins.
- Ornithodoros
  - Soft ticks cause more serious reactions such as necrosis, swelling, pain, vesiculation, and bullae.
  - Ornithodoriasis
    - Brownish rings that resemble resolving ecchymosis.
Rhipicephalus

- Rhipicephalus ticks are common dog ticks.
- Most are brown with brown legs.
- Teardrop shaped hard dorsal plate.
- Inornate plate (scutum)
- Coxa 1 is characteristically bifid.
- The eyes and festoons are prominent.
Rhipicephalus

- The mouth parts are short and attached at a hexagonal basis capituli, which is rectangular in Dermacentor ticks.
- They can carry
  - RMSF
  - Boutonneuse fever
  - Canine ehrlichiosis
  - Can be vectors for babesiosis and Congo-Crimean hemorrhagic fever virus.
Ixodes Ticks

- *Ixodes scapularis* is typically found attached to the host in late fall and spring.
- They have a small inornate brown scutum that is overshadowed by a large, soft, cream-colored engorged abdomen.
- They have short anterior mouth parts and prominent antennae.
- There is a U shaped ventral groove with the apex anterior to the anus.
Ixodes

- The are vectors for
  - Lyme disease—B. burgdorferi
  - Babesiosis—malaria like illness
  - Human granulocytic ehrlichiosis—febrile illness with leukopenia, thrombocytopenia, and increased serum hepatic transaminases.

- They can carry and transmit more than one disease.
Mites

- Mites are small arachnids that range from .1 to 2 mm in length
- They lack host specificity
- They mature through larval, nymph, and adult stages
- There is a single larval stage and multiple nymph stages
- Most lay eggs
## Table 85.2 Mite families

<table>
<thead>
<tr>
<th>MITE FAMILIES</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acaridae</td>
<td>Food mites</td>
</tr>
<tr>
<td>Demodicidae</td>
<td>Follicle mites</td>
</tr>
<tr>
<td>Dermanyssidae</td>
<td>Bird, rodent mites</td>
</tr>
<tr>
<td>Glycyphagidae</td>
<td>Food mites</td>
</tr>
<tr>
<td>Haemogamasidae</td>
<td>Straw mites</td>
</tr>
<tr>
<td>Psoroptidae</td>
<td>Mange, scab mites</td>
</tr>
<tr>
<td>Pyemotidae</td>
<td>Grain mites, straw mites</td>
</tr>
<tr>
<td>Sarcoptidae</td>
<td>Scabies mites</td>
</tr>
<tr>
<td>Trombiculidae</td>
<td>Chiggers, harvest mites</td>
</tr>
</tbody>
</table>
Mites

- Baker’s itch
- *Acarus*
- Rickettsial pox
- *Allodermanyssus sanguineus*
- Walking dandruff
- *Cheyletiella*
- Allergic reactions
- *Dermatophagoides farinae*
- Grocer’s itch/cheese mite
- *Glyciphagus domesticus*
- Western equine encephalitis/Equine encephalitis
- *Ornithonyssus*
### Table 85.3 Mites of medical importance

<table>
<thead>
<tr>
<th>Mite</th>
<th>Common name</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acarus siro</em></td>
<td>Grain mite: hay, grain, house dust</td>
<td>Baker’s itch</td>
</tr>
<tr>
<td><em>Allodermanyssus (Liponyssoides) sanguineus</em></td>
<td></td>
<td>Rickettsial pox</td>
</tr>
<tr>
<td><em>Ascoschoengastia indica</em></td>
<td>House mouse mite</td>
<td>Murine typhus (Java, Indonesia)</td>
</tr>
<tr>
<td><em>Cheyletia</em></td>
<td></td>
<td>Walking dandruff on cats, dogs and rabbits</td>
</tr>
<tr>
<td><em>Cheyletus malaccensis</em></td>
<td>Wheat mite</td>
<td>Wheat warehouse itch (Japan)</td>
</tr>
<tr>
<td><em>Demodex sp.</em></td>
<td>Fowl mite: chickens, wild birds, rodents, rabbits</td>
<td>Possibly rosacea, blepharitis, alopecia (rare)</td>
</tr>
<tr>
<td><em>Dermanyssus gallinae, D. avium</em></td>
<td>Dust mite: dust, blankets, mattresses, pillows, pets, stored foods and grains</td>
<td>Equine encephalitis (<em>D. gallinae</em>)</td>
</tr>
<tr>
<td><em>Dermatophagoides farinae, D. pteronyssinus</em></td>
<td>Dust mite</td>
<td>Allergic reactions</td>
</tr>
<tr>
<td><em>Euroglyphus maynei</em></td>
<td>Cheese mite, barn mite, grocer’s mite: cheese, grains, hay, mattresses</td>
<td></td>
</tr>
<tr>
<td><em>Glyciphagus domesticus</em></td>
<td>Rodent mites</td>
<td>Allergic reactions</td>
</tr>
<tr>
<td><em>Laelaps, Androlaelaps, Eulaelaps</em></td>
<td>Dust mite, hay mite</td>
<td>Grocer’s itch</td>
</tr>
<tr>
<td><em>Lepidoglyphus destructor</em></td>
<td>Harvest mite (Northern Europe)</td>
<td>Murine typhus, tularemia (<em>L. chitwoodi</em>), spotted fever (<em>Androlaelaps</em>)</td>
</tr>
<tr>
<td><em>Neotrombicula autumnalis</em></td>
<td>Snake mite</td>
<td></td>
</tr>
<tr>
<td><em>Ophionyssus natricis</em></td>
<td>Fowl mite</td>
<td>Western equine encephalitis</td>
</tr>
<tr>
<td><em>Ornithonyssus sylviarum</em></td>
<td>Tropical rat mite, tropical fowl mite, Northern fowl mite: rodents, chickens, wild birds, carnivores</td>
<td>Equine encephalitis (<em>O. bocottii</em>, <em>O. sylvanum</em>), murine typhus (<em>O. bocottii</em>), rickettsial pox, tularemia, plague (<em>O. bocottii</em>)</td>
</tr>
<tr>
<td><em>Ornithonyssus bocoii</em> (murine typhus, rickettsial*, pox, equine encephalitis, tularemia, plague), <em>O. bursa, O. sylvanum</em> (equine encephalitis)</td>
<td>Straw itch mite, grain mite: parasites of insects in grains and straw</td>
<td></td>
</tr>
<tr>
<td><em>Pyemotes ventricosus, P. tritici</em></td>
<td>Chigger mite, red bug</td>
<td></td>
</tr>
<tr>
<td><em>Trombicula (Eutrombicula) alfredi</em></td>
<td>Red mite</td>
<td></td>
</tr>
<tr>
<td><em>Trombicula (Leptotrombidium) akamushi, L. deliensis, L. fletcheri, L. arenicola, L. pallidum, L. povolovskyi, L. scutellare</em></td>
<td>Mold mite, grain storage mite</td>
<td></td>
</tr>
<tr>
<td><em>Tyrophagus putrescentiae</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Species that cause dermatoses (papules, vesicles) in humans.

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**Rickettsia tsutsugamuchi**

**Scrub typhus (Asia)**

**Cora itch**
Clinical Features

- Cutaneous reactions to mites include papular, papulovesicular, bullous, urticarial, and morbilliform eruptions
- Chigger bites most often affect the lower extremities, the edges of underwear, and the genital areas
- All animals should be treated by a veterinarian
- Permethrin treated clothing is also of value
- Treatment is symptomatic
Mites

- Scabies is caused by the female itch mite Sarcoptes scabiei var. hominis
- It is an **eight-legged mite** with worldwide distribution
- It lives its entire life cycle within the epidermis of the skin
- Higher incidences with
  - Overcrowding
  - Natural disasters
  - Wars
  - Economic depression
  - Refugee status
- Close contact is the primary means of transmission
- Spread between family members is common
- Crusted of Norwegian scabies is found in individuals with compromised immune systems
  - Elderly
  - HIV
  - Transplant patients
Scabies

- Animal scabies mites do not infest humans
- The mite measures .35 x .3mm
- It has a **30 day life cycle** completed within the epidermis
- A female mite will lay 60-90 eggs
- The eggs require 10 days to mature
- The scabies mite can live at most 3 days without a new host
- Transmission by fomites is possible
Scabies

- With normal scabies the number of scabies mites on a person is usually less than 100.
- With crusted scabies the number can be millions.
- The incubation period is days to months.
- Symptoms for first time infestations can take 2-6 weeks before the host becomes sensitized to the mite.
- Later infestations are recognized in 24-48 hours.
Scabies

- Patients have intense pruritus commonly at night.
- It is exacerbated by hot baths or showers.
- Typical sites of involvement are the
  - Interdigital web spaces
  - Flexural aspect of the wrists
  - Axillae
  - Behind the ears
  - Waist
  - Ankles
  - Feet
  - Buttocks
  - Belt area
  - In men penile and scrotal lesions
  - In women the areolae and nipples
Scabies

- Small erythematous papules are commonly present
- Vesicles, indurated nodules, eczematous dermatitis, excoriations, and secondary infection can be seen
- The pathognomonic sign is the burrow
  - A tunnel that the female mite excavates while laying eggs
- The burrow is wavy, thread-like, grayish-white, and 1-10mm in length
Scabies

● Clinical confirmation is done by skin scrapings
● Diagnosis is made by finding the mite, egg, or scybala
● Other means of diagnosis are epiluminescence microscopy and skin biopsy
● Application of a scabicide overnight to the entire body is the treatment of choice
● Clothing, linens, and towels must be washed in hot water
Family members can be asymptomatic mite carriers. Thus, all family members and close contacts need to be treated simultaneously, even if no clinical signs or pruritus. Pets cannot harbor human mites and do not need to be treated. Pruritus and lesions can persist for 2-4 weeks after successful treatment. This is referred to as ‘post-scabietic pruritus’. This is not treatment failure, but the body’s response to dead mites.
Scabies

- Most get relief from pruritus in 3 days
- A second treatment should be done 7 days after the first treatment
- It is important to wait 7 days due to the life cycle of the mite
- Permethrin is the preferred topical scabicide
- Lindane resistance is increasing
- Crotamiton
  - Comes in a 10% lotion and cream
  - Nightly treatments for 3-5 days
  - Irritation is common
- Sulfur ointment
  - Three nights of 5-10% sulfur in petrolatum is scabicideal
  - Commonly used in pregnant women
- Ivermectin
  - Initially 200ug/kg was suggested
  - Now 250ug/kg to 400ug/kg and repeated in a week is safe and effective
Table 84.1 Treatment for scabies. All treatments for scabies should be repeated 12–14 days later to kill any nymphs that survived treatment and also to prevent the development of resistance.

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Administration</th>
<th>Risk factors</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permethrin cream (5%)</td>
<td>Topically overnight on day 1 and day 8</td>
<td>Allergy to formaldehyde</td>
<td>Good but some tolerance noted</td>
</tr>
<tr>
<td>Lindane lotion (1%)</td>
<td>Topically overnight</td>
<td>CNS side effects, pregnancy</td>
<td>Poor, resistance common</td>
</tr>
<tr>
<td>Sulfur (5%)</td>
<td>Topically for 3 nights</td>
<td>None</td>
<td>Not evaluated</td>
</tr>
<tr>
<td>Crotamiton (10%)</td>
<td>Topically overnight on days 1, 2 and 8</td>
<td>None</td>
<td>Very poor</td>
</tr>
<tr>
<td>Ivermectin (250–400 μg/kg)</td>
<td>Orally on days 1 &amp; 12 or 14 (250–400 μg/kg)</td>
<td>Avoid if &lt;15 kg, pregnancy</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Chiggers

- Chiggers are the larvae of the common, harmless, harvest mites.
- They are extremely small, about 1 mm long, with a bright red velvety appearance.
- Unless they are fully engorged, they are generally invisible to the naked eye.
- They are found in all states, and are active throughout the year in the southern states.
- Chigger mites are common in moist microenvironments with grassy, weedy, or wooded areas, especially forest edges.
Chiggers

- The female lays eggs singly on soil or litter, and the eggs hatch in about 1 week
- After hatching, the life cycle includes six stages
- The entire life cycle from egg to adult may be completed in about 60 days
- The six-legged larval chiggers crawl up on blades of grass or leaves and subsequently get on passing vertebrate hosts
Chiggers

- On humans, they attach at the area of ankles, groin, or waistline
- Within 3-6 hours, most pest chiggers produce itching, followed by dermatitis consisting of macules and wheals
- After 10-16 hours red, dome-shaped papules appear, and itching increases in severity over the next 20 to 30 hours
- The can be vesicles or bullae
Chiggers

- Larva chiggers do not usually burrow beneath the skin but **insert their mouthparts at a pore or base of a hair follicle** and feed for a few days
- They inject saliva that dissolves host cellular tissue
- The mites then ingest this mixture of lymph, dissolved body tissues, and stray blood cells
Chiggers

- The first general rule for chigger control is to remove the harborage by keeping grass and weeds cut.
- Lawns and other infested areas may be sprayed with a pesticide.
- After exposure to infested areas, hot soapy baths or showers will help remove any chiggers, attached or unattached.
- Treat symptomatically.
Chiggers

- Seasonal penile swelling, pruritus, and dysuria in children is called **summer penile syndrome**
- It is related to a **hypersensitivity response** to chigger bites
- Treatment is symptomatic
Cheyletiella (Walking Dandruff)

- Cheyletiella mites are non burrowing mites
- C blakei → cats
- C parasitovorax → rabbits
- C yasguri → dogs
- Animal infestation is sometimes called walking dandruff
- Pruritic papules and bullae can be seen
- The animal needs to be treated
Demodex

- Demodex mites can be found in normal hair follicles and sebaceous glands
- They feed on sebum
- Most often found on the nose, cheeks, and forehead
- Implicated as an etiologic agent of rosacea and pityriasis folliculorum
- No study has definitively linked Demodex mites with human disease
- Demodex folliculorum and Demodex brevis