Bites and Stings

Bites and Stings

- Arthropods
  - Insects
  - Spiders
  - Scorpions
  - Ticks
- Reptiles
  - Pit Vipers
  - Coral Snakes
- Venomous Marine Life

Phylum Arthropoda

- Joint-legged animals
- At least 750,000 species
- Three times number of all other animal species combined
- Most successful life forms on earth
- Insects, spiders, scorpions, ticks, centipedes, etc.

Venomous Bites and Stings

- Parrish, 1950-59
- Review of coroner's records
- 460 deaths
  - 50% insect sting
  - 30% snake bite
  - 14% spider bite
  - 6% other

Hymenoptera

- Bees, wasps, hornets, yellowjackets, ants
- Problems
  - Allergic reactions
  - Anaphylaxis
  - Toxic venom effects (rare)
- About 25 deaths/year
  - Honeybees 50%
  - Yellowjackets and other wasps 50%

Hymenoptera

- 0.4% of population at risk for serious allergic reaction
- Most give history of progressive severity of response
- Some deny prior stings or report only normal reactions
- 50% of 2006 sting patients experiencing allergic reaction had NO previous warning symptoms!

Hymenoptera

- Local reaction
  - Sharp, burning pain
  - Itching
  - Edema
    - Extensive reactions may involve entire extremity
    - Stings to tongue/throat may cause loss of airway

Hymenoptera

- Systemic reactions
  - Immediate
    - Mild: Diffuse itching, urticaria, swelling distant from sting site, flushing
    - Severe: Laryngeal edema, severe bronchospasms, profound hypotension

Hymenoptera

- Systemic reactions
  - Delayed
    - 1 to 48 hours after sting
    - May be life threatening

Hymenoptera

- Treatment
  - Immediate
    - Remove stinger (scrape)
    - Manage airway
    - Oxygen
    - Support BP with fluid
    - Epinephrine
    - Antihistamines
    - Steroid

Hymenoptera

- Treatment
  - Prevent subsequent sting
    - Avoid exposure
    - No bright clothing
    - Avoid sweet fragrances
    - Avoid eating sweets outdoors

Hymenoptera

- Treatment
  - Self treatment
    - Medic Alert Tags
    - Anaphylaxis kit
  - Hyposensitization therapy

Lepidoptera

- Pus caterpillar
- Larval form of the M. opercularis moth.
- Seasonal: one stage in June/July and one in October/November
- 1921 San Antonio , so abundant public schools were ordered to close while pest was brought under control.

Pus caterpillar

Pus caterpillar

Pus Caterpillar

- Distribution: widely throughout Southern states.
- Host plants: Citrus trees, hackberry, elm, plum, sycamore and oak.
- Stages:
  - Adult--yellowish brown, wings have long wavy hairs with white streaks
  - Larva--5 or 6 instars (molts), ~1 inch.
  - Cocoon--Larva sheds hairs as it spins and are interwoven with the silk.

Pus Caterpillar

- Life history:
  - First generation--Max number of grown larvae in June and July
  - Second generation--Max number of grown larvae in September and October
- Stings:
  - Caused by inadvertently pressing caterpillar against exposed part of body
  - Severity of reaction varies among individuals and also depends on amount of pressure applied

Pus Caterpillar

- Toxicology
  - Poorly understood
  - Never been extensively studied
  - 6 rows of spines underneath long hairs
  - Spines contain toxin that is secreted into victim upon touch

Clinical Presentation

- Intense local burning pain
- Erythema, swelling
- Severe proximally radiating pains
- Hemorrhagic lesion may develop forming grid-like pattern
- Swollen lymph nodes common
- Pain may last 24 hours to 5 days
- Allergic reactions unlikely

Grid-like pattern

Treatment

- Application of adhesive tape is successful in removing spines
- Local wound care
- Intermittent ice application
- Morphine or meperidine may be required for pain control
- 10mL of 10% IV calcium gluconate was shone to provide pain relief in a small study.
- Hydrocortisone used empirically.
- Pruritus and urticaria -- Diphenhydramine

Spiders

- 37,000 species
- All are venomous
- 50 U.S. species can bite humans
- 15 U.S. species will produce symptoms
- Only two are dangerous
  - Black widow (*Latrodectus mactans*)
  - Brown recluse (*Loxosceles reclusa*)

Spiders

- Parrish, 1950-59
  - 65 spider bite deaths in U.S.
    - Brown recluse 2
    - Black widow 63

Black Widow

- Throughout U.S.
  - As far north as Oregon, New York
  - Common in South, Southwest
- Irregular webs in wood piles, under rocks, in trash dumps, in outdoor structures
- Occasionally in houses
- Females rarely leave web
- Only females can bite humans

Black Widow

- Neurotoxic venom
- More potent than pit viper venom
- Binds to nerve-ending calcium channels
  - Triggers neurotransmitter release
  - Blocks neurotransmitter re-uptake
  - Inhibits normal nerve impulse transmission
  - Produces low serum calcium

Black Widow

- Immediate sharp, stinging pain
- Muscle cramping in 15 minutes to 2 hours
  - Upper extremity: pleuritic chest pain
  - Lower extremity/genitalia: abdominal pain, rigidity

Black Widow

- Muscle twitching, weakness, paralysis, drooping eyelids
- Sweating, tearing, salivation, increased bronchial secretions
- Anxiety, headache, restlessness, dizziness, nausea, vomiting, hypertension (? hypertensive crisis)
- Edema, skin rash, conjunctivitis, itching
- Shock, respiratory depression

Black Widow

- Symptoms peak in a few hours, then diminish
  - Usually last < 24 hours
  - Some symptomatic up to 4 days
- 5% have delayed hypersensitivity 2 to 3 days post-bite
- Mortality rate unknown
- Most recover completely

Black Widow

- Treatment
  - Local cold application
  - Relieve muscle cramping
    - Calcium gluconate
    - Methocarbamol (Robaxin)
    - Diazepam
    - Narcotics

Black Widow

- Treatment
  - Antivenin indicated for:
    - Very young
    - Very old
    - Hypertensive reactions
    - Acute respiratory distress

Black Widow

- Admit if:
  - Treated with antivenin
  - Very young
  - Very old
  - Persistent symptoms develop

Brown Recluse

- Southeast and South Central U.S.
- Related species in desert Southwest
- Shy, nocturnal
- Dark closets, basements
- May live on floors, behind furniture in houses
- Incidence of bite unknown

Brown Recluse

- Local effects
  - Tissue necrosis
  - Leukocyte infiltration of bitten area
  - Edema
  - Hemorrhage
  - Thrombosis

Brown Recluse

- Systemic effects
  - Breakdown of red cells
  - Elevated white cell count
  - Decreased platelet count

Brown Recluse

- Local signs and symptoms
  - No pain or only mild stinging
  - Within 2 hours: Local pain, blue-gray constrictive halo
  - 12 to 18 hours: Bleb formation, growing ischemic zone
  - 5 to 7 days: Aseptic necrosis, eschar formation, necrotic ulcer
  - Severe lesions up to 30 cm in diameter

Brown Recluse

- Mild systemic signs and symptoms
  - Fever, chills
  - Malaise
  - Nausea, vomiting
  - Joint pain

Brown Recluse

- Severe systemic effects (rare)
  - Disseminated intravascular coagulation
  - Renal failure
  - Convulsions
  - Heart failure
  - Death

Brown Recluse

- Prehospital management
  - Local cold application
  - Wound cleansing
  - Padded splint, bulky dressing

Brown Recluse

- Hospital management
  - Supportive and symptomatic care
  - Debride full thickness lesions with subsequent grafts
  - Dapsone may improve outcomes
  - Antivenin under development
  - Outcomes NOT improved by
    - Early excision
    - Steroids

Scorpions

- 40 U.S. species
- Only one potentially lethal (*Centuroides sculpturatus*)
  - Primarily in Arizona
  - Occasionally in western New Mexico, southeast California, northern Mexico, far West Texas
  - 1929-48: More deaths in Arizona than any other venomous animal
  - No deaths since 1969

Centuroides sculpturatus

- Neurotoxic venom
- Acts on neuronal synapse and neuro-muscular junction
- Increased neuron sodium permeability
  - Neurotransmitter release at synapses
  - Increased acetylcholine release at neuromuscular junction

Centuroides sculpturatus

- Local signs, symptoms
  - No local swelling or inflammation
  - Local pain with hyperesthesia

Centuroides sculpturatus

- Systemic signs, symptoms
  - Extreme restlessness, agitation
  - Roving eye movements
  - Poor coordination, slurred speech, difficulty swallowing
  - Salivation, wheezing, stridor
  - Tachycardia, tachypnea, hypertension, nausea, vomiting

Centuroides sculpturatus

- Treatment
  - Symptomatic, non-specific
  - Antivenin
  - Analgesia
    - Narcotics, benzodiazepines safe in SMALL doses
    - Large sedative, narcotic doses may cause respiratory depression

Ticks

- Rocky mountain spotted fever
  - First identified in Idaho, Montana
  - Most cases now in:
    - Carolinas
    - Virginia
    - Georgia
    - Tennessee
    - Maryland
    - Oklahoma

Ticks

- Rocky mountain spotted fever
  - 95% of cases in spring, summer
  - Caused by: *Rickettsia rickettsii*
  - Tick species responsible:
    - West: wood tick (*Dermacentor andersoni*)
    - Southeast: dog tick (*Dermacentor variabilis*)

Rocky Mountain Spotted Fever

- Signs, symptoms
  - Fever
  - Headache
  - 2nd to 6th day: Pink, spotty rash near ankles, wrists
  - Over 6 to 12 hours: Rash spreads to armpits, buttocks, trunk, neck, face

Rocky Mountain Spotted Fever

- Mild cases recover in 20 days
- Untreated mortality: 8 to 20%
- Treated mortality: 4%
- Antibiotic therapy:
  - Chloramphenicol
  - Tetracycline

Ticks

- Lyme disease
  - Originally identified in Lyme, Connecticut
  - Incidence may approach that of Rocky Mountain Spotted Fever
  - Caused by *Borrelia burgdorferi*
  - Responsible ticks:
    - *Ixodes* species
    - *Amblyomma americanum*

Lyme Disease

- Phase one:
  - Large circular lesions (Erythema chronica migrans)
  - Pain in muscles, joints
  - Fatigue
  - Headache
  - Fever
  - Malaise
  - Swollen lymph nodes
  - Diffuse erythema
  - Conjunctivitis
  - Periorbital edema

Lyme Disease

- Phase two (weeks to months later)
  - Pericarditis
  - Myocarditis
  - AV conduction problems
  - Meningoencephalitis
  - Cranial, peripheral neuropathies
- Phase three:
  - Chronic, recurrent arthritis

Lyme Disease

- Antibiotic therapy during phase one prevents later stages of disease
- Agents
  - Adults: tetracycline
  - Children: penicillin or erythromycin

Tick Paralysis

- Neurotoxin in saliva of pregnant female hard ticks
- Blocks acetylcholine release at neuromuscular junction
  - Weakness, decreased reflexes, ascending paralysis
  - May progress to respiratory paralysis in 12 to 24 hours

Tick Paralysis

- Usually in summer months
- Typically female child with long hair
- Locate, remove ticks

Whipscorpions

- Live under logs, rocks, bark
- Active at night
- *Mastigoproctus giganteus* (Vinegaroon)
  - Can pinch
  - Sprays vinegar when surprised
    - 84% acetic acid
    - Can blister human skin

Tarantulas

- Large, wandering predatory spiders
- About 30 U.S.species
- Relatively docile
- Rarely bite
- Bite produces local pain, edema, lymph node swelling
- Flick irritating abdominal hairs if bothered

Solifugids

- Sun spiders, wind spiders, Child of the Earth
- Over 100 species in Southwest
- Active during day
- Large chelicerae (mouth parts)
- Non-venomous, but can pinch

Snakes

- 45,000 bites per year in U.S.
- 8,000 bites from venomous snakes
- 25% are dry strikes
- 10 deaths

Venomous Snakes

- Types of U.S.venomous snakes
  - Pit vipers (Crotalidae)
    - Rattlesnakes
    - Copperheads
    - Water moccasins (cotton mouth)
  - Coral snakes (Elapidae)

Venomous Snakes

- Pit vipers
  - Heavy bodies
  - Diamond-shaped heads
  - Vertical, elliptical pupil
  - Heat sensing pit on upper lip between eye and nostril
  - Erectile fangs
  - Venom primarily hemotoxic, necrotoxic (exception: Mojave rattler)

Venomous Snakes

- Rattlesnakes
  - 13 Species
  - 7,000 bites/ year
  - 9 to 10 fatalities
  - Most deaths are from western diamondback or eastern diamondback

Venomous Snakes

- Copperhead
  - Agkistrodon contortrix
  - Deaths VERY rare
  - Minimal edema and pain

Venomous Snakes

- Water moccasin
  - Agkistrodon piscivorus leucostoma
  - Causes an average of one death a year
  - Produces mild systemic symptoms, potential for severe local tissue injury and necrosis

Epidemiology

- 25% are dry bites
- 25-75% of venom is discharged in a bite
- Replenished in 3 to 4 weeks
- Extremities are most common bite site
- Most common victims:
  - Children
  - Intoxicated adults
  - Snake handlers and collectors

Epidemiology

- Risk Factors
  - Tequila
  - Testosterone
  - Tattoo
  - Teeth (more missing = greater chance)
  - Trailer park
  - T-shirt (Heavy Metal Band)

Pit Viper Envenomation

- Pain, swelling at bite site
- Progressive edema of bitten extremity
- Bruising of bitten area
- Formation of blood-filled vesicles

Pit Viper Envenomation

- Weakness, sweating, nausea, vomiting
- Tachycardia
- Hypotension, shock
- Prolonged clotting times
- Bleeding gums
- Hematemesis, melena, hematuria

Pit Viper Envenomation

- Numbness, tingling, and neurological symptoms may develop
- Mojave rattlesnake
  - Produces few local effects
  - May cause a systemic intoxication syndrome
    - Decreased level of consciousness
    - Cranial nerve dysfunction
    - Respiratory paralysis

Grading of Pit Viper Envenomation

- Dry Bite
  - Local abrasion or bite mark without severe pain or swelling
  - Normal vital signs
  - Normal coagulation studies
  - Normal platelet count

Grading of Pit Viper Envenomation

- Mild Envenomation
  - Local pain and swelling
  - Normal vital signs
  - Normal to mildly abnormal coagulation studies
  - Platelet count >100,000

Grading of Pit Viper Envenomation

- Moderate Envenomation
  - Local pain and moderate swelling
  - Normal vital signs
  - Abnormal coagulation studies (doubling of pT and pTT)
  - Thrombocytopenia (platelets <100,000)

Grading of Pit Viper Envenomation

- Severe Envenomation
  - Initial presentation consistent with shock
  - Altered mental status with or without normal vital signs and/or poor peripheral perfusion
  - Abnormal coagulation studies (unmeasurable pT and pTT)
  - Thrombocytopenia (platelets <20,000)

Venomous Snakes

- Coral snake
  - Thin-bodied
  - Small, rounded head
  - Brightly colored
  - Small, non-erectile fangs
  - Injects venom by chewing
  - Venom primarily neurotoxic

Venomous Snakes

- Coral snake
  - Two species
    - Arizona coral snake
      - Non-aggressive
      - No recorded human deaths
    - Eastern coral snake
      - Several bites reported annually (mostly Florida, Texas)
      - About one death every 5 years

Coral Snake Envenomation

- Little, no pain
- Little, no swelling
- Paresthesias around bitten area
- Muscular incoordination, weakness

Coral Snake Envenomation

- Increased salivation
- Difficulty swallowing, talking
- Visual disturbances
- Respiratory distress, failure
- Shock, cardiovascular collapse

Most deaths occur from respiratory arrest within 36 hours

Snakebite Management

- Calm victim
- Oxygen, monitor, IV
- Proximal constricting band (±)
- Clean, bandage wound
- Immobilize bitten area, keep dependent
- Watch constricting bands, bandages, splints carefully for vascular compromise 2º to edema
- Transport

Snakebite Management

- Do NOT
  - Apply ice
  - Apply arterial tourniquet
  - Cut and suck
  - Use electrical shock
  - Actively attempt to locate a venomous snake
  - Bring a live venomous snake to the hospital

Venomous Marine Life

- Jellyfish, Portuguese man-of-war, fire corals
  - Stinging cells (nematocysts) in tentacles
    - Intense, burning pain
    - Red, hemorrhagic lesions
    - Nausea, vomiting
    - Fever, chills
    - Respiratory distress, wheezing, stridor
    - Hypotension, shock
    - Cardiovascular collapse
  - Kill stinging cells with alcohol or vinegar

Venomous Marine Life

- Venomous Fish
  - Sting ray
  - Scorpionfish (Lion fish, Stonefish)
  - Immerse stung area in hot water

Venomous Marine Life

- Sea Urchins
  - Immerse injured area in hot water
  - Use acetic acid to dissolve embedded spines
  - Larger spines may require surgical removal