Inflammation

- Natural, nonspecific defense mechanism
- Occurs in response to an injury or antigen
- Inflammation limits spread of injury or antigen
  - Contains injury
  - Destroys microorganism
- Acute—8 to 10 days
- Chronic—months or years

Signs of Inflammation

- Swelling
- Pain
- Warmth
- Redness

Chemical Mediators

- Alert surrounding tissue of injury
  - Histamine
  - Leukotrienes
  - Bradykinin
  - Complement
  - Prostaglandins

Acute Inflammation

- Occurs after cellular injury causes release of chemical mediators
- Five basic steps
  - Vasodilation
  - Vascular permeability (edema)
  - Cellular infiltration (pus)
  - Thrombosis (clots)
  - Stimulation of nerve endings (pain)
Histamine

- Key chemical mediator in inflammation
- Stored in mast cells
- Initiates inflammatory response
- Directly stimulates pain receptors

Histamine (continued)

- Release of histamine produces vasodilation.
  - Capillaries become leaky
    - Causes tissue swelling
  - Responsible for symptoms of anaphylaxis

Histamine Receptors

- Histamine can produce its effects by interacting with two different receptors
  - H1 receptors: found in vascular smooth muscle, in bronchi, and on sensory nerves
    - Stimulation results in itching, pain, edema, vasodilation, bronchoconstriction
    - Characteristic symptoms of inflammation and allergy
  - H2 receptors located in stomach
    - Stimulation results in secretion of hydrochloric acid

Nonsteroidal anti-inflammatory drugs (NSAIDs)

- Primary drugs for treatment of mild to moderate inflammation
- Include aspirin, ibuprofen, and COX-2 inhibitors
- All have about same efficacy
- All are analgesics and antipyretics
- Side effects vary
- Acetaminophen has no anti-inflammatory action and is not an NSAID

Cyclooxygenase

- Two forms of cyclooxygenase (COX)
  - COX-1
    - Present in all tissues
    - Reduces gastric-acid secretion, promotes renal blood flow, promotes platelet aggregation
    - Inhibition of COX-1 results in bleeding, gastric upset, reduced renal function
Cyclooxygenase (continued)

- Cyclooxygenase-2 (COX-2)
  - Present at sites of injury
  - Promotes inflammation, sensitizes pain receptors, mediates fever in brain
  - Inhibition of COX-2 results in suppression of inflammation

Aspirin

- Treats inflammation by inhibiting both COX-1 and COX-2
- Readily available, inexpensive, effective
- Large doses needed to relieve severe inflammation

Adverse effects:
- Irritate digestive system
- May cause bleeding
- Salicylism may occur
  - Tinnitus, dizziness, headache, excessive perspiration

Ibuprofen

- Alternative to aspirin
- Inhibits COX-1 and COX-2
- Common side effect—nausea and vomiting
- Causes less gastric irritation and bleeding than aspirin

COX-2 Inhibitors

- Newest and most controversial class
- No inhibition of COX-1
  - Do not affect blood coagulation
  - Do not irritate digestive system
- Were treatment of choice for moderate to severe inflammation

COX-2 Inhibitors (continued)

- Rofecoxib (Vioxx) found to double risk of heart attack and stroke—removed from market in 2004
- Valdecoxib (Bextra) also removed in 2005
- Celecoxib (Celebrex) only remaining COX-2 inhibitor
Systemic Glucocorticoids

- Effective in treating severe inflammation
- Naturally released from adrenal cortex
- Suppress histamine and prostaglandins
- Can inhibit immune system to reduce inflammation

Systemic Glucocorticoids (continued)

- Serious adverse effects
  - Suppression of adrenal-gland function, hyperglycemia
  - Mood changes, cataracts, peptic ulcers
  - Electrolyte imbalances, osteoporosis

Systemic Glucocorticoids (continued)

- Can mask infections
  - Creates potential for existing infections to grow rapidly and undetected
  - Contraindicated in active infections

Treatment with Glucocorticoids

- Used for short-term treatment of acute inflammation
- Long-term treatment
  - Keep dose as low as possible
  - Use alternate-day dosing
  - Cushing’s syndrome may result
  - Discontinue gradually

Role of the Nurse

- Monitor client’s condition
- Provide client education
- Obtain medical, surgical, drug history
- Assess lifestyle and dietary habits
- Obtain description of symptomology and current therapies

Anti-inflammatory Drugs—Nonsteroidal Anti-inflammatory Drugs (NSAIDS)

- Obtain baseline kidney- and liver-function tests, CBC
- Monitor bleeding time with long-term administration
- Assess for changes in pain, reduction in temperature and inflammation
- Assess for gastrointestinal bleeding, hepatitis, nephrotoxicity, hemolytic anemia, salicylate toxicity
Anti-inflammatory Drugs—Nonsteroidal Anti-inflammatory Drugs (NSAIDS)

- Use NSAIDs cautiously in elderly clients
  - Potential for increased bleeding
- Aspirin contraindicated in pediatric clients
  - Possibility of Reye's syndrome

Anti-inflammatory Drugs—Glucocorticoids

- Assess for infections
- For long-term use, consider alternate-day therapy plan
- Monitor client for serum glucose levels, body weight, blood pressure, CBC, electrolytes (especially sodium and potassium)

Antipyretic Drugs

- Assess developmental status, origin of fever, associated symptoms
  - Determine appropriate formulation or route.
    - Clients who are vomiting: antipyretic by suppository
    - Young children: flavored elixirs
- Baseline lab data necessary to assess kidney and liver status

Antipyretic Drugs (continued)

- Acetaminophen
  - Contraindicated in clients with significant liver disease
  - Inhibits warfarin metabolism; may result in bleeding
- NSAIDs may also promote bleeding in combination with warfarin

Antipyretic Drugs (continued)

- Aspirin now contraindicated for pediatric clients: Reye’s syndrome
- Acetaminophen antipyretic of choice for fevers

Anti-inflammatory Drugs—NSAIDs

- **Prototype drug**: ibuprofen (Advil, Motrin, others)
- **Mechanism of action**: to inhibit prostaglandin synthesis
- **Primary use**: for musculoskeletal disorders such as rheumatoid arthritis and osteoarthritis, mild to moderate pain, reduction of fever, primary dysmenorrheal pain
- **Adverse effects**: nausea, heartburn, epigastric pain, dizziness
Anti-inflammatory Drugs—Systemic Glucocorticoids

- **Prototype drug:** prednisone (Meticorten)
- **Mechanism of action:** being metabolized to an active form of glucocorticoid
- **Primary use:** to treat inflammation
- **Adverse effects:** long-term therapy may result in Cushing’s syndrome

Antipyrétiques

- **Prototype drug:** acetaminophen (Tylenol)
- **Mechanism of action:** to reduce fever by direct action at level of hypothalamus and dilation of peripheral blood vessels
  - Enables sweating and dissipation of heat
- **Primary use:** to relieve pain and reduce fever; no anti-inflammatory actions
- **Adverse effects:** possible liver damage; causes less gastric irritation than aspirin; does not affect blood coagulation

Acetaminophen Animation

Click here to view an animation on the topic of acetaminophen.

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Anti-inflammatory Drugs

- Includes nonsteroidal anti-inflammatory drugs
- **Prototype drug:** ibuprofen (Advil, Motrin, others)
- **Mechanism of action:** to inhibit prostaglandin synthesis
- **Primary use:** for musculoskeletal disorders such as rheumatoid arthritis and osteoarthritis, mild to moderate pain, reduction of fever, primary dysmenorrheal pain

Systemic Glucocorticoids

- Are anti-inflammatory drugs
- **Prototype drug:** prednisone (Meticorten, others)
- **Mechanism of action:** being metabolized to active form of glucocorticoids
- **Primary use:** to treat inflammation

Drug Therapy for Inflammation and Fever

- **Assessment**
  - Obtain complete health history
  - Obtain vital signs; assess in context of client’s baseline values
  - Obtain complete medication history, including nicotine and alcohol consumption, herbal-supplement use, use of alternative therapies
Drug Therapy for Inflammation and Fever (continued)

• Nursing Diagnoses
  – Pain
  – Hyperthermia; risk for injury (hepatic toxicity)

• Planning—client will
  – Experience reduction in body temperature
  – Demonstrate understanding of drug

• Implementation
  – Assess for intolerance to ASA
  – Monitor hepatic and renal function
  – Use with caution in clients with history of excessive alcohol consumption
  – Use with caution in clients with diabetes

• Evaluation
  – Client’s temperatures within normal limits
  – Client verbalizes understanding of drug

Selected Nonsteroidal Anti-inflammatory Drugs

Table 33.2 Selected Nonsteroidal Anti-inflammatory Drugs

Table 33.2b Selected Nonsteroidal Anti-inflammatory Drugs
### Selected Glucocorticoids for Severe Inflammation

Table 33.4 Selected Glucocorticoids for Severe Inflammation