Concepts of Homeostasis

• Homeostasis – a dynamic steady state, representing the net effect of all turnover reactions

  – Within each homeostatic system there exists a range of values under which the body functions adequately

    • Example: blood glucose levels (80 – 100 mg/ml)

• Homeostatic Control Mechanisms

  – Negative Feedback

    • Variable to be regulated
    • Sensor
    • Integrator
    • Effector
    • Change in variable
Temperature increase

Temperature decrease

Generates heat

纠正信号 via 电气线路

Correction signal via electrical wires

Effector

Sensor

Detected by

Temperature increase

Temperature decrease

Detection via sensors

Temperature receptors

Skin

Hypothalamus

Sensor

Effector

Motor nerve fibers

Sensory nerve fibers

Shivering

Muscles

Artery Vein

Set point value

Actual value

Correction signals via nerve fibers

Feeds information via wires back to

Integrator

Set point value

Actual value

Integrator

Feeds information via nerve fibers back to
Concepts of Homeostasis

– Positive Feedback Mechanisms

• Delivery
• Blood clotting

Concepts of Disease and Illness

• Disease – a disruption of homeostasis, the sum of the variations form the normal

• Factors Affecting Determination of Normality
Concepts of Disease and Illness

– Genetic Variation (ex. A normal low blood pressure)

– Cultural Considerations

– Age Differences
  
  • Typically organs get smaller
  • Hair grays
  • Skin wrinkles
  • Gums recede
  • Near sight diminishes
  • Loss of high tone hearing
  • Taste less discriminatory
  • Less sweat glands/diminished thirst
  • Decreased temperature discrimination
  • Heart rate
Concepts of Disease and Illness

– Gender Differences

  • Levels of sex hormones
  • Blood test values (which ones and what?)

– Situational Differences

  • Polycythemia

– Time Variations – circadian rhythms
Concepts of Disease and Illness

- Laboratory Conditions – different methods and reagents can give different results
- Baseline Evaluations – importance of a healthy physical and regular examinations

Framework for Pathophysiology

• Three aspects of a particular disease form a framework as to what is happening in an individual
  - Etiology
  - Pathogenesis
  - Clinical Manifestations
Framework for Pathophysiology

- Etiology – the study of the causes or reasons for a disease or phenomena (ex. A particular bacterium or infectious agent)

  - Inheritance and Environment

    - Environment can cause changes by itself as can genetic makeup (ex. Barrel chest of people living at high altitudes. Why? – Down Syndrome)

    - In some instances both environmental and genetic factors interact (ex. Allergy to bee stings)

    - Implications in sickle cell anemia
Framework for Pathophysiology

- Classification of Disease – many things can initiate disease
Framework for Pathophysiology

• Inherited – the result of abnormal proteins being made
  – Many are lethal
  – Some require environmental triggers to turn them on
  – Metabolic Diseases - PKU

• Congenital Diseases
  – Malformation of organs during development

• Degenerative Diseases
  – Heart disease and strokes
  – Osteoarthritis
  – Emphysema of the lungs
Framework for Pathophysiology

• Neoplastic Diseases – tumors; can be malignant or benign
  – Cancers – causes can be varied
    » Chemicals
    » Viruses
    » Sunlight
    » Irradiation
    » chronic irritation

• Immunologic Diseases
  – Autoimmune diseases
  – Hypersensitivites
  – AIDS
Framework for Pathophysiology

• Infectious Diseases
  – Prions ("mad cow" disease)
  – Viruses
  – Bacteria
  – Fungi
  – Protozoa
  – Pathogenic animals

• Physical Agent-Induced Diseases
  – Destructive chemicals
  – Violent injury
  – Chemicals
  – Hernia
  – Gall and kidney stones
Framework for Pathophysiology

• Nutritional Deficiency Diseases

• Iatrogenic Diseases – caused by physicians or health professionals “medical errors”
  – $29 billion/year
  – 44,000 – 98,000 deaths annually (lower value 8th leading cause of death)

• Psychogenic Diseases – emotional or mental causes
  – Some ulcers
  – Spastic colon

• Idiopathic Diseases – unknown causes
  – Idiopathic hypertension
Framework for Pathophysiology

• Pathogenesis – development or evolution of a disease; example a *Staph* infection
  
  Invasion of body by organism
  
  Manifestation of the infection
  
  – Factors Affecting Pathogenesis
    
    • Time
    
    • Quantity
    
    • Location
    
    • Morphologic Changes
Framework for Pathophysiology

- Clinical Manifestations
  - Signs and Symptoms
    - Symptoms – subjective feelings
    - Signs – manifestations of the disease
    - Syndrome – a collection of different signs and symptoms
    - Lesion – a structural change (can be gross or microscopic)
  - Stages
    - Latent period
    - Prodrome or prodromal period – first signs and symptoms
    - Stage of manifest illness or acute phase
    - Subclinical stage – disease is progressing but no clinical signs or symptoms (kidney disease)
    - Exacerbation – sudden increase in the signs and symptoms
    - Remission – decline in the severity of the signs and symptoms (if permanent then cured)
    - Convalescence – stage of recovery
    - Sequela – a condition the result of a disease
    - Complication – a new problem the result of the original
Framework for Pathophysiology

– Acute or Chronic Disease
  
  • Acute – severe manifestations but usually short lived
  • Chronic – condition persists for a long time
  • Intercurrent Disease – when a disease occurs during the course of another

Concepts of Epidemiology

Epidemiology is the patterns of disease within populations

Epidemics – disease spreads to many individuals at the same time

Pandemic – epidemics that affect large geographical areas
Concepts of Epidemiology

• Factors Affecting Patterns of Disease

  – Age – related terminology

    • Prenatal

    • Childhood

      – Certain accidents
      – Childhood diseases

• Developmental processes – occur early years of life

• Aging Processes – occur later in life (gerontology)
Concepts of Epidemiology

- Ethnic Group – very closely related to socioeconomic, religion, customs, and geographic factors

- Gender
  
  - Particular gender specific diseases
  - Urinary tract infections in young women
  - Delayed progression of vascular diseases in women (Why?)

- Socioeconomic Factors and Lifestyle Considerations
  
  - Poverty
  - Occupations
  - Cultures – smoking, diet, and lack of exercise
  - Access to health care
Concepts of Epidemiology

- Geographic Location
  - Climate related problems
    - Insects
    - Fungal infections
    - Frostbite, heat related problems
    - Altitude

Implications for Treatment

- Levels of Prevention
  - Primary Prevention
    - Vaccinations
    - Better housing, nutrition, access to health care, sanitation
    - Education
Implications for Treatment

– Secondary Prevention

  • Regular “check ups” and exams

    – Mammograms
    – PAP smears
    – Blood pressure
    – Colonoscopy
    – Prostate exams (digital and PSA)
    – Amniocentesis

– Tertiary Prevention - treatment