History of Pathophysiology

What is Pathophysiology?

- Focuses on either the bodily function changes that cause an illness or the bodily function changes that the illness causes.

Pathophysiology and the disease process

- What is the cause of disease?
- What are the mechanisms responsible for disease onset, progression and recovery?
- What are the mechanisms responsible for development of symptoms and signs of disease?

HISTORY OF DISEASE

Primitive People

- Diseases/conditions that prehistoric man suffered from:
  - tuberculosis and parasitic infections
  - under-calcified bones (osteoporosis)
  - caries (decayed teeth)
  - pyorrhea (eroded teeth from discharge of pus from inflamed gums)
  - skeletal fractures
- Health issues for prehistoric women:
  - had much shorter lifespan than men due to difficult childbirth
  - weakened immune systems
    - birthing and nursing children
    - malnourishment since best food was for men and boys because they were/would be leaders, hunters, and warriors

Primitive People

- Therapeutic techniques used by primitive healers/shaman
  - praying
  - chanting
  - hallucinogenic trances – a means of communication with the spirit world
- Prehistoric medicinal herbs
  - foxglove plant (digitalis) -- treatment for failing heart
  - birch fungus -- treatment that stops bleeding and acts as a disinfectant
  - peek-a-boo plant (“toothache plant”) -- treatment of toothaches and oral infections
  - bark of cinchona tree (quinine)-- treatment for malaria
  - opium poppy (morphine)-- treatment for relief of severe pain
  - belladonna plant also known as “deadly nightshade plant” (atropine)-- treatment for spastic colon and gastric ulcers

The Egyptians (3150 BC)

- First to keep accurate written health records
  - The most important sources are the Edwin Smith Papyrus (17th century BC) and Papyrus Ebers (about 1550 BC)
  - These records contain information on different types of bone injuries, trachoma (Nile valley), ulcerating lumps (cancer), and parasites
- Medical practice included bloodletting, monthly purging, making prosthetic devices, embalming
- Surgeons in ancient Egypt were both priests and doctors who blended ritual with medicine

Ancient India (3300 BC)

- Detected diabetes by smelling and tasting urine for sweetness
- Practiced surgical procedures such as hernia repairs, amputations, C-sections, cosmetic surgery to nose, earlobes and harelips

Ancient China (15 Century BC)

- Illness was still seen as a violation of a god
- Male doctors didn't directly examine women
- Ivory dolls were used by doctors to diagnose woman (they would point to the area of discomfort or pain)
- Also used acupuncture to treat ailments (believed that the needles stimulated energy points throughout the body, relieving obstructions, enabling the body to heal)

Ancient China (15 Century BC)

- Used a variety of herbs to treat diseases, which were thought to throw away the evil intruders of the body
  - ginseng – reduces stress
  - rhubarb – enhances body strength
  - licorice – relieves muscle spasms
  - ginger – treats diarrhea
  - peony – regulates blood
  - salvia – relieves pain of inflammation

Ancient Greece

- The first to study the cause of disease
  - looked for natural explanations, not just divine ones
  - made discoveries in science, math, and astronomy
- Hippocrates (460-370 BC) was one of the most famous of the ancient Greek physicians
  - Based his knowledge of anatomy on observation of the external body since human dissection was taboo during this time
  - First to construct theories of the causes of diseases based on what he observed in his patients
  - Responsible for writing the first known oath of medical ethics: The Hippocratic Oath
  - Later became known as the “Father of Modern Medicine”

Ancient Greece

- Greek **balance theory** – theory held that the human body was filled with four basic substances called humors, which are in balance when the person is healthy
  - Four humors:
    - black bile
    - yellow bile
    - blood
    - phlegm
  - These humors were connected with the four elements:
    - earth
    - fire
    - air
    - water

Ancient Greece

- Greek **balance theory** – theory held that the human body was filled with four basic substances called humors, which are in balance when the person is healthy
  - They were also related to the four seasons:
    - autumn
    - winter
    - spring
    - summer
  - Humors, elements, and seasons were all linked to the human body; an imbalance in any of these caused illness

Ancient Rome

- Learned about disease and cleanliness from the Greeks
- This period marks the beginning of public health and sanitation
  - developed sanitation system of aqueducts to bring clean water to cities and sewers to carry off waste
  - built public baths with filtering systems
- Aqueducts
  - collected water from several natural springs, which were located far away from cities
  - water was chosen according to many factors: position of its springs, purity of its water, its taste, alleged medical properties due to mineral salts
  - gravity moved water towards cities (aqueduct acted as a continuous slope)

Ancient Rome

- Sewers
  - underground sewers were covered by stones
  - waste flushed from toilets flowed through central channel into the main sewage system into a nearby stream away from the city
- Bath and spas (not just for bathing)
  - a place to meet friends, relax, play games
  - public baths were cheap to enter, so both rich and poor could afford to go often
  - men and women bathed in separate facilities

Dark Ages (AD 400-800) to High Middle Ages (AD 800-1400)

- "Dark Ages" was a term used by European historian in the 18th century to designate the period in Western Europe after the fall of the Western Roman Empire.
- During this time, church began to dominate practice of science and medicine and the study of medical science all but stopped
- Treatment for ill during this time: prayer, exorcism saintly relics, superstition
- Terrible outbreak of epidemics occurred during this period:
  - bubonic plague (black death – responsible for death of 60 million people)
  - smallpox
  - syphilis
  - diphtheria
  - tuberculosis

The Renaissance period (AD 1350 – 1650)

- Period which marked the rebirth of learning
- Building of universities and medical schools
- There was a search for new ideas rather than the unquestioning acceptance of disease as the will of God
- Acceptance of dissection for purpose of anatomical study
- Development of printing press and publishing of books, which allowed more access to knowledge

Sixteenth and seventeenth centuries

- Leonardo da Vinci (1452 – 1519)
  - Italian artist, scientist, engineer
  - Studied anatomy of body by dissection of human corpses
- William Harvey (1578-16570
  - Discovered circulation of blood in the body
- Anton van Leeuwenhoek (1632 – 1723)
  - Dutchman who invented the microscope
  - His early microscope was a lens mounted in a tiny hole of a brass plate
  - He held the plate to the light to see his specimen
  - Discovered tiny moving microorganisms that he referred to as “animacules”

Eighteenth century

- Edward Jenner (1749 – 1823)
  - English country doctor
  - Observed that the milkmaids who caught less serious cowpox generally did not catch smallpox
  - Led him to discover technique of vaccination when he deliberately infected a small boy with cowpox
  - He coined the word “vaccination” for cow (*vacca* means cow in Latin)
  - This word was later adopted by Louis Pasteur for immunization against any disease

Eighteenth century

- Rene Laennec (1781 – 1826)
  - French physician who invented the cylinder stethoscope
  - Originally made from paper, although later made from a hollow wooden tube
  - Before the cylinder stethoscope, doctors put their ear directly to a patient's body
  - He is hailed as the "Father of Thoracic Medicine"

Nineteenth Century

- James Blundell (1790 – 1877)
  - Performed the first successful human blood transfusion from a husband to his wife by means of a syringe
  - He performed 10 transfusions; only half were successful since blood typing had not been developed
- Ignaz Semmelweis (1818 --1865)
  - Known as an early pioneer of antiseptic procedures
  - Discovered how to prevent the transmission of puerperal fever in 1847
- William Morton (1819 – 1868)
  - Dentist who developed anesthesia techniques that made surgery painless
  - He developed an ether inhaler
  - Before anesthesia, operations were limited to amputations and the removal of external growths

Nineteenth Century

- Florence Nightingale (1820 – 1910)
  - Pioneer of nursing
  - She reformed hospital sanitation methods and campaigned to improve health standards
- Rudolf Carl Virchow (1821-1902)
  - Known as "the father of modern pathology"
  - His work helped to discredit humorism, bringing more science to medicine

Nineteenth Century

- Louis Pasteur (1822 – 1895)
  - "Father of Bacteriology"
  - With his microscope, he showed that by heating foods, harmful bacteria was prevented from growing; hence the term "Pasteurization"
  - Pasteur also developed several vaccines including ones against anthrax and rabies
- Sir Joseph Lister (1827-1912)
  - Discovered that carbolic acid killed germs
  - Used as an aseptic in surgery
  - The mouthwash *Listerine* was named after Joseph Lister

Nineteenth Century

- Robert Koch (1843-1910)
  - German physician and pioneering microbiologist
  - Discovery of the causative agent of anthrax led to the formation of a generic set of postulates
- Wilhelm Roentgen (1845 – 1923)
  - German physicist who discovered x-rays
  - His first medical x-ray was of his wife's hand
- Paul Ehrlich (1854-1915)
  - Invented the precursor technique to Gram staining bacteria
  - Described magic bullets – antibodies

Biomedical firsts of the 20th century:

- EKG Machines
- Respirators
- MRI/CT scans
- Laser surgery
- Organ transplants
- Open-heart surgery
- Pacemakers
- Remote surgery

The Future

- Cell-based disease
- Gene-based disease
- Individual molecules
- Nanopathology