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

Introductory video
https://www.youtube.com/watch?v=1PLBmUVYYeg

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

Belladonna plant “deadly nightshade plant”	atropine	spastic colon and gastric ulcers
opium poppy	morphine	Severe pain
bark of cinchona tree	quinine	malaria
“toothache plant”		Oral infections / cavities
birch fungus		stops bleeding and acts as a disinfectant
foxglove plant (digitalis)		heart

The Egyptians (3150 BC)

- First to keep accurate written health records
  - Papyrus paper
  - bone injuries, trachoma (Nile valley), ulcerating lumps (cancer), and parasites
- Medical practice included bloodletting, monthly purging, making prosthetic devices, embalming

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
- Also used acupuncture to treat ailments

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

- 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
  - 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
  - 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 400-1400)

- "Dark Ages" fall of the Western Roman Empire.
- Churches 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 (responsible for 60 million deaths)
  - Smallpox https://www.youtube.com/watch?v=1PLBmUVYYeg
  - Syphilis
  - Diphtheria
  - Tuberculosis (TB)

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 – beautiful/detailed drawings
- **William Harvey** (1578-16570
  - Discovered circulation of blood in the body
- **Anton van Leeuwenhoek** (1632 – 1723)
  - Dutchman who invented the microscope
  - Discovered tiny moving microorganisms that he referred to as “animacules”

Eighteenth century

- **Edward Jenner** (1749 – 1823)
  - 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)
  - https://www.youtube.com/watch?v=yqUFy-t4MlQ

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

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
  - https://www.youtube.com/watch?v=V8EkNJgc0nY
- **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 / Robotic surgery

The Future

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