Source: [KBBiologyMasterIndex]

1 | Overview of Human Diseases

A lecture by Paul.

#flo #disorganized

Disease is an abnormal condition that causes impairment in/loss of function of an organism (a.k.a. decreased fitness) that is not due to immediate external injury.

- · What causes human disease?
 - · Infectious agents
 - · Deficiency disorders
 - Heritable factors
 - Physiological disorders (immunodeficiency, autoimmune disorders, allergies, etc.)

1.1 | Congenital vs. Acquired disease

Congenital diseases => diseases present at birth due to DNA abnormalities / pregnancy pathological issues Acquired diseases => diseases that begin during lifetime, including...

- Microrganism invasion => "infectios diseases"
- Autoimmune reaction
- Nutrient deficiency
- · Mechanical wear
- · Ingestion of noxious chemicals

Infectious diseases actually smaller on the causes of death in the US

- Heart disease => wear + deficiency
- · Cancer => heritable + DNA
- Unintentional injuries => not a disease
- Chronic respitory disease => wear
- Stroke => not a disease
- Alhetimer disease => wear
- Diabetes => autoimmune, nutrient, wear
- Influenca <= here, finally, an infections disease.

1.2 | Disease causing agents

- Protozoan => single-celled eukaryotes
- Fungal => single/multi-celled eukarotyes
- **Bacteria** => single-celled prokaryotes
- Viral => acellular parasitic infectious agent
- **Helminuthus** => multicellular worms
- **Prions** => acellular misfolded proteins
- Viroids => infections nucleic acids w/o protein coat to make virus

1.3 | Pathogenicity + Virulence

Pathoginecity => relative capacity to cause disease

- Non-pathogenic agents => no diesease
- Primary pathogens => yes disease
- Opportunistic pathogens => yes disease only when it can, for instance, in immunocompromised individuals

Virulence => numerical measures for pathonicity

Measured experimentally with LD50 + ED50

1.4 | Overview of various diseases

This video

1.4.1 | Protozoan

- **Protozoan factors** => direction pathogenisis leading to tissue damage
- Host-mediated factors => immune evation + escape mechnisms + immunalsupression

Adaptable!!

1.4.2 | Fungal

- Fungal factors => many shapes and very adaptable, colud produced specialized enzymes to take root in body
- Host-mediated factors => cause immunocomprimzation, acquired though inhalation, etc.

1.4.3 | Bacteria

- Bacterial-induced toxicity => produces toxins + has hard capsule cell
- Host-mediated factors => may develop host resistance, could compete for resources, and could be grown introcellularly

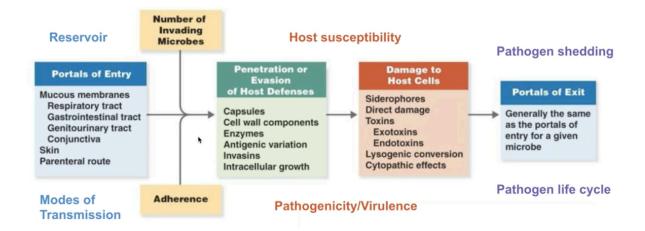


Figure 1: Screen Shot 2020-10-12 at 3.08.53 PM.png

1.5 | Bacteria causing diseases

Biofilm formation

- · Communities of bacteria could work together by adhering and exchanging information
- Bacterial could perform quorum sensing => exchange of information with each other + recognize various members of their group

1.5.1 | Fighting bacterial infections

Antibiotics => drugs with selective toxicity for specific bacterial types Act by...

- Disrupting membrane + cell wall integrity
- Selectively target + impair bacterial ribosomes
- Block bacterial DNA replication/transcription
- · Inhibit bacterial metabolism

1.6 Viruses causing diseases

Viruses: acellular macromolecular assemblies

- Contain protein coat called capsid
- DNA or RNA, but not both
- Are obligate parasites that could only replicate within host
- Assembled and mature viral particles => virions, which contain...
 - Capsid
 - · Genetic material

- · Occationally outside lipid layer
- => Viruses exist on the nanometre scale, but they are difference in share and size

1.6.1 | Structure of viruses

- · All contain
 - Capsid => structural protein coat
 - Genome => RNA/DNA; but not both
- · Some contain
 - Membraneous-enclosed capsid => envelope
 - Externally-facing host-cell fusion proteins => spikes
 - Viral genome replication enzymes => prlymerases
 - Other proteins for fun => enzymes, motor proteins, transcription factors, host-cell interacting proteins, etc.

1.6.2 | Two types of virus

- Prokaryotic-infecting viruses
 - · Variety of shapes
 - · Complex and prolate shapes
 - · Has, sometimes complex shapes! a la this image
- · Eukarotic-infecting viruses
 - · Much more "boring" in terms of shape
 - · Icosahedral/spherecial outside
 - Enveloped constructions => envelope protein layer outside, spherical inside
 - Helical/Cylindrical/Bullet shapes, too!
 - Often single patterns assemble together to create symmetric shape that creates the whole of the virus

1.6.3 | Viral Life Cycle

- 1. Attachment => protein contact between virus and host
- 2. Viral entry/Uncoating => shedding the protein layer
- 3. Biosynthesis => make baby viruses
 - 1. Genome Replication: transcribe DNA/RNA
 - 2. Genome Expression: read DNA/RNA to make proteins
- 4. Viral genome integration => retrovirus only
- 5. Assembly => put it all togethr
- 6. Viral Exit => mature virons leave

Viral Entry

Option 1: Direct Entry

· Insert genome in thro