Microbes Facilitate Transmission – microns cause symptoms that aid transmission. Common cold – sneeze – inhaled virus droplets, TB – cough – inhaled bacteria droplets, Salmonellosis – diarrhoea and vomiting into environment, syphilis – infected sore - contact
Indirect or direct transmission, common source or host to host, vertical or horizontal
Direct or indirect transmission – Direct – host to host, good for microbe, remains inside environment for long time, minimal outside time – require high population density, low risk
Indirect – leave human host →arthropods (mosquito), verts (cow TB), fromites (door cold), food and water – risky may not be vector there, permits wider spread – more potential hosts
Cases per day – common source – spikes, host to host – fluctuates but fairly level.
Vertical transmission – vertical – parent to child – 1 gen to next (sperm/ova/pollen)
Horizontal – within a pop – 1 person to next (air/water)
Control = prevention/cure – clean water, sewage disposal, vaccinations, antibiotics + health care measures, good nutrition + housing, education.
Incidence – disease incidence increases with social infrastructure collapse, incidence higher in poorer pops
1/3 of global deaths due to infection → most preventable but cost, delivery, compliance

Preventing Transmission

1. Control of infected human – isolate (compliance – may not like being shut up alone), cost (very expensive – air locks, equiptment disposal), ethics (is it right to shut someone up)
2. Control/change human behaviour – sexual practices – give them condoms – may not use, personal hygiene – cook food, washing hands after/before looking after kids/elderly, food handling – visit factory and change practices
3. Control of transmission – water – clean it, food – lots of control of food manufacture/sale, fromites – clean regularly – door handles/rails, air –filtered in baby food factory – difficult to control
4. Control alternative host – cull badgers/cattle with TB, vaccinate – chickens for salmonella, easy to control domestic – poor access to wild animals
5. Control vector – insecticides – difficult to kill all – resistance, avoid bites – mozzy nets/cream, control vector habitat – drain swamps to prevent mozzy egss.

Prevention - vaccination - effective for individual and pop if Herd immunity achieved – enough vaccinated so disease has nowhere to go. Cannot vaccinate all – cost, cannot get to everyone (war), refuse vaccine (poor voluntary uptake), side effects – benefits outweigh risks, vaccinate at risk groups – children (MMR, DTP), travellers (yellow fever, cholera, Typhoid), exposed (menigitus), Medics (BCG, HepB), elderly (influenza)
Prophylaxis – treatment to prevent disease before it is caught – anti malarial chemo if visiting malaria zone
Strategies may fail/be absent→ infection results → treat/cure/prevent further infection
Antimicrobial chemo – antiobiotics – bacteria – penicillin 1929, sulpha drugs 1935, streptomycin 1940's, tetracyclines 1950's
Bacteriostatic – inhibit – cell wall synth (peni) Protein synth (strepto) Nucleic Acid synth (sulphonamides) cell membrane function (polymixins)
Antifungal agents – ergosterol – targetable similar to cholesterol use amphiotericin B, fungal enzymes – use micronazae
Humans + fungus both eukaryotic – harder to kill than bacteria as bacteria are in diff kingdom, fungal treatments are toxic – tend to be topical only.
Antivirus – antiviral agents – viruses are intercellular and replication occurs before symptoms appear – harder to kill. Treatment – amantidine – inhibits virus penetrating cell, zidouudine – acts as nucleoside analouges – pretends to be DNA, virus uses, virus does not work (not replicated properly)

Amoeboid – Rhizopoda – pseudopoid movement, mostly aquatic – entamoeba histolytica → amoebic dystentry – common in warm climates,associated with poor hygiene/sanitation, cysts excreted in faeces, can become systemic – Liver→brain +lungs
Ciliated – Ciliophora – use cilia for locomotion, common in freshwater, not normally pathogenic to humans, break down plant material in cows rumen.
Parasitic – sporozoa – Malaria – 10^8 infected, 10^7 new infections 10^6 deaths per year AFRICA, plasmodium species (1880 discovery) transmitted by anopheles mosquito.

Fungi – range – microscopic single cells →large mushrooms, eukaryotic, no chlorophyll, usually immotile, definite cell walls, ergosterol instead of cholesterol in cell membrane
Moulds – Mycellium, hypae, spores (babies) Yeasts – unicellular – replication by budding
Classification method of sexual reproduction – zygomycota – rhizopus – bread mould, Ascomycota – saccharomyces cerevisiae – beer/bread/wine, Basidiomycota – agaricus campestris – field mushroom, Deuteromycota – Penicillium
Fungal diseases – mycoses
Cutaneous – persistant infection as spore is under skin – tinea pedis – athletes foot/ringworm
Systemic – Cryptococcus neoformans (pigeons fanciers disease) mould on pigeon feet/feathers/nest →into elderly respiration→systemic infection
Oppurtunistic - aspergillus – lung infection→systemic. Candida albicans (thrush) reduced immunity/microbial flora
Mycotoxicoses – primary via infected plant material, 2nday via infected food chain, fungal toxin produced – fungi grows on food, produces toxins – hepatoxic – bad for liver

Host parasite relationship – microbes need host, humans have evolved protective mechanisms, microbes evolved avoiding mechanisms.
Host parasite relationship – balanced, constantly changing at individual level, constantly evolving at pop level, highly dynamic – stress/weather

Endocrine System – controls body functions by releasing hormones into the blood, chemical produced in 1 location, effects felt at distance, controls homeostasis, intergrates and regulates growth and development, controls mammams and instigates sexual reproduction.
Autocrine – works on cell that produced it, Paracrine – works on nearby cell to producer.
Hormone functions – homeostasis (controlled by thyroid, cortisol), changes in environment (cortisol, thyroid aldosterone), growth + development (thyroid, GH, sex steroids, cortisol), Reproduction (estrogen, testosterone, FSH, LH, thyroid)
Hormone Classification – can be – protein based (thyroid stimulating, insulin parathyroid), amino acid based (Thyroid, epinephrine), steroids (cortisol, aldosterone, testosterone – must eat cholesterol to make steroids)
Mechanism of Hormone action – circulate in blood stream - bound to transport protein or free, enter cells to alter biological activity
Hormone Regulation – receptor specifity – lock + key mechanism, perfect match → response, only particular receptors respond to hormones e.g. no hair in eyes, receptor concentration – more receptors on cell – more hormone sensed, feedback loops – response to high/low hormone levels, circadian rhythms – hormones only produced at certain times e.g. menstrural cycle
Feedback Mechanism – autocrine – hormone produced by cell, too much produced, cell told to stop production. Target cells – target cell sends biological response, this tells producer cell that no more hormone needed.
Brain + Pituitary Regulation – Hypotholamus sends biological response, this tells producer cell that no more hormone needed
Nervous system – chemical signal at target cell, “wired”, rapid, brief duration, anatomical proximity

Full pancreas transplant – limited by immunosuppressive medication, 50% rejected, indicated for Type 1 DM requiring kidney transplant
NIDDM – progressive relentless deterioration of pancreatic beta cell function, insulin resistance + declining insulin secretion, increases requirements for powerful medication to combat hyperglycemia, most patients require insulin eventually
Monitoring glucose – blood glucose levels easily measured,
diabetes – controllable by adjusting therapy according to changes in glucose levels
Problems – excersise alters glucose levels (they vary), food intake varies, illness + stress use glucose, alcohol causes hypoglycaemia
HbA1c – produced from non covalent haemoglobin modification, half life of 60 days in body, measure – indicator of long term glucose levels (controlled by treatment)
Problems – daily variation not show, hyper and hypoglycaemia missed
Exenatide – GLP-1 analogue (FDA approved 2005), promotes glucose –dependant insulin secretion, indications – therapy of type 2 when 1st line oral therapy fails, 2ndary benefit – weight loss
Amylin – stored in beta cells, co secreted with insulin, decreases gastric emptying, suppresses glucagon secretion/glucose production, promotes saiety, decreases appetite, decreased levels in all diabetics – some type 1 – no response to meals due to low Amylin
Too much Amylin → cell death
Insulin – increases glucose uptake in cells, convert glucose to glycogen (glycogenesis), promotes lipogenesis, blood glucose level drops, increase AA uptake + protein synth, slows gluconeogenesis and glycogenolysis, hypoglycaemia inhibits insulin release
Glucagon – acts on hepatocytes, converts glycogen to glucose (glycogenesis), forms glucose from lactic acids + AA's (gluconeogenesis), glucose released from liver to make blood glucose increase to normal, hyperglycaemia inhibits glucagon release.

Spring Term

Cell Cycle – cell birth (mitosis)→maturation/differentiation→functions→death (by apoptosis)→replacement→cell birth M→G1→S→G2→M
Apoptosis – programmed cell death – contents destroyed no spillage ☺, controlled by cell signals – decision from cell itself/surrounding cell/cell from part of immune system, occurs when cell – damaged beyond repair/infected with virus/undergoing stress e.g.starvation/DNA damage from ionising radiation or toxic chemicals., prevents cell sapping nutrients from organism/spread of viral infection
Necrosis -breaking down of cell, organelles spilled ☹
Tumour – uncontrolled growth of abnormal cells→abnormal cell keeps dividing→abnormal cells eventually to join to form tumour→as tumour becomes larger, impedes function of nearby organs→unless growth stopped + tumour removed→healthy organs destroyed
Causes of uncontrolled growth – stimulation genes becomes hyperactive (dominant) altered gene = oncogene
Inhibitory genes become inactive (recessive) – lost gene = tumor suppressor gene
Tumour development – Hyperplasia – proliferation of cells within organ/tissue – may cause benign tumour
Dysplasia – abnormality in maturation of cells within a tissue – indicative of early neoplastic process – pre cancerous
Neoplasia – genetically abnormal cells proliferate in a non physiological manner, may result in formation of malignant tumour
Tumour – abnormal mass of tissue/cells (parenchyma) with supporting conncective tissue framework and blood vessels (stroma)
Cancer – abnormal growth of cells, tend to proliferate uncontrollably sometimes metastasise