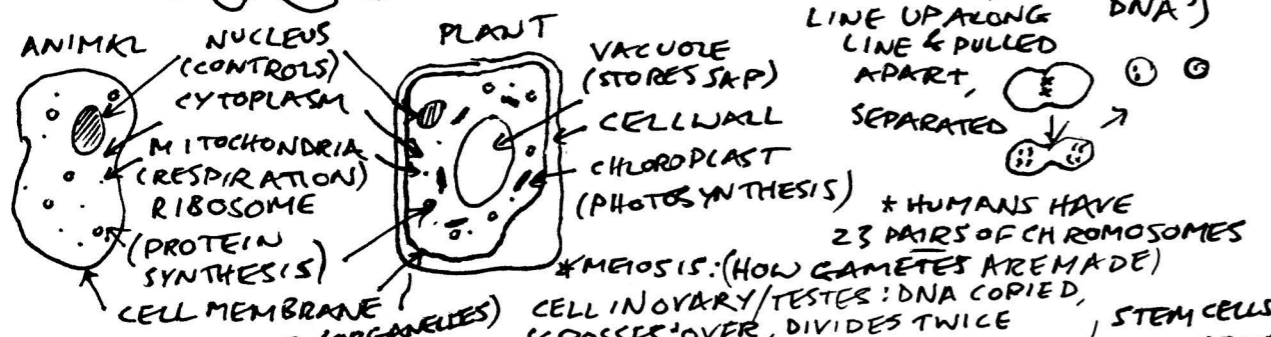


CELLS



- EUKARYOTIC: DNA IN NUCLEUS e.g. BELOW
 - PROKARYOTIC: DNA NOT " " e.g. BACTERIA (PLASMID, 'RING OF DNA')
 * MITOSIS: CELLS DIVIDING: CHROMOSOMES COPIED, LINE UP ALONG LINE & PULLED APART, SEPARATED

* MICROSCOPY
 MAGNIFICATION = $\frac{\text{IMAGE SIZE}}{\text{OBJECT SIZE}}$
 $\div 1000$ MM \rightarrow MM \rightarrow MM
 (nano) (micro)

- SEM: SCANNING ELECTRON MICROSCOPES
 - TEM: TRANSMISSION MICROSCOPES
 * DIFFUSION: WHEN SUBSTANCE/PARTICLES MOVE FROM HIGH CONCⁿ TO LOW (DOWN CONCⁿ GRADIENT). PASSIVE: NO ENERGY NEEDED. OSMOSIS: WATER DIFF THROUGH SEMI PERMEABLE MEMBRANE. PRACT: CUT SAME SIZE CYLINDERS OF POTATO. WEIGH, PUT IN DIFFERENT CONCENTRATIONS OF SUCROSE SOLⁿ, LEAVE. WEIGH AGAIN: IF HEAVIER, WATER OSMOSSED IN (AS CONCⁿ OF SUGAR > SOLⁿ). V.V. FOR LIGHTER. - NO CHANGE: CONCⁿ IN CELL = CONCⁿ OF SOLⁿ.

* DNA MADE UP OF 4 BASES (CHEMICALS): T+A, C+G. EVERY 3 BASES ARE CODE FOR AN AMINO ACID \rightarrow TELLS CELL WHAT ORDER TO PUT IN. SYNTHESISE PROTEIN. LOTS OF TRIPLETS MAKE GENE

* ACTIVE TRANSPORT: ENERGY USED TO MOVE PARTICLES AGAINST CONCⁿ GRAD e.g. MINERALS IN TO ROOTS. CARRIER PROTEINS ACT AS 'GATE'.

* INFECTIOUS DISEASES (e.g. MALARIA) CAUSED BY PATHOGENS: BACTERIA, VIRUS, FUNGUS, PROTIST
 * BODY'S DEFENSES: SKIN, PLATELETS, CILIA (HAIRS IN e.g. TRACHEA), MUCUS, ACID, WHITE BLOOD CELLS

INFECTION & RESPONSE
 PHAGOCYTES INGEST PATHOGENS NON-SPECIFIC ALSO MAKES ANTI-TOXINS.
 LYMPHOCYTES SPECIFIC: MAKES ANTIBODIES THAT BOND TO ANTIGEN ON SURFACE OF VIRUS: CAN TAKE TIME TO MAKE RIGHT ONE, BUT THEN 'REMEMBERS'.
 * VACCINATION: INJECT DEAD/INERT VERSION OF VIRUS. BODY WILL HAVE ANTI BODIES READY WHEN REAL VIRUS ARRIVES.
 * ANTIGEN: FLEMING ACCIDENTALLY DISCOVERED PENICILLIN - MOULD GROWING IN PETRI DISH \rightarrow BACTERIA DIDN'T GROW THERE \rightarrow MOULD HAD ANTI-BIOTIC COMPOUND.

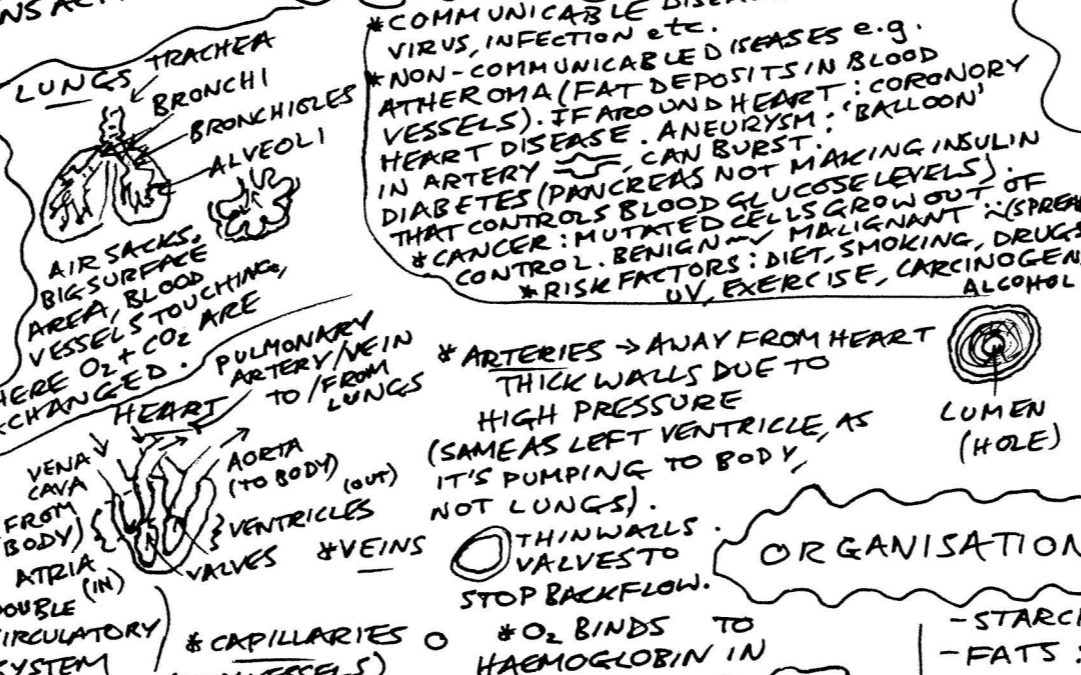
ANTIBIOTICS: DON'T KILL VIRUSES! - SHOULD'N'T OVERUSE, AS BACTERIA MUTATE & BECOME RESISTANT (ALSO WHY RUN WHOLE COURSE).
 BIOLOGY PAPER 1

DEVELOPING DRUGS: - DISCOVERY
 - DEVELOPMENT: TEST ON TISSUE
 - TRIALS: ANIMAL THEN HUMAN
 BLIND TRIALS (SOME GIVEN PLACEBO)
 - DOUBLE BLIND TRIALS (DOCTORS DO NOT KNOW WHICH IS CONTROL GROUP, REMOVES BIAS).
 - MANUFACTURE
 - REVIEW.

TESTING ANTI-BIOTICS PRACT!
 - PREPARE AGAR PLATE, SPREAD BACTERIA e.g. E-COLI TO MAKE 'LAWN'.
 TRIPLE ALWAYS OPEN IN PRESENCE OF BUNSEN FLAME. SO OTHER BACTERIA DO NOT ENTER PLATE/DISH. (CONVECTION CURRENT MAKES AIR RISE).
 - PLACE DISCS/DROPS OF DIFFERENT ANTI-BIOTICS ON LAWN (+ CONTROL e.g. H₂O). WAIT, THEN AFTER FEW DAYS, SEE HOW BIG AREA OF NO BACTERIA AROUND EACH IS \rightarrow MEASURE DIAMETER W/ RULER. (ASEPTIC TECHNIQUE)

* MONOCLONAL ANTIBODIES: MADE TO TARGET SPECIFIC CELLS/CHEMICALS IN BODY. INJECT MOUSE W/ ANTIGEN, THEN EXTRACT WBC. MAKING RIGHT ANTIBODY \rightarrow FUSE WITH TUMOUR CELL, MAKES HYBRIDOMAS \rightarrow CLONE, THEN HARVEST ANTIBODIES MADE.
 * PLANT DISEASES: VIRUS (e.g. TOBACCO MOSAIC), FUNGUS (ROSE BLACK SPOT), MINERAL DEFICIENCY: NITRATES: FOR AMINO ACIDS \rightarrow PROTEINS/GROWTH. MAGNESIUM: IN CHLOROPHYLL \rightarrow CAUSES CHLOROSIS, YELLOW LEAVES. * DISEASES IDENTIFIED BY SPOTS, STUNTED GROWTH, DECAY & ROT.
 * PLANT DEFENSES: CELL WALLS, WAXY CUTICLE, BARK/DEAD CELLS; ANTIBACTERIAL CHEMS, POISONS, DETERRENTS (THORNS etc).

RESPIRATION \rightarrow ALL CELLS DO THIS!
 $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$ (AEROBIC)
 WATER + CARBON DIOXIDE \leftarrow RESP
 IF LESS O₂ AVAILABLE: ANAEROBIC RESP
 GLUCOSE \rightarrow LACTIC ACID (HURTS!) LESS ENERGY (FEWER ATP MOLECULES)
 REVERSE REACTION = PHOTOSYNTHESIS!
 (SUNLIGHT ENERGY IN). GLUCOSE USED TO MAKE STARCH/CELLULOSE/PROTEINS (GROWTH) LIPIDS (STORE ENERGY)
 - TEST FOR IODINE ON LEAF/DROPS OF IODINE ON LEAF/ TURNS PURPLE
 THIS BUILDS UP OXYGEN DEBT \rightarrow O₂ NEEDED TO BREAK DOWN ACID AFTER EXERCISE (RECOVERY).
 DURING EXERCISE, HEART RATE + BREATHING RATE TO GET MORE O₂ TO CELLS TO GET MORE RESP IN MUSCLES.



* COMMUNICABLE DISEASES e.g. VIRUS, INFECTION etc.
 * NON-COMMUNICABLE DISEASES e.g. ATHEROMA (FAT DEPOSITS IN BLOOD VESSELS). IF AROUND HEART: CORONARY HEART DISEASE. ANEURYSM: 'BALLOON' IN ARTERY, CAN BURST.
 * DIABETES (PANCREAS NOT MAKING INSULIN THAT CONTROLS BLOOD GLUCOSE LEVELS).
 * CANCER: MUTATED CELLS GROW OUT OF CONTROL. BENIGN vs MALIGNANT (SPREAD).
 * RISK FACTORS: DIET, SMOKING, DRUGS, UV, EXERCISE, CARCINOGENS, ALCOHOL.

* ARTERIES \rightarrow AWAY FROM HEART THICK WALLS DUE TO HIGH PRESSURE (SAME AS LEFT VENTRICLE, AS IT'S PUMPING TO BODY, NOT LUNGS).
 * THIN WALLS VALVES TO STOP BACKFLOW.
 * CAPILLARIES (TINY VESSELS) * O₂ BINDS TO HAEMOGLOBIN IN RED BLOOD CELLS.
 * CO₂ DISSOLVED IN PLASMA (LIQUID IN BLOOD).

ORGANISATION
 PLANT STRUCTURE: ROOT HAIR CELL: SO WATER OSMOSSES IN AT HIGHER RATE.
 LEAF: WAXY CUTICLE: WATERPROOF SO WATER DOESN'T EVAPORATE
 UPPER EPIDERMIS: TRANSPARENT TO LET LIGHT THROUGH
 PALISADE LAYER: WHERE MOST PHOTOSYNTHESIS OCCURS
 SPONGEY MESOPHYLL LAYER: WHERE GAS EXCHANGE OCCURS.
 GUARD CELLS, SIZE CONTROL OF STOMATA (HOLES)
 STEM: XYLEM: LONG TUBES MADE FROM DEAD CELLS (WATER) PHLOEM: TUBES OF CELLS THAT USE ACTIVE TRANSPORT TO MOVE SUBSTANCES THROUGH
 * TRANSPIRATION: PLANT (e.g. GLUCOSE) WATER EVAPORATES FROM LEAVES, CAUSES LOW PRESSURE IN PLANT \rightarrow WATER OSMOSSES INTO ROOTS + RISES UP XYLEM.
 - AFFECTED BY: TEMP, WIND, HUMIDITY.

FOOD TESTS PRACT!
 - STARCH: IODINE TURNS PURPLE
 - FATS: ETHANOL \rightarrow CLOUDY.
 - GLUCOSE: BENEDICT'S SOLUTION: BLUE \rightarrow ORANGE.
 - PROTEIN: BIURET REAGENT: BLUE \rightarrow PURPLE.

* ENZYMES BREAK DOWN MOLECULES: SPECIFIC TO CHEMICAL e.g. AMYLASE BREAKS DOWN STARCH \rightarrow SUGAR. LIPASE, LIPIDS. PROTEASE, PROTEINS. 'LOCK & KEY' ACTIVE SITE. OPTIMUM pH BETWEEN 6-7.
 - TOO HIGH TEMP OR HIGH/LOW pH, ACTIVE SITE DENATURES (CHANGES SHAPE \rightarrow STOPS WORKING)
 * ENZYME PRACT! PUT IODINE IN SPOTTING TILE. WATERBATH 30°C. STARCH + AMYLASE + pH 5 BUFFER SOLUTION. START TIMER ONCE AMYLASE ADDED. EVERY 20S TAKE DROP + ADD TO IODINE ON TILE. WHEN IT NO LONGER TURNS PURPLE, NO MORE STARCH \rightarrow BROKEN DOWN. pH 5 - pH 8. REPEAT FOR

* RATES OF PHOTOSYNTHESIS PRACT!
 PUT PONDWEED IN WATER IN TEST TUBE. PUT LIGHT NEAR TUBE. COLLECT O₂ MADE IN UP TURNED MEASURING CYLINDER FILLED W/ WATER. IND. VAR: LIGHT INTENSITY BY MOVING LAMP FURTHER AWAY.
 BIOENERGETICS
 METABOLISM: SUM OF ALL CHEMICAL REACTIONS
 LIVER DOES LOTS!
 - REMOVES LACTIC ACID
 - TURNS GLUCOSE \rightarrow GLYCOGEN IF NOT NEEDED
 CORRELATION? MAYBE - MUST DO RESEARCH TO PROVE ONE AFFECTS OTHER.
 Video
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