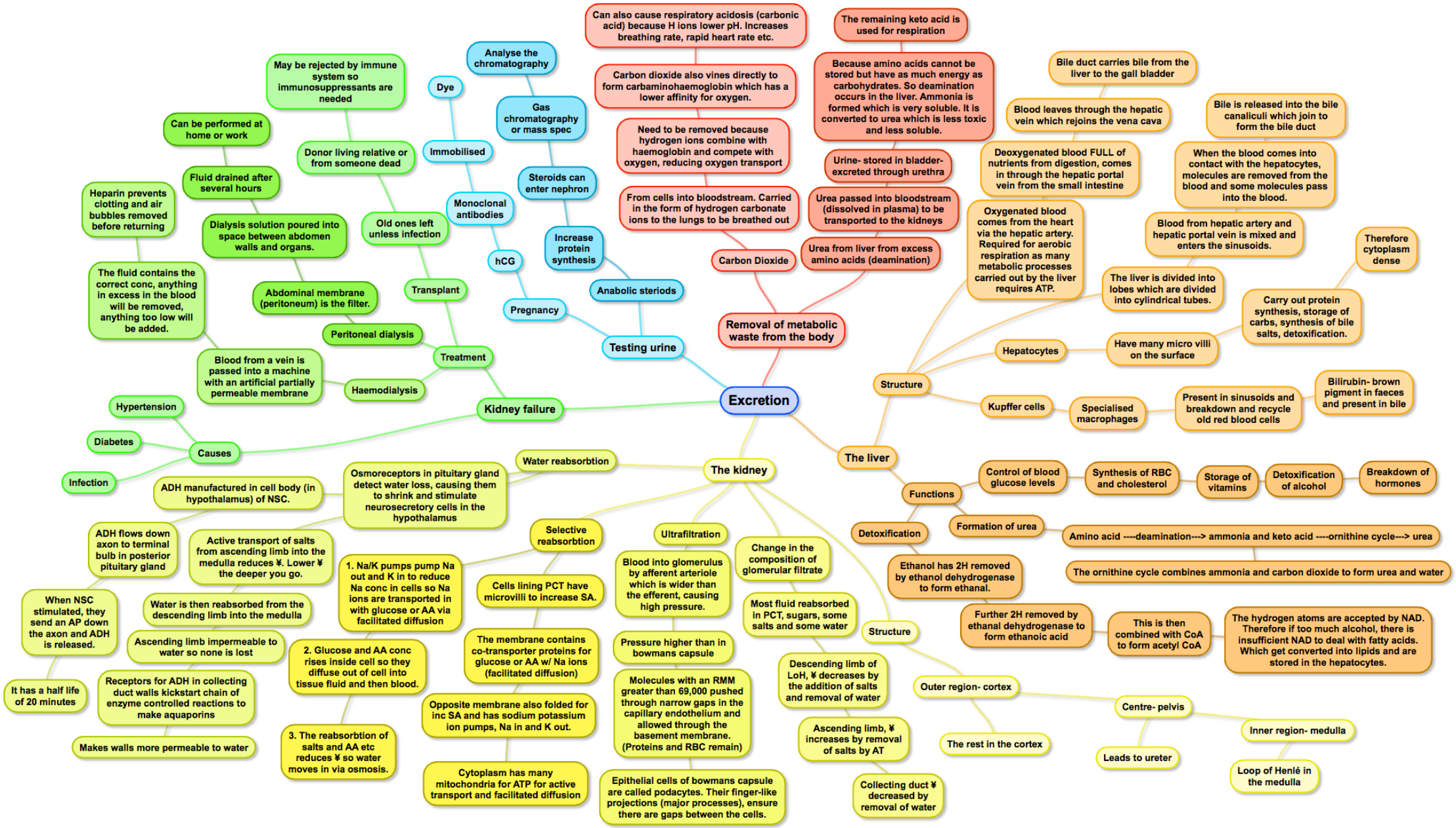
Excretion
Removal of metabolic waste from the body
Carbon Dioxide
Can also cause respiratory acidosis (carbonic acid) because H ions lower pH. Increases breathing rate, rapid heart rate etc.
Carbon dioxide also vines directly to form carbaminohaemoglobin which has a lower affinity for oxygen.
Need to be removed because hydrogen ions combine with haemoglobin and compete with oxygen, reducing oxygen transport
From cells into bloodstream. Carried in the form of hydrogen carbonate ions to the lungs to be breathed out
Urea from liver from excess amino acids (deamination)
Urea passed into bloodstream (dissolved in plasma) to be transported to the kidneys
Urine- stored in bladder- excreted through urethra
Because amino acids cannot be stored but have as much energy as carbohydrates. So deamination occurs in the liver. Ammonia is formed which is very soluble. It is converted to urea which is less toxic and less soluble.
The remaining keto acid is used for respiration
Testing urine
Pregnancy
hCG
Monoclonal antibodies
Immobilised
Dye
Analyse the chromatography
Gas chromatography or mass spec
Steroids can enter nephron
Increase protein synthesis
Anabolic steriods
Kidney failure
Treatment
Haemodialysis
Peritoneal dialysis
Abdominal membrane (peritoneum) is the filter.
Blood from a vein is passed into a machine with an artificial partially permeable membrane
Transplant
Old ones left unless infection
Donor living relative or from someone dead
May be rejected by immune system so immunosuppressants are needed
Dialysis solution poured into space between abdomen walls and organs.
Fluid drained after several hours
Can be performed at home or work
Heparin prevents clotting and air bubbles removed before returning
The fluid contains the correct conc, anything in excess in the blood will be removed, anything too low will be added.
Causes
Hypertension
Diabetes
Infection
The kidney
Water reabsorbtion
Osmoreceptors in pituitary gland detect water loss, causing them to shrink and stimulate neurosecretory cells in the hypothalamus
ADH manufactured in cell body (in hypothalamus) of NSC.
ADH flows down axon to terminal bulb in posterior pituitary gland
When NSC stimulated, they send an AP down the axon and ADH is released.
It has a half life of 20 minutes
Active transport of salts from ascending limb into the medulla reduces ¥. Lower ¥ the deeper you go.
Water is then reabsorbed from the descending limb into the medulla
Ascending limb impermeable to water so none is lost
Receptors for ADH in collecting duct walls kickstart chain of enzyme controlled reactions to make aquaporins
Makes walls more permeable to water
Selective reabsorbtion
1. Na/K pumps pump Na out and K in to reduce Na conc in cells so Na ions are transported in with glucose or AA via facilitated diffusion
2. Glucose and AA conc rises inside cell so they diffuse out of cell into tissue fluid and then blood.
3. The reabsorbtion of salts and AA etc reduces ¥ so water moves in via osmosis.
Cells lining PCT have microvilli to increase SA.
The membrane contains co-transporter proteins for glucose or AA w/ Na ions (facilitated diffusion)
Opposite membrane also folded for inc SA and has sodium potassium ion pumps, Na in and K out.
Cytoplasm has many mitochondria for ATP for active transport and facilitated diffusion
Ultrafiltration
Blood into glomerulus by afferent arteriole which is wider than the efferent, causing high pressure.
Pressure higher than in bowmans capsule
Molecules with an RMM greater than 69,000 pushed through narrow gaps in the capillary endothelium and allowed through the basement membrane. (Proteins and RBC remain)
Epithelial cells of bowmans capsule are called podacytes. Their finger-like projections (major processes), ensure there are gaps between the cells.
Change in the composition of glomerular filtrate
Most fluid reabsorbed in PCT, sugars, some salts and some water
Descending limb of LoH, ¥ decreases by the addition of salts and removal of water
Ascending limb, ¥ increases by removal of salts by AT
Collecting duct ¥ decreased by removal of water
Structure
Outer region- cortex
The rest in the cortex
Centre- pelvis
Leads to ureter
Inner region- medulla
Loop of Henlé in the medulla
The liver
Structure
Bile duct carries bile from the liver to the gall bladder
Blood leaves through the hepatic vein which rejoins the vena cava
Bile is released into the bile canaliculi which join to form the bile duct
Deoxygenated blood FULL of nutrients from digestion, comes in through the hepatic portal vein from the small intestine
When the blood comes into contact with the hepatocytes, molecules are removed from the blood and some molecules pass into the blood.
Oxygenated blood comes from the heart via the hepatic artery. Required for aerobic respiration as many metabolic processes carried out by the liver requires ATP.
Blood from hepatic artery and hepatic portal vein is mixed and enters the sinusoids.
The liver is divided into lobes which are divided into cylindrical tubes.
Therefore cytoplasm dense
Carry out protein synthesis, storage of carbs, synthesis of bile salts, detoxification.
Hepatocytes
Have many micro villi on the surface
Kupffer cells
Specialised macrophages
Present in sinusoids and breakdown and recycle old red blood cells
Bilirubin- brown pigment in faeces and present in bile
Functions
Control of blood glucose levels
Synthesis of RBC and cholesterol
Storage of vitamins
Detoxification of alcohol
Breakdown of hormones
Detoxification
Formation of urea
Amino acid ----deamination---> ammonia and keto acid ----ornithine cycle---> urea
The ornithine cycle combines ammonia and carbon dioxide to form urea and water
Ethanol has 2H removed by ethanol dehydrogenase to form ethanal.
Further 2H removed by ethanal dehydrogenase to form ethanoic acid
This is then combined with CoA to form acetyl CoA
The hydrogen atoms are accepted by NAD. Therefore if too much alcohol, there is insufficient NAD to deal with fatty acids. Which get converted into lipids and are stored in the hepatocytes.