| Homeostasis – Key Regulatory Systems Summary | | | |
| --- | --- | --- | --- |
| **Regulation System** | **Endocrine System** | **Nervous System**  **[Sensory/effectors]** | **Issues & Impacts of imbalance** |
| **Glucose regulation** | **Adrenaline** (from **adrenal gland**) = helps convert glycogen to glucose  **\*Insulin and glucagon** (from **pancreas**)  If glucose is above limit **INSULIN** causes…  - glycogenesis (changing glucose to glycogen)  - cells to absorb glucose out of blood  - inhibition of gluconeogenesis (stops body making glucose)  If glucose is below limit **GLUCAGON** causes…  - gluconeogenesis (changing glycogen to glucose)  - cells release glucose into the blood  - inhibition of glycogenesis (stops body making glycogen out of glucose) | Brain transmits nerve impulse to adrenal gland to secrete adrenaline | * [glucose] too 🡩 = hyperglycaemic   - excess glucose in urine  - more urination and thirst   * [glucose] too 🡫 = hypoglycaemic   **Diabetes mellitus**  = reduced insulin production  **Type I**  - pancreas cells destroyed by the person’s immune system! Affects for lifetime.  *- treat with insulin injection*  **Type II**  - body cells resist insulin, which means glucose builds up in blood  *- treat by diet/lifestyle/medications* |
| **Thermoregulation** | **Thyroxine** (from **thyroid gland**)  - 🡩 production = 🡩 metabolism rate (generates heat)  **Adrenaline** (from **adrenal gland**)  - increases heart rate and respiration (generates heat) | **Sensory thermoreceptors:**  Skin receptors  Hypothalamus receptors  **Effectors:**  Shiver + sweat  Vasodilation/constriction  Hair follicle muscles |  |
| **Metabolism Regulation** | **TSH** (thyroid stimulating hormone)  - secreted from **pituitary gland**  - stimulates **thyroxine** (T4/3) production in **thyroid gland**  **Thyroxine** (from **thyroid gland**)  - causes increase in metabolism rates  **Feedback =**  - 🡩 [thyroxine] inhibits pituitary making more TSH  - this leads to less TSH, and so less thyroxine from thyroid gland |  | **Hypothyroidism**  - not enough thyroxine etc. from thyroid gland = can’t tolerate cold; poor memory; feel tired  **Hyperthyroidism**  - excessive production of thyroxine etc. from thyroid gland = can’t tolerate heat; rapid heart beat; can’t sleep |
| **Osmoregulation**  Links to:   * Blood volume * Blood pressure | **ADH –** anti-diuretic hormone (from **pituitary gland**)  Diuretic = cases increase urination (loss of water)  Anti-diuretic = causes decrease urination (keep water) | **Sensory receptors:**  Hypothalamus (osmoreceptors)  - controls how much ADH is released from glands  Baroreceptors (detects blood pressure)  - found in nephron  - if blood pressure 🡫 they cause hormones to make blood vessels constrict and thus 🡩blood pressure  **Feedback - High Osmolarity (**🡫**water)**  1. Hypothalamus detects  2. **ADH** production increases  3. more water exits nephron back into blood  4. less urination / water saved / back to normal | * [solutes] too 🡩 = enzymes affected;   Causes: dehydration; diarrhoea   * [solutes] too 🡫= cells swell; too dilute for some metabolism   Causes: too much water; ADH not secreted properly  **WHEN water enters blood…**  - blood osmolarity decreases  - blood volume increases  - blood pressure increases  **Hypotension** (low blood pressure)  - light-headedness; dizzy  Causes: dehydration; stress; some meds  **Hypertension** (high blood pressure)  - no symptoms but can lead to other complications  Causes: obesity; genetic; smoking; lifestyle |
| **Carbon dioxide & pH**  CO2 in blood = H2CO3 = H+ + HCO3- | **Adrenaline** & **thyroxine** both used to increase breathing rates to get rid of excess CO2 | **Sensory chemoreceptors:**  - in the heart  - in the medulla (brain stem); detect pH  **Effectors:**  - rib cage muscles, etc. | * 🡩 [H+] = acidic = breathing rate increases to get rid of excess CO2 * 🡫 [H+] = basic = respiratory alkalosis due to low CO2 |