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Homeostasis Negative feedback	Homeostasis Insulin: source, stimulus, effect
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Body temperature, blood pH, blood glucose concentration, blood osmotic concentration.

Maintenance of the internal environment of an organism: variables kept within preset limits despite fluctuations in the external environment.

β cells of pancreatic islets; high blood glucose; liver and muscle cells absorb glucose and convert it to glycogen.

A change from the set point triggers a response that reverses it, from above or below, returning the variable to the set point.

Secreted directly into blood capillaries and transported in the blood to cells with the matching receptors.

α cells of pancreatic islets; low blood glucose; liver cells break glycogen to glucose and release it into the blood.

Target cells become resistant to insulin.
Risk factors: obesity, inactivity, diet, age, genetics.

Autoimmune destruction of β cells, so little or no insulin is secreted. Treated with insulin injections.

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How can type 2 diabetes be prevented?

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Roles of the hypothalamus and pituitary in thermoregulation

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Effect of thyroxine on body temperature

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Uncoupled respiration in brown adipose tissue

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Vasodilation versus vasoconstriction

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Responses to overheating

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Excretion versus osmoregulation

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Ultrafiltration

Hypothalamus compares temperature with the set point and controls effectors; via the pituitary (TSH) it increases thyroxin secretion when cold.

Healthy diet low in sugars and fat, regular exercise and keeping a healthy body mass.

Protons leak back across the inner mitochondrial membrane, so energy is released as heat instead of making ATP.

Raises the basal metabolic rate, so cells generate more heat.

Vasodilation of skin arterioles and sweating (evaporation removes heat); behaviour such as seeking shade.

Vasodilation: skin arterioles widen, more blood near surface, more heat lost.
Vasoconstriction: arterioles narrow, less heat lost.

High pressure in the glomerulus forces small solutes and water from plasma into Bowman's capsule; cells and large proteins stay in the blood.

Excretion: removal of metabolic wastes such as urea. Osmoregulation: regulation of osmotic concentration (osmol L^{-1}).

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Role of the proximal convoluted tubule

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Role of the loop of Henle

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Effect of high ADH on collecting duct cells

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Where are osmoreceptors, and what do they control?

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Blood supply during vigorous physical activity

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Which organ's blood supply stays constant during sleep, rest and exercise?

Ascending limb actively transports Na^+ out, keeping the medulla at high osmotic concentration so collecting ducts can reabsorb water.

Reabsorbs all glucose and amino acids, most ions and water; toxins and unwanted solutes stay in the filtrate.

In the hypothalamus; they detect blood osmotic concentration and control the rate of ADH secretion by the pituitary.

Aquaporins move from intracellular vesicles into the cell membrane, so more water is reabsorbed and urine is concentrated.

The brain, which needs a steady supply of oxygen and glucose.

Large increase to skeletal muscles; reduced to gut and kidneys by vasoconstriction; brain roughly constant.