homeostasis

INTRODUCTION

- conditions in our bodies are constantly changing
- mechanisms in the body help to adjust and prevent changes within our bodies from going beyond normal
- this is known as homeostasis
  - ↳ the maintenance of a constant internal environment in the body

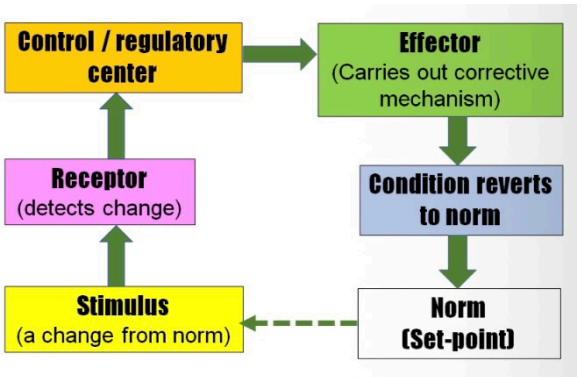
INTERNAL CONDITIONS THAT COULD CHANGE

- blood glucose concentration
  1) low blood glucose concentration leads to insufficient energy
  2) high blood glucose concentration can cause damage to blood vessels
     - ↳ persistent high blood glucose concentration is a sign of diabetes
- water potential of blood plasma
  1) higher water potential than cells
     - ↳ cells burst / lyse
  2) lower water potential than cells
     - ↳ cells shrink / crenate
- body temperature
  1) rate of enzyme-catalysed reactions affected

NEGATIVE FEEDBACK LOOP

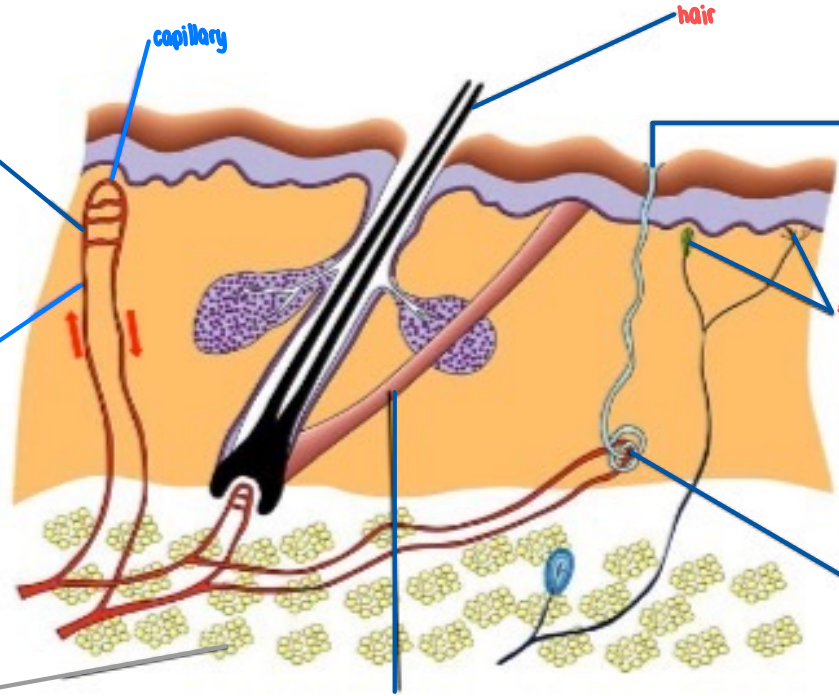
homeostasis is maintained by a negative feedback loop

- a change to the normal state acts as a stimulus
  stimulus is detected by a receptor, which will activate corrective mechanisms to restore conditions to normal
- after conditions are restored, the corrective mechanisms stop



Component	
set-point (norm)	the normal condition to be maintained
stimulus	change in internal or external environment that the body reacts to
receptor	detects the stimulus
control center	triggers appropriate responses by effectors to restore constant internal environment
effector	carries out responses as directed by the control center
corrective mechanism	made up of response(s) that return condition to normal

negative feedback is a process that brings about an opposite effect to the change from the normal condition



Arterioles, capillaries & veavles

- vasoconstriction and vasodilation of the arterioles in the skin is caused by the contraction of muscles in the arteriole walls
- affects the amount of blood flowing through the capillaries near the surface of skin
- helps to regulate body temp.

temperature receptors (thermoreceptors)

- detect temperature changes in the external environment

sweat gland

- secretes sweat through a duct and out of the sweat pore at the skin surface

- serves as a layer of insulation, reducing heat loss

- attached to hair follicles
- contraction of hair erector muscle makes hair stand on their ends and produce goose pimples

THERMOREGULATION

- receptor — thermoreceptors
  1) thermoreceptors in the skin detect temperature changes in the environment
  2) thermoreceptors in the hypothalamus detect temperature changes in the blood
- control centre
  1) hypothalamus in the brain
  2) monitors and regulates body temp.
  3) receives information about temp. changes from:
     - thermoreceptors in the skin
     - thermoreceptors in the hypothalamus

corrective mechanisms

1) shivering
   - sudden, uncontrolled muscle contractions increases respiration in muscle cells, thus increasing rate of release of heat energy
2) sweating
   - sweat glands can be more active or less active
   - more or less sweat is produced from the sweat gland, through the sweat duct and out of the sweat pore heat is lost as the water in sweat evaporates
   - this leads to a cooling effect on the skin

3) vasoconstriction and vasodilation of arterioles in the skin

when body temperature rises above normal,

vasodilation of arterioles in the skin allows more blood to flow through the capillaries near the surface of the skin

due to the relaxation of muscles in the walls of the arterioles

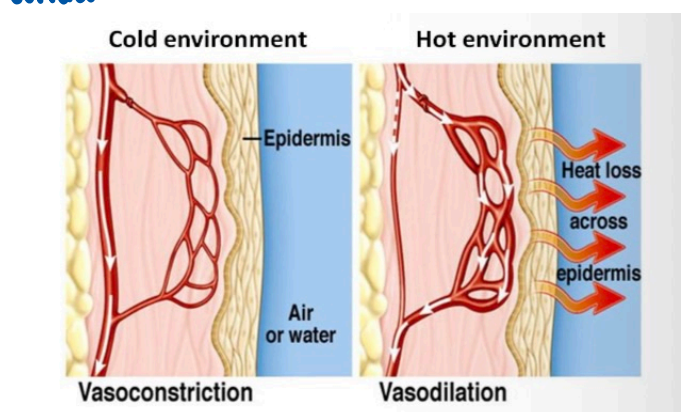
- this allows more heat to be lost through the skin surface

when body temperature drops below normal,

- vasoconstriction of arterioles in the skin lead to less blood flowing through capillaries near the surface of the skin

due to contraction of muscles in the walls of the arterioles

- this reduces the heat lost through the skin surface



4) hair erector muscles contract/relax

- contract when external temperature is cold

1) leads to production of goosebumps

2) in hairy mammals, the raised skin hair traps a layer of air next to skin to act as a layer of insulation

- relax when external temperature is warm

for humans, this is not a significant corrective mechanism in response to temperature changes as we do not have long enough hair