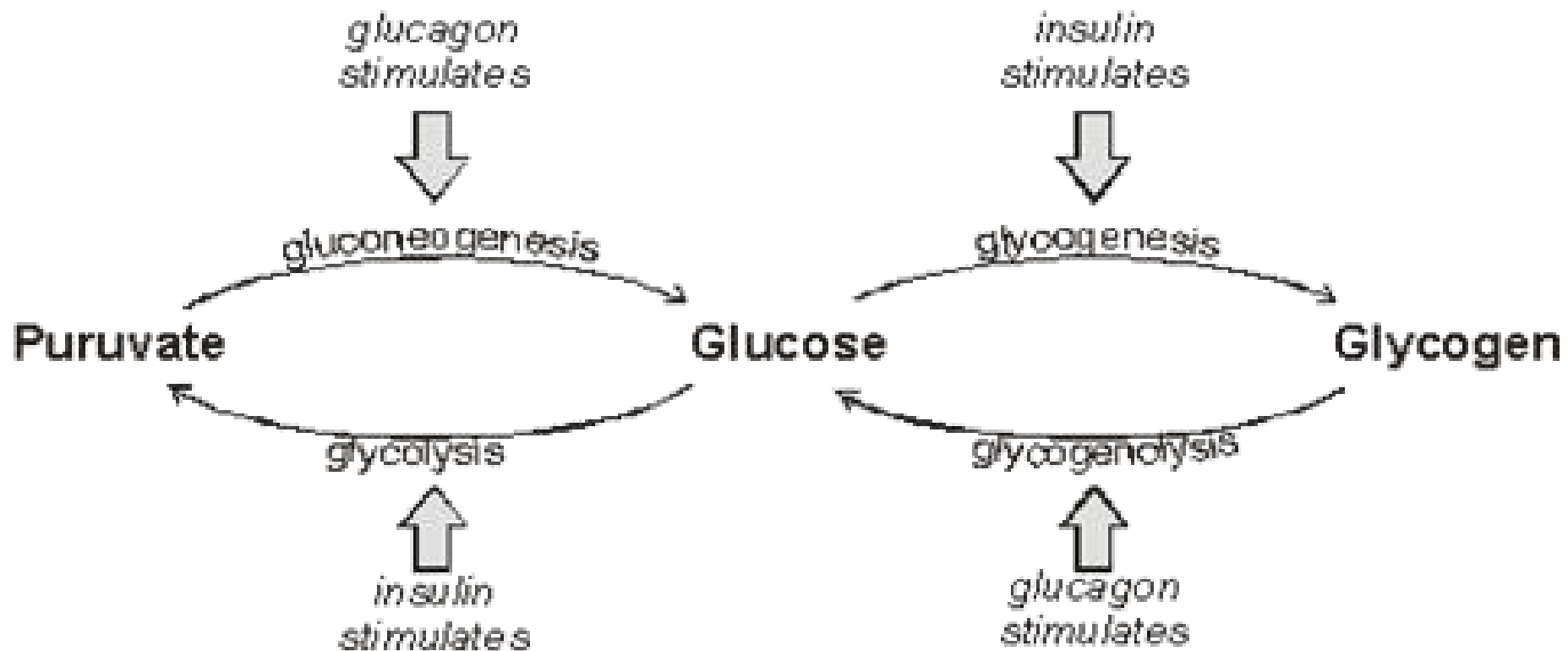


Effector	Response to low temperature	Response to high temperature
Smooth muscles in peripheral arterioles in the skin.	Muscles contract causing <u>vasoconstriction</u> . Less heat is carried from the core to the surface of the body, maintaining core temperature. Extremities can turn blue and feel cold and can even be damaged (frostbite).	Muscles relax causing <u>vasodilation</u> . More heat is carried from the core to the surface, where it is lost by convection and radiation. Skin turns red.
Sweat glands	No sweat produced.	Glands secrete sweat onto surface of skin, where it evaporates. This is an endothermic process and water has a high latent heat of evaporation, so it takes heat from the body.
Erector pili muscles in skin (attached to skin hairs)	Muscles contract, raising skin hairs and trapping an insulating layer of still, warm air next to the skin. Not very effective in humans, just causing “goosebumps”.	Muscles relax, lowering the skin hairs and allowing air to circulate over the skin, encouraging convection and evaporation.
Skeletal muscles	Muscles contract and relax repeatedly, generating heat by friction and from metabolic reactions.	No shivering.
Adrenal and thyroid glands	Glands secrete adrenaline and thyroxine respectively, which increase the metabolic rate in different tissues, especially the liver, so generating heat.	Glands stop releasing adrenaline and thyroxine.
Behaviour	Curling up, huddling, finding shelter, putting on more clothes	Stretching out, finding shade, swimming, removing clothes

Another feedback



Excretion means the removal of waste products from cells.
There are five important excretory organs in humans:

- **Skin** excretes sweat, containing water, ions and urea
- **Lungs** excrete carbon dioxide and water
- **Liver** excretes bile, containing bile pigments, cholesterol and mineral ions
- **Gut** excretes mucosa cells, water and bile in faeces. (The bulk of faeces comprises plant fibre and bacterial cells, which have never been absorbed into the body, so are not excreted but egested.)
- **Kidneys** excrete urine, containing urea, mineral ions, water and other “foreign” chemicals from the blood.