FORM matches FUNCTION

★ CONTROL SYSTEMS ARE NEEDED TO REGULATE THE COMPOSITION OF INTERNAL BODY FLUID

EMERGENT PROPERTIES ~ TISSUES
↓
ORGANS
↓
ORGAN SYSTEMS

ODD SYSTEM
- INTEGUMENTARY ⇒ SKIN & CLAWS !!

MULTIPLE SYSTEMS - PANCREAS — digestive
— endocrine
- heart — muscular
— circulatory

ANIMAL TISSUE

(1) EPITHELIAL
(2) CONNECTIVE
(3) MUSCLE
(4) NERVOUS

} be able to IDENTIFY.

Epithelial

- covers outside of body and lines organs/cavities
- ACTIVE INTERFACES (with FLUID or AIR)
- Polarized — Apical surface → faces lumen (cavity)
  basal surface → attached to basal lamina

Nervous

- Neurons are basic unit

  Axon – cell body – dendrite

- Glial cells – GLIA – support cells

Muscle

striated (1) skeletal
involuntary (2) smooth
striated (3) cardiac

} filaments containing ACTIN and MYOSIN (proteins)

Connective Tissue – E.C.M. ← fibroblasts / macrophages)

(1) loose C.T.
(2) Fibrous C.T.
(3) ADIPOSE – stores fat
(4) BLOOD – cells + fragments suspended in plasma
(5) CARTILAGE
(6) BONE

!!

vertebrate C.T.

REGULATOR

- ANIMAL USES INTERNAL MECHANISMS TO CONTROL INTERNAL CHANGE IN FACE OF EXTERNAL FLUCTUATION

CONFORMER

- IT ALLOWS ITS INTERNAL CONDITION TO CHANGE ALONG WITH EXTERNAL CHANGES.

↳ ORGANISMS CAN REGULATE SOME & CONFORM TO OTHER.

VOCAB – "INTERSTITIAL" – FLUID THAT SURROUNDS CELLS.

HOMEOSTASIS

- "STEADY STATE"
- MAINTENANCE OF INTERNAL BALANCE

"SET POINT" – A PARTICULAR VALUE OR "NORMAL RANGE"
- i.e. pH = 7.4 i.e. 19–21°C
temp = 98.6°F

STIMULUS → SENSOR (RECEPTOR) → RESPONSE

NEGATIVE FEEDBACK

CONTROL MECHANISM REDUCES THE STIMULUS.

THERMOREGULATION - example of Homeostasis

↳ temps can:
(1) reduce efficiency of enzymes
(2) alter fluidity of cell membranes.
(3) affect biochemical processes.

ENDOTHERMIC - warmed by metabolic heat

ECTOTHERMIC - heat from external sources.

↳ fish, reptiles, amphibians
↳ ADJUST by BEHAVIORAL MEANS
↳ need less food
↳ successful strategy in resource-depleted area

Exchange of HEAT

(1) RADIATION
(2) CONVECTION
(3) CONDUCTION
(4) EVAPORATION

ADAPTATIONS

- INSULATION – fat, fur, feathers, hair ("goose bumps")

- Circulatory
  1) VASODILUTION – cools
  2) VASOCONSTRICTION – warms

- counter current exchange
  arteries (warm) and veins (cold) running next to and in opposite direction

ACCLIMATIZATION

- adjusting insulation.
- cellular adjustments
  - ENZYME LEVELS
  - RATIO of SATURATED / UNSATURATED LIPIDS
  - Anti freeze proteins

SENSORS

- hypothalamus (in brain) → thermostat

FEVER – increase in the set point

(endotherms)

- ectotherms will seek out a warmer environment when INFECTED !!

Animal's Response to Stimuli

(1) Nervous System - limited to cells that connect

(2) ENDOCRINE SYSTEM - limited to cells that have receptors for the hormone

HORMONES
- single location at multiple sites
- act in seconds - remain for minutes/hours.

COORDINATES GRADUAL CHANGES THAT AFFECT ENTIRE BODY
- Growth
- Development
- reproduction
- METABOLIC PROCESSES
- DIGESTION

SIMPLE ENDOCRINE PATHWAY

Low pH Duodenum → S-cells secrete SECRETIN → Travels to Pancreas

→ Pancreas releases Bicarbonate → pH increases!

Neuroendocrine Pathway

- rely on a sensor in the nervous system

NERVES → hypothalamus → pituitary gland

↳ hormones released → regulate other glands

→ SUCKLING by infants → OXYTOCIN

(posterior pituitary hormone)

Positive feedback until stimulus stops

WATER SOLUBLE HORMONES must bind to cell-surface receptors because they cannot pass membrane

↓

SIGNAL TRANSDUCTION PATHWAYS

LIPID SOLUBLE hormones bind to receptors in cytosol — form a hormone-receptor complex — and move into Nucleus

Testosterone & Estradiol

↳ affect Transcription !!

Multiple Effects - same hormone

Epinephrine (adrenaline)

- adrenal glands (on kidney)
- fight or flight

Hormone Evolution

- Thyroid Hormone Thyroxine (T_4) reabsorbs tadpoles' tails.
- Prolactin - multiple functions
  - ↳ old hormone