## Homeostasis

Homeostasis is the tendency to resist change in order to maintain a stable, relatively constant internal environment.

Many factors of the internal environment must be homeostatically maintained. For example: (Nutrients; O 2 and CO 2; Waste products; pH; Water, Salt, and other electr-olytes; Volume and pressure; Temperature)

Homeostasis is dependent on the commun-ication of cells and body systems in order to perform regulatory actions

Cells can communicate through Direct or Indirect Communication for the Nervous System and are relied on getting fast rapid responses accurately throughout the body

## Synaptic Transmission

Synapse: - junction between two neurons, or between a neuron and a muscle or gland that enables one cell to electrically and/or biochemically influence another cell

Electrical synapses: neurons connected directly by gap junctions

## Organization of Nervous System

The nervous system is organized into the central and peripheral nervous system

Central nervous system (CNS): brain and spinal cord

Peripheral nervous system (PNS): nerve fibers (Afferent and efferent divisions)

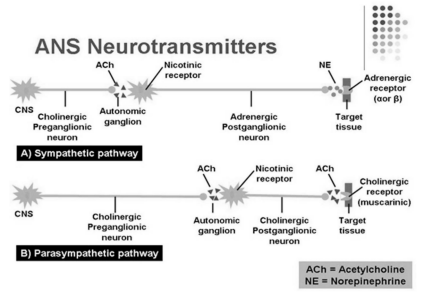
Enteric nervous system (ENS): nerve network of the digestive tract

Autonomic nervous system: fibers that innervate smooth muscle, cardiac muscle, and glands (Further subdivided into the sympathetic and parasympathetic nervous system)

Sympathetic - division of the autonomic nervous system that prepares the body for strenuous physical activity. “Fight or flight response”

Parasympathetic - division of the autonomic nervous system that maintains resting functions of the internal organs. “Maint-aining homeostasis”

## Nervous System Pathways




## Diffusion

Diffusion is the process of movement of molecules under a concentration gradient.

Rate of diffusion through a membrane depends on five factors:

1) **magnitude** of the concentration gradient: as concentration gradient increases, rate of diffusion increases

2) **permeability** of the membrane: as permeability increases, rate of diffusion increases

3) **surface area** of the membrane: as surface area increases, rate of diffusion increases

4) **molecular weight** of the substance: as molecular weight increases, rate of diffusion decreases

5) **distance** (thickness) over which diffusion takes place: as distance increases, rate of diffusion decreases

## Membrane Potential

## Action & Graded Potentials

Depolarization – change in membrane polarization to more positive values than resting membrane potential

Hyperpolarization – change in membrane polarization to more negative values than resting membrane potential

Repolarization - return to resting membrane potential after depolarization

Action Potential - Brief all-or-nothing reversal in membrane potential (spike), lasting on the order of 1 millisecond, , that is brought about by rapid changes in membrane permeability to Na+ and K+ ions

Graded potentials - are local changes in membrane potential, occur in varying grades or degrees of magnitude or strength, spread by passive current flow, and die over short distances

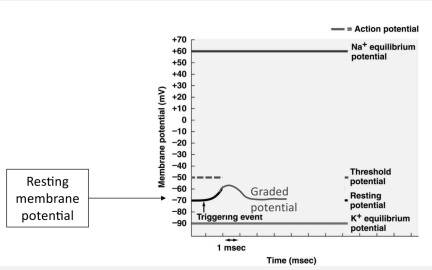
Propagation - action potentials propagate when locally generated depolarizing current spreads to adjacent regions of membrane causing it to depolarize.

Absolute refractory period - a brief period during a spike

Relative refractory period - a brief period following a spike

Refractory period prevents “backward” current flow

## Graded Potential




## Action Potential

Membrane potential is a separation of opposite charges across the plasma membrane.(Vm)

The grater the separation of charges across the membrane, the larger the potential

Equilibrium potential for K+ ($E_{K+}$= -90mV)

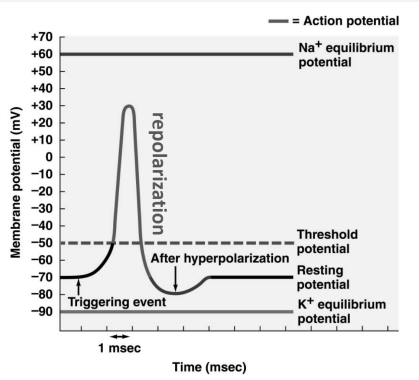
Equilibrium potential for Na+ ($E_{Na+}$= +60mV)

Resting membrane potential (- 70mV)

At the resting membrane potential, membrane permeability K+ > Na+

Leak channels permit ions to diffuse down concentration gradients

Na/K ATPase establishes and maintains concentration gradients (pumps 3 Na + out of the cell for every 2 K + pumped into the cell)

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