General sensory physiology

I. Introduction

A. Sensory receptors

B. General processing patterns

- Networks
    - primary sensory neuron
    - secondary, tertiary, etc., sensory neurons
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II. SR classification

A. Location

1. exteroceptors
2. interoceptors
3. proprioceptors
4.

B. Type of stimulus detected

1. mechanoreceptors
2. thermoreceptors
3. photoreceptors
4. chemoreceptors
5. nociceptors
6.

C. Structural complexity

1. simple receptors - modified dendritic endings of sensory neurons

    a. free (naked) dendritic endings -- cutaneous senses

    b. encapsulated endings -- nerve endings associated with connective tissue coverings

        - cutaneous senses

- proprioception

2. complex receptors
   - sensory cells

III. Electrical and chemical events occurring in receptors

A. Receptor potentials (RP)

1. mechanism

- stimulus produces a change in membrane potential directly proportional to its intensity; if receptor threshold reached SAP produced.

2. receptor potentials -- in simple receptors

3. receptor potentials -- in complex receptors

4. ionic basis of generator potential

5. adaptation

   a. tonic receptors -- slow adapting

   b. phasic receptors -- fast adapting

   c. basis of adaptation phenomena

   - opening of channels that cause repolarization -- decay GP rapidly
   - accessory structures decrease amount of stimulus reaching receptor

IV. Coding of sensory information

A. Modality and location

1. Sensation invoked by impulses generated in a receptor depends of specific part of brain they ultimately activate.

- specific sensory pathways are discrete from sense organ to cortex: labeled line coding.

   a. modality: brain associates signals from specific receptors with a specific modality.

b. location

- no matter where a particular sensory pathway is stimulated along its course to cortex, conscious sensation produced is referred to the location of the receptor.

- phantom limb example in amputees

- lateral inhibition - helps isolate the location of stimulus; involves pre-synaptic inhibition.

B. Intensity and duration

1. Intensity

a. coded by frequency of APs generated - porportional to intensity of stimulation.

b. coded by number of sensory units firing

- a sensory unit is a sensory axon and all its peripheral branches

- receptors of a primary neuron pick up information from a specific area -- receptive field; thus each sensory unit has a receptive field

- primary and secondary sensory neurons do not always exist 1:1

- often multiple primary sensory neurons converge onto a single secondary sensory neuron -- individual receptive fields merge onto a single, large receptive field.

- intensity of stimulus also determined by number of sensory units being stimulated

- recruitment of sensory units by increasing stimulus intensities can result in perception of a stronger stimulus.

c. examples of two point discrimination.