

## Physiology Lecture (3): Somatic Sensations

### Sensation & Perception

**Sensation** is conscious awareness of a stimulus, while **perception** is awareness with interpretation. Perception requires an intact sensory pathway.

### Sensory Pathway (Axis)

Includes sensory receptors, afferent neurons, ascending tracts to the thalamus (except olfaction), and sensory areas of the cerebral cortex.

### Sensory Receptors

Specialized structures that detect stimuli and transduce them into action potentials, allowing the CNS to respond and maintain homeostasis.

### Somatic Sensations

Arise from skin, muscles, bones, tendons, and joints and are mediated by somatic receptors.

### Mechanoreceptive Sensations – Tactile

**Crude touch** is poorly localized and transmitted by the ventral spinothalamic tract, while **fine touch** is well localized and transmitted by gracile and cuneate tracts.

### Tactile Discrimination & Stereognosis

Two-point discrimination depends on receptor density and cortical representation. Stereognosis requires intact somatosensory association cortex (areas 5,7).

### Pressure & Vibration

Pressure is mediated by Pacinian corpuscles and Ruffini endings. Vibration sense is transmitted by the dorsal column system.

### Proprioceptive Sensations

Static proprioception senses position, dynamic proprioception senses movement. Both are transmitted via gracile and cuneate tracts.

### Ascending Sensory Pathways

Consist of three neurons: first-order (DRG), second-order (decussate), and third-order (thalamus to cortex).

### Anterolateral System

Carries crude touch, pain, temperature, tickle, and itch sensations from the contralateral side.

### Dorsal Column–Medial Lemniscal System

Carries fine touch, vibration, pressure, conscious proprioception, and muscle tension sensations.

# Physiology Lecture (3)

## Somatic Sensations: Tactile & Proprioceptive

### Sensation & Perception

Sensation is the conscious awareness of a stimulus, while perception is sensation combined with interpretation. Perception requires an intact sensory pathway.

Term	Definition
Sensation	Conscious awareness of a stimulus
Perception	Awareness plus understanding of meaning

### Sensory Receptors

Specialized structures that detect stimuli and transduce them into action potentials, allowing the CNS to respond and maintain homeostasis.

Function	Description
Detection	Detect changes in internal and external environment
Transduction	Convert stimulus energy into action potentials
Transmission	Send information to CNS via afferent neurons

### Mechanoreceptive Sensations

Type	Receptors	Fibers	Pathway
Crude Touch	Free nerve endings, hair organs	A-delta	Ventral spinothalamic
Fine Touch	Meissner, Merkel	A-alpha, A-beta	Gracile & cuneate
Vibration	Meissner, Pacinian	A-beta	Gracile & cuneate
Pressure	Pacinian, Ruffini	A-beta	Gracile & cuneate

### Proprioceptive Sensations

Type	Function	Receptors	Adaptation
Static	Position sense	Muscle spindle, Golgi tendon, Ruffini	Slow
Dynamic	Movement sense	Joint receptors, Pacinian corpuscles	Fast

## Ascending Sensory Pathways

System	Fibers	Sensations	Crossing
Anterolateral	A-delta, C	Pain, temperature, crude touch	Spinal cord
Dorsal column	A-alpha, A-beta	Fine touch, vibration, proprioception	Medulla

