9.09J/7.29J - Cellular Neurobiology, Spring 2005.
Massachusetts Institute of Technology.
Department of Brain and Cognitive Sciences, Department of Biology
Instructors: Professors William Quinn and Troy Littleton
Lecture notes courtesy of Wyan-Ching Mimi Lee. Used with permission.

5/10/04

somatosensation:

- 4 different classes:

  1. discriminative touch (tell shape, consistency, etc of objects)

  2. proprioception (knowledge of convey self: where parts are)

  3. nociception (pain detection)

  4. temperature

- all neurons receiving signal are in dorsal root ganglia (all 4 types)

brainstem

DRG

Sends 1 axon to periphery, 1 to spinal cord
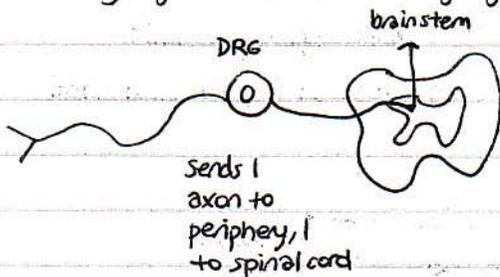
pain + temperature synapse in dorsal horn, cross over, T by contralateral pathway

discriminative touch + proprioception don't synapse, → ipsilateral brain stem

○ L1
○ L2
○ L3

dorsal root ganglion has one type of specific sensation (each neuron)

each segment (L1, L2, etc) has own DRGs

- different receptors in periphery for different pathways
  - free, bare endings for pain, T°
  - encapsulated for somatosensory (w/ help of nonneural cells)

touch: myelinated, large Aβ fibers (conduct APs quickly)

pain, T°: no myelination (C fibers), slow
or
slight myelination (Aδ fibers), slightly faster

4 things encoded in brain by somatosensation:

1. modality (pain, T°, etc): coded by different DRGs

2. location (eg which hand burned?): depends where receptors are, #, how innervated

3. intensity (how strong): response amplitude of receptor

4. timing (how long event lasts): fire when touch, stop when pressure removed

- intensity & timing separate 2 neuron classes:

1. rapidly adapting   ⌐‾‾‾⌐   good for encoding timing, motion

2. slowly adapting   ⌐‾‾‾‾‾   good for texture, shape, boundary, etc.

4 types of receptors in periphery for somatosensation:

1. Meissner's corpuscles ⎫ rapid adapting   40%
2. Pacinian corpuscles   ⎭   high frequency stimuli?   15%
3. Merkel's disks   ⎫ slow adapting   major role in 2-point discrimination 22%
4. Ruffini's corpuscles ⎭   25%
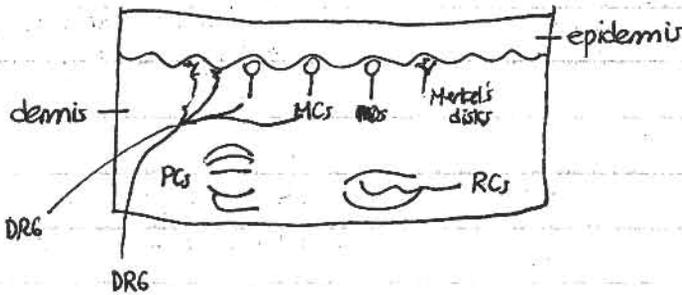
- Meissner's corpuscles & Merkel's disks in fingertips, for fine touch
- RCs also detect touch, deeper
- MDs detect vibration, PCs also w/ much stronger activation

40% Rs in hand are MCs (important in vibration?
                        concentrated in fingertips)

MCs
(PCs?)
like this   →) DRG
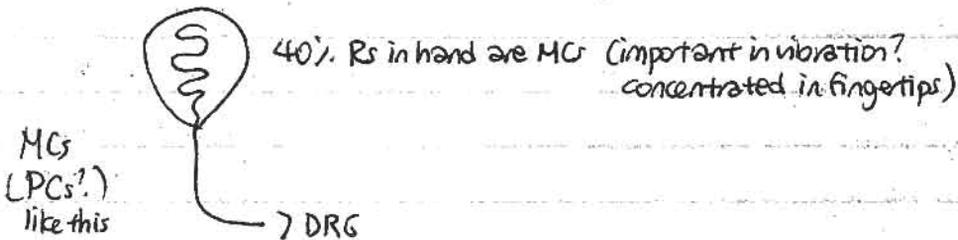
Merkel cells (non neuronal) innervated?
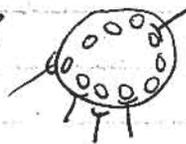
- MCs & MDs: DRG neuron innervates many receptors
  PCs & RCs: DRG neuron innervates one receptor

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