Homework7

1. List three physiological processes that are regulated with mechanical force.

(1) The regulation of blood pressure.

(2) Representation of body and limb position.

(3) The process of holding goods. (We should determine the pressure from goods to regulate force.)

2.How are mechanosensitive channels gated?

There are two models to explain the mechanism of gated property of mechanosensitive channel.

**Stretch model:** The mechanosensitive channels interact with lipids in membrane through hydrophobic effect. When membrane stimulated by tension, mechanosensitive channel conformation change triggered by membrane curvature and hydrophobic mismatch between bilayer and protein.

**Spring-like tether model:** There are spring-like tethers between channel and cytoskeleton and extracellular matrix. When extra stimuli change relative location of matrix, cytoskeleton and channel, tether can transmit forces to the channel and trigger the conformation change.

3. Briefly describe the components of the somatosensory system in human.

**Proprioception**: Derives information about body position and movement.

**Thermosensation**: Derives information about temperature.

**Nociception**: Derives feeling or pain.

**Pruriception**: Derives feeling of itch.

**Interoception**: Derives the sense of internal organ function.

4. List three types of mechanosensory pathways.

**Audition**

**Proprioception**

**Nociception**

5. What are the functions of Piezo2 in the somatosensory system?

Piezo2 located in mechanosensitive receptors (Merkel cell) and dorsal root ganglions. It plays an important role as a channel which receives extra mechanism stimuli and change convert them to electron signals.

6. What are the advantages of ribbon synapses over ordinary synapses?

Ribbon synapses induced neurotransmissions are fast, exact and sustained, which are quite important to transmit information in sensory pathway.

7. Design an experiment to search for hearing transduction channels.

(1) Get mutants of mice which are hearing lose.

(2) Locate the position of mutation on chromosome.

(3) Sequence the mutated genes which express ion channels, and do blast to get their ordinary gene sequences.

(4) Clone these sequences and build expression vectors.

(5) Transfect HET263K with these vectors and determine expression of genes.

(6) Give mechanical stimuli to HET293K transfected by different vectors, and use patch clamp to record currents induced by stimuli.

(7) Channels which involve current change may be hearing transduction channels.