Lecture 5 – 10/29/01

Neurons

1. Textbook pages that you can skip
   Chapter 44: pp. 773-774
       Figs. 44-8, 44-12
   pp. 788-792

2. Roadmap of the lecture

   • general description of neurons and glial cells
   • electrical properties of neurons:
     o ion gradients and membrane potential at rest
     o different types of ion channels and action potential
     o propagation of the action potential
     o saltatory conduction in myelinated axons
   • synaptic transmission: biochemical events; excitatory & inhibitory synapses; temporal and spatial summation

3. Study guide

   After studying for this lecture, you should be able to:
   • Know the different parts of a neuron
   • Know the ionic distributions across neuronal membranes, how they are maintained, and describe how a membrane potential is established at rest
   • Define depolarization and hyperpolarization; know what types of ionic movements support these events
   • Describes the events that take place during an action potential in terms of: the change in membrane voltage, the movement of ions, the types of ion channels involved and the changes of activity that the ion channels undergo
   • Understand how the action potential propagates down an axon
   • Define myelin sheath and node of Ranvier; understand why the action potential is only regenerated at the node of Ranvier
   • Describe the cellular organization of a synapse
   • Describe the biochemical events that take place during synaptic transmission
   • Know the difference between excitatory and inhibitory synapses
   • Compare spatial and temporal summation
   • Answer the following questions:
     • Which ions leave (enter) the neuron at rest? Which ions leave (enter) the neurons during an action potential?
     • Why does the membrane potential become less negative during the first phase of an action potential? Why does it return to the resting value at the end of the action potential?
     • How long does an action potential last?
• Where is myelin located?
• What is the most important point of entry of Na+ ions in myelinated neurons?
• What is an ion channel?
• Why do calcium channels open at the synapse?
• What is a neurotransmitter? Where are the neurotransmitter molecules stored at rest?
• What is the role of neurotransmitter receptors at the synapse? Where are they precisely located?
• What is the role of calcium ions in synaptic transmission? How does it get into the synaptic terminal?
• What is acetylcholinesterase? What is it do? What would happen to the neuromuscular junction if acetylcholinesterase was not made?
• What is an EPSP? What is an IPSP?