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Class #31-32: Hippocampal formation

Questions based on Schneider chapter 28 and classes:

1. Describe differences between place cells and head direction cells as recorded in rats. How are shifts in head direction signaled to the endbrain?
2. Describe the major difference between place cells in the dorsal and the ventral hippocampus in rats.
3. Contrast the learning manifest in the two major links between olfactory inputs and motor outputs as proposed for primitive vertebrates.
4. What is the major change in the configuration of the medial pallium of what we call more primitive vertebrates and the hippocampus of mammals?
5. What is the difference in location of the hippocampus of large primates and its location in the rat?
6. In a section cut across the longitudinal axis of the hippocampus, the cell layer is subdivided by anatomists into four sectors, CA1 to CA 4, with the dentate gyrus cupped around CA4 like the hem of a skirt. What do the letters CA stand for, and where did the name come from?
7. Describe the circuit that begins in the entorhinal cortex and can be followed through the hippocampus to the subiculum, from which a major output to the mammillary bodies of the hypothalamus arises.
8. Where is long term potentiation (LTP) found in the hippocampus?
9. Describe the type of anatomical plasticity seen in the hippocampus after specific lesions in adulthood.
10. How might neuromodulators affect the functioning of the hippocampus during waking and sleep?
11. Why is the neocortex of critical importance in the function of the hippocampus in mammals?

Questions on readings: Brodal

1. Identify the major subregions of the hippocampus and adjacent structures.
2. What pattern of interconnectivity distinguishes area CA1 from area CA3 ?
3. What types of memory are dependent on the hippocampus? What types are not dependent on the hippocampus?
4. What is the name of the major input pathway to the hippocampus in mammals and where does it originate?

5. What is the pathway for subcortical projections to and from the hippocampus of mammals?
6. Identify a major neuromodulatory system which regulates hippocampal activity and locate the nucleus that provides this input.

Questions on readings: Striedter

1. What are the major kinds of evidence that has shown that the hippocampal formation of mammals is the homologue of the medial pallium of non-mammalian vertebrates? (p 290-293)
2. In what sense are evolutionary changes in hippocampal connections like the evolutionary changes in striatal connections? (p. 291)
3. In Georg Striedter's opinion, which is conserved more in evolution, specific connections or embryonic origins? (p. 292)

Questions on readings: Butler & Hodos

4. What is the "triune brain"? How, or in what way, has this idea been shown to be invalid?
5. What difference in medial pallial afferents is characteristic of amniotes as opposed to anamniotes? (p 457; also see Striedter p 291 figure)

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