5/12/04

Final Exam : Tuesday, 5/18

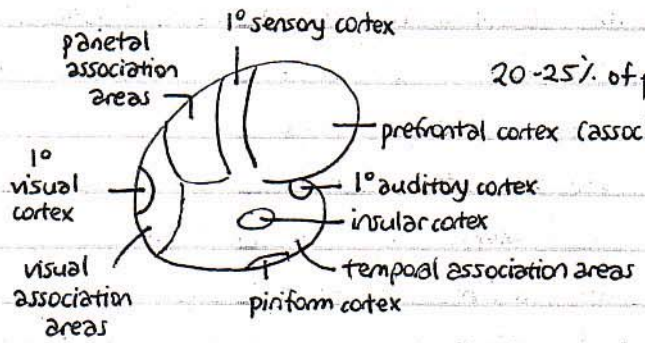
- 100 pts
  - 10 pts define (2 pts each)
  - 15 pts multiple choice
  - 4/5 problem questions (12.5 pts each)

frontal, visual, etc
↓
pulvinar nucleus → parietal cortex

lateral posterior nucleus → temporal cortex

medial dorsal nucleus → frontal cortex

(thalamic nuclei) different parts of cortex feed into these nuclei, they output to other parts



20-25% of brain for 1° sensory input; rest for cognition

lot of information that doesn't go through thalamus

also tracts that take info from one side to other (eg corpus callosum)

thalamus: (large region devoted to nonsensory stuff)

S → VP

V → LGN

A → MGN

O → X

G → VPN (subset of somatosensory part)

- association areas take on specific functions
  - prefrontal cortex: personality (Phineas Gage etc)

    1930's - 50's: Moniz introduces frontal lobotomies (Nobel Prize in 1949)

    720,000 people in US had this done
  - parietal cortex: attention (contralateral neglect, eg, with lesions)
  - temporal association areas: what are objects? identification (eg face recognition)

basal ganglia - inputs from premotor area, outputs to thalamus → motor areas
- integration of motor stuff

- also when making decisions about what to do w/ object (prefrontal → B6 → ?)
emotion (cingular gyrus → B6 → amygdala?)

neurological diseases:

1. dyslexia - difficulty reading, pronouncing words, etc
- up to 5% of kids have some form of this
- ties into visual pathway (retina → brain: magnocellular + parvocellular pathways)
- defect in magnocellular pathway (motion, depth) : motion in reading

2. autism - 1/2500 kids have this : social isolation, expresses at 1-3 years old
- strong genetic concordance (50% MZ twins)
- cortex bigger in some areas, smaller in others
- developmental defects in cortical migration?

3. fragile X mental retardation - most common cause of mental retardation
- genetic, recessive, mostly in boys
- defect in RNA-binding protein (protein translation at ~~synapse~~ postsynaptic side impaired, maybe)
- extra branching in neurites

4. Rett's syndrome - X-chrom. dom. (boys dead) ; girls have X chrom. inactivation
- prominent source of autism in girls (seizures, developmental defects)
- CpG-binding protein (methylation defect)
- abnormal expression of X chromosome genes

5. schizophrenia - shows up in teens, late 20's
- hallucinations, delusions, depression, isolation, abnormal behaviors / responses
- strong genetic component (50% MZ twins)
- 30% all hospitalizations due to schizophrenia
- 3-10 different loci found that correspond / predispose people to phenotype
- dopamine pathways involved
- prefrontal cortex smaller

mood disorders:

1. depression - drugs are #1 class used in US
2. bipolar disease - depression & mania (4-8 months depression → 1 week mania, etc.)
   - involvement of serotonin in both this & depression
- electroconvulsive shock used to treat severe depression
3. panic disease
4. obsessive-compulsive

} not much known about neurological basis

Review:

- know transduction pathways, structural pathways
- know spinal cord
- 2 types of cell fate choices: extrinsic determinants
  intrinsic determinants
- SHH, TGFβ, Notch-Delta pathways

- anterior pathway in brain development default; FGF & retinoic acid to get posterior structures
- proneural genes vs. neurogenic genes
- ephrins for neural crest cell migration (only migrate rostrally b/c of ephrin inhibition)
- cortical layers (V output → thalamus, III receives inputs)
- cortical layer migration
- neurotrophic hypothesis (need signals from target cells for survival (shut off apoptosis))
- pathfinding mechanisms
- robo/slit/comm system: crossing of midline (in spinal cord)
  - slit secreted by floor plate in spinal cord
- synapse formation, NMJ synapse formation (clustering, T transcription, etc)
- activity-dependent competition of axons
- monocular deprivation

7.29J / 9.09J Cellular Neurobiology

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