Combining Microdialysis and Electrophysiology in Cerebral Cortex to Delineate Functional Implications of Acetylcholine Gradients

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Background/Relevance
- Cortical microcircuit functions can change with the change of concentration of neuromodulators such as Acetylcholine.
- The function of a microcircuit can be controlled by controlling the spatial concentration of neuromodulators across the spatial extent of a microcircuit.

Innovation
- A novel combination of microelectrode arrays (MEA) and microdialysis (µD) probes for integrated precision chemical and electrophysiological measurements.

Approach
- Implant the device in rat brain.
- Control and measure Acetylcholine concentration via µD probes.
- Measure the neural activity in terms of action potentials via MEA in response to whisker simulation under varying chemical conditions.

Key Results
- Preliminary Data
  - (a) Natural ACh
  - (b) ACh (20 mM)

Figure. LFP recorded from rat barrel cortex (a) w/o applying Acetylcholine (b) with topical application of 20 mM Acetylcholine. The different colors represent data obtained from different recording sites/channels.

Future Work
- Analyze the data obtained from the pilot studies to determine the standard concentration of Acetylcholine and the standard of other experimental parameters to be used in the final experiments.
- Develop and administer successful use of the device.

Reference: Shew Lab