**Method for Extra- and Intraoral Flavor Delivery during Electrophysiology in Freely Moving Rats**

**Abstract**

Chemosensory neuroscientists use a variety of methods to deliver both odors and tastes to rodents. Many methods utilize head fixation or anesthetized animals, which neglects many normal behaviors that occur during consummatory behaviors, including breathing, in favor of clarity of signal. Our group has implemented intraoral taste delivery during electrophysiological in the past demonstrating clear resolution in behaving animals, however, we have now gone on to create a method for comparing intraoral flavor delivery to extraoral flavor delivery during electrophysiological recordings in the primary chemosensory cortices (gustatory and primary olfactory cortex). This system provides precise delivery of intraoral and extraoral flavors to freely moving rodents with a reproducible and relatively cost-efficient setup. Simple to build 3-D printed microwire drivable electrodes are customizable to accommodate multiple regions based on research need. Neuronal activity, as well as, behavior, and respiration measurements are considered during each recording. Each arena is controlled by a single Nvidia Jetson Nano microcontroller and Intan RHD USB electrophysiology acquisition system. All designs are open-sourced and documented online to provide easy use, implementation, and adaptation to other researchers. Preliminary results demonstrate the robustness of responses regardless of intraoral or extraoral delivery of flavor stimuli in freely moving Long-Evans rats.

**Introduction**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Item | Manufacturer (Product #) | Distributor (Product #) | Qty. | Price/Unit ($USD) | | Total | |
| Nvidia Jetson Nano Kit | Nvidia (DEV-16271) | SparkFun (KIT-16308) | 1 | 229.00 | 229.00 | |
| JST – Jumper Wire | JST | SparkFun (PRT-08670) | 12 | 1.05 | 12.60 | |
| JST – SMD Connector | JST | SparkFun (PRT-11641) | 12 | 0.95 | 11.40 | |
| JST – Jumper 6 Wire | JST | SparkFun (PRT-1036) | 3 | 1.60 | 4.80 | |
| DC Barrel Power Jack SMD | SparkFun | SparkFun (PRT-12748) | 2 | 1.60 | 3.20 | |
| N-Channel MOSFET | SparkFun | SparkFun (COM-24144) | 12 | 1.50 | 18.00 | |
| Diode Rectifier | SparkFun | SparkFun (COM-14884) | 12 | 0.25 | 3.00 | |
| 10K Ohm Resistor | SparkFun | SparkFun (PRT-14491) | 1 | 1.25 | 1.25 | |
| Soldering Iron | SparkFun | SparkFun (TOL-14456) | 1 | 16.50 | 16.50 | |
| Solder – Lead Free | SparkFun | SparkFun (TOL-10242) | 1 | 32.50 | 32.50 | |
| Tweezer | SparkFun | SparkFun (TOL-10602) | 1 | 4.50 | 4.50 | |
| Custom PCB Board | OSH Park | OSH Park | 3 |  |  | |
| Taste Reservoirs | Fisnar | Ellesworth Adhesives (8001002-40) | 1 | 22.40 | 22.40 | |
| Taste Reservoir Caps | Fisnar | Ellesworth Adhesives (8001015) | 4 | 28.00 | 112.00 | |
| Air Source |  |  |  |  |  | |
| Inline HEPA Filter | Whatman (6702-7500) | Cole Parmer (EW-29700-94) | 1 | 139.00 | 139.00 | |
| Vacuum Source |  |  |  |  |  | |
| Tungsten Carbide Scissors | Fine Science Tools | Fine Science Tools (14568-09) | 1 | 149.00 | 149.00 | |
| Acrylic Behavior Arena |  |  |  |  |  | |
| IOC Coupler Set | Colder (SMC01) | Fresh Water Systems | 10 | 4.89 | 48.90 | |
| Polyamide Tubing | Keystone Medical Technologies | Chamfr (KMT40175) | 1 | 400.00 | 400 | |
| Scotch Weld Adhesive | 3M | ULINE | 1 | 59.00 | 59.00 | |
| Faraday Tape | 3M | DigiKey (3M158381-ND) | 1 | 28.39 | 28.39 | |
| 12VDC Wall Power | SparkFun | SparkFun (TOL-15313) | 3 | 6.50 | 19.50 | |
| Open Ephys Starter Kit | Open Ephys | Open Ephys | 1 | 7,303.48 | 7,303.48 | |
| EIB 32-Channel | Open Ephys | Open Ephys | 4 | 125.00 | 500.00 | |
| 1000x Large Gold Pins | Open Ephys | Open Ephys | 1 | 280.00 | 280.00 | |
| Pin Pliers | Weller-Excelite | DigiKey (378MN-ND) | 1 | 20.40 | 20.40 | |
| Nichrome Formvar Wire | AM-Systems | AM-Systems (761500) | 1 | 262.00 | 262.00 | |