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Vagus Nerve Recordings Using Carbon Fiber Microelectrode Array (CFMA)

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SPARC

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The carbon fiber microelectrode array (CFMA) has demonstrated promising results in recording single-unit neural activity. This protocol is for obtaining CFMA recordings from the cervical vagus nerve of rats in response to the application of potassium chloride (KCl) on the vagus nerve.

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carbon electrodes, vagus nerve, neural probes, KCl


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19295

MATERIALS

 **Carbon Fiber Microelectrode Array (CFMA)** Contributed by users


 **Potassium Chloride** Contributed by

users Catalog #001772

Carbon Fiber Microelectrode Array (CFMA), NeuroNex MINT

Potassium Chloride, 20 mEq, MWI Animal Health

Potassium Chloride Solution

- 1  **0.3 mL** of potassium chloride (KCl) solution is prepared at a concentration of 2 mEq/mL.

Anesthesia

- 2 The animal (Sprague-Dawley female rat) is anesthetised with an intraperitoneal injection of ketamine (90 mg/kg) and xylazine (10 mg/kg). Anesthesia is maintained with a ketamine (30 mg/kg) injection approximately every hour.

Surgical Preparation

- 3 A midline cervical incision is made to access the left cervical vagus nerve. Under a dissection microscope, the vagus nerve is isolated (5-7 mm) from the carotid artery and surrounding tissue and placed on a custom 3D-printed nerve holder.

CFMA Insertion

- 4 The Carbon Fiber Microelectrode Array (CFMA) is connected to a neural interface processor (Grapevine, Ripple) through a front-end headstage (Nano 2, Ripple). The headstage is controlled by a micromanipulator for accurate insertion of CFMA fibers into the vagus nerve. A small camera (MS100, Teslong) is positioned in the surgical opening to visualize the alignment and insertion of CFMA fibers into the vagus nerve.

Experiment

- 5 Once the CFMA fibers are inserted, a recording trial is initiated. Forty seconds into the recording trial, 0.3 mL of KCl (2 mEq/mL) is applied on the vagus nerve.

Data Analysis

- 6 Recorded signals are sorted for spikes using Plexon Offline Sorter and analyzed using MATLAB to calculate peak-to-peak voltage of spikes, conduction velocity and noise floor.