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## Procedure for EEG surgery

daniel.dautan<sup>1,2</sup>, Per Svenningsson<sup>1,2</sup><sup>1</sup>Department of Clinical Neuroscience, Karolinska Institutet, 171 76 Stockholm, Sweden;<sup>2</sup>Aligning Science Across Parkinson's (ASAP) Collaborative Research Network, Chevy Chase, MD 20815, USA

Eileen Ruth Torres

Weill Cornell Medicine

### ABSTRACT

Standard Operating Procedure for EEG surgery

### MATERIALS

- Transponder- EET40 or EET20
- M4-threaded screw (agntho's MCS1X2)
- Stereotaxic surgery frame and related equipment

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Procedure for EEG surgery.

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We use this protocol and it's working

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## Preparation of EEG transponder (DSI)

- 1 The transponder has four wires, two of which will be used for EEG (by convention the orange and the orange-white wires). Cut off a few millimeters of the plastic coating on the end of the wires and solder a M4-threaded screw (agntho's MCS1X2) onto the exposed metal wire.
- 2 **Calibration of the transponder:** For EEG/EMG set the calibration to 550 and the temperature to respectively 35, 36 and 39. Select the type of transponder used (EET40 or EET20).

## Sub-chronic (internal) protocol (max 2-3 weeks)

- 3 Anesthetize animal with isoflurane (2% in O<sub>2</sub>) and fit into stereotaxic frame. Secure the head carefully and safely for proper surgery. Shave the animals' head and back using depilatory cream.
- 4 Make an incision on the back just large enough to insert the transponder. The incision can be around 1 cm long and located on the thoracic level of the spines.
- 5 Make a separate incision on scalp from the frontal cortex to cerebellum.
- 6 Clear scalp of tissue using scalpel blade and scrape the surface to make it rough for the dental cement to adhere better. It is crucial that the skull is dry and scratched.
- 7 Insert forceps under the skin between the two incisions to make space for the wires of the transponder.

8 Use the forceps to guide the wires from the transponder under the skin and out through the scalp incision. Careful to prevent the wire to damage the skin.

9 Periodically flush the back incision with sterile saline to hydrate the tissue and remove debris.

10 **EMG wires:** Place a small piece of heat-shrink plastic tubing through the blue wire. Take a 27-gauge needle and insert it under/through the trapezoid muscle.

The needle is used as a cannula to guide the wires through the muscle: insert the exposed metal of the blue wire into the needle and then remove the needle. The wire is now through the muscle.

Now stretch out the coiled wire, insert the end into the heat-shrink tubing, and heat the heat-shrink with the hand-held cauterizer to fasten the loop. Cut off the excess wire. The loop formed by the wire need to be a small as possible to avoid contact with the skin, but enough to allow muscle movements.

11 Repeat the same procedure with the blue/white wire, approx. 1-2 mm caudally to the blue wire.

**N.B: Make sure the metal wires cannot touch each other!**

12 **EEG wires:** Drill a hole (same diameter as the screws using a 0.7 mm drill bit) at the level of the right PFC (coordinates approx. AP:+1.7-1.9 mm, ML: +1.1 mm) and one at the level of the right SNc (approx. AP:-3.3, ML: +1.5).

Gently screw the orange wire to the hole over the PFC, approximately 1.5 turns (approx. 0.6mm deep). Screw the orange/white wire to the caudal hole.

**NB: For both the color code is indicative, but requires the same for all experiment to record the signal in channel 1 and 2 from the same origin (muscle, brain).**

13 Add dental cement to the skull. It is important to completely cover the screws and wires in order to fasten and electrically insulate them. First, apply a layer of thin dental cement to allow it to seep into crevices, then add thicker cement.

- 14** Allow for approx. 1 week recovery before recording.

### Chronic (external) protocol (several months)

- 15** Prior to the surgery, an implant constituted by 4 pins will be connected to 4 silver wires with the first 2 a EEG screw fixed on the other end. Each transponder is thus connected to a 10-15 cm long color-coded wire with a female 4-pin connector on the other end.
- 16** Similar to the acute recording, anesthetize, shave, and prepare mouse for surgery.
- 17** Cut a small incision (around 1 cm) on the top of the scalp, and place the EMG wire as before. The EEG screw are implanted in same coordinates as before.
- During surgery, a few centimeters long metal rod (for example a cutoff syringe) is also attached to the skull with dental cement to allow holding of the animal head during connection and thus reduce the stress linked with the holding process.
- 18** For each recording the mice placed in their home cage will be connected to the wire placed on the top lead of the cage and connected. The transponder will then be positioned on the top of the cage and can move freely with the animal.