APPLICATION NOTE

Sample Preparation of Mouse Brain Tissue Slices by Micro-Dissection for Electrophysiology Experiments

Applications in biology research such as electrophysiology require micrometer precision cutting to isolate thin slices of tissue for cell analysis and sample characterization [1]. This challenging operation is difficult to achieve with traditional manual methods such as using sharp scalpels, because dissociating the layers by hand is insufficiently precise. While laser cutting is more precise, it is very onerous and can cause alterations of the biological material, such as a boiling effect.

In this experiment, two miBots micromanipulators were used for the micro-dissection of a brain slice of 500 µm wide and 3 mm long under a Leica MZ16 FA stereomicroscope. The first miBot, with a 0.003" (76.2 µm) diameter probe mounted on its vertical axis, was used to cut the tissue by moving back and forth. The second miBot, fitted with a 10 µm tip radius probe, gently separated the cut portion from the rest of the slice. Figure 1 illustrates the cut progression of a 300 µm thick parasagittal slice of the rodent brain. The slice was mounted on a buffered agarose and immobilized with silver wire impalements to prevent it from moving during the cutting.

The freedom to move the miBot manipulator proved to be an important advantage for high precision cutting of large brain samples. In fact, the position of the manipulators and their angles of approach were modified in minutes to adapt to the morphology of each sample thus greatly reducing the risk of damage due to improper maneuvers. The small size of the miBot was also an advantage since it provided greater stability during the cut process than with a larger manipulator.

[1] T. Rinaldi, G. Silberberg, H. Markram, Hyperconnectivity of Local Neocortical Microcircuitry Induced by Prenatal Exposure to Valproic Acid, Cerebral Cortex April 2008;18:763--770, doi:10.1093/cercor/bhm117

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Imina Technologies products in use:

- miBot™ BT-11 micromanipulator
- miBase BS-42 stage
- syDrive SD-10 piezoelectric controller

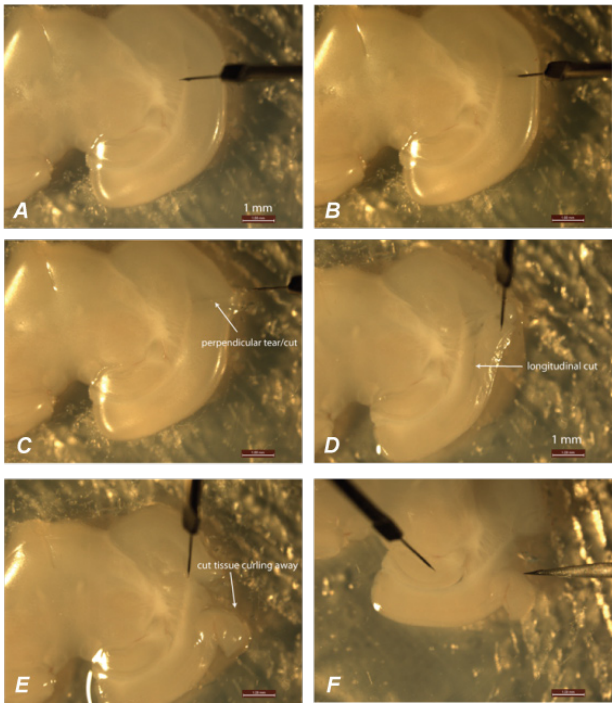

Figure 1. steps in micro-dissection of a brain slice using two miBot micromanipulators.

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