



SWITCH/TDE clearing

LENS -European Laboratory for Non-linear Spectroscopy

 Advanced clearing technique for human brain

TECHNOLOGY DESCRIPTION

Clinical analyses are based on traditional processes that suffer from significant drawbacks. Such limitations are inherent to the two-dimensional nature of the classical slide-based preparation, including low sensitivity for sparse features, arduous assessment of dimensions, visual artifacts (different orientation or distribution), and sampling bias. All these problems hinder a thorough examination of the sample and increase the risk of misdiagnosis. To solve these problems we developed a new method based on the SWITCH immunostaining technique (a tissue-transformation procedure that increases the permeability of the sample) and the TDE clearing method (a methodology that homogenizes the refractive index inside and outside the sample), to be combined with advanced microscopy techniques to achieve high-resolution 3D reconstruction of the brain.

Tissue transformation method based on the integration of the SWITCH immunohistochemistry technique with the TDE clearing method for human brain treatment

3D cytoarchitectonic analysis of the human brain at high resolution using Confocal Microscopy, Two-photon Fluorescence Microscopy and Light Sheet Microscopy

AREAS

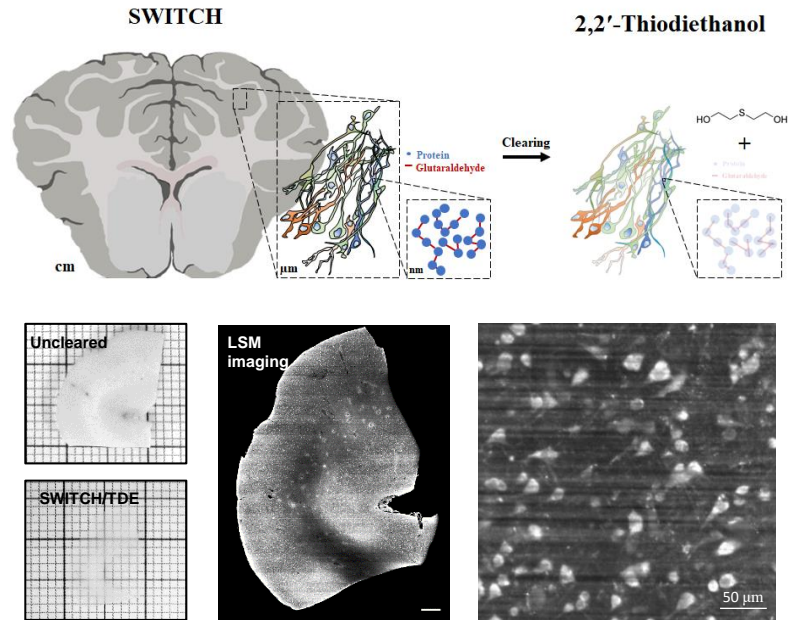
3D reconstruction, anatomy, cell morphology



COMPETITIVE ADVANTAGES

Tissue clearing makes antigens and light to penetrate deep inside the sample, enabling fluorescence imaging by high-resolution optical techniques. Tissue transformation techniques, such as SWITCH/TDE, in comparison to other organic based methods (e.g DISCO methodologies) allows:

- Reliability and reproducibility on different tissue: pediatric, adult and elderly with any specific storage/fixation conditions
- Fast, cheap, and easy to perform
- Versatile: compatible with various microscopy techniques



3D cytoarchitectonic analysis of the human brain

APPLICATION & MARKET POTENTIAL

The combination of optical tissue clearing with advanced microscopy techniques can address the issues of more traditional histology protocols, enabling 3D histology, providing a higher level of anatomical insight. Our approach could be used in the future by researcher of any field, not only to produce the anatomical description of samples, but also to eliminate human biases to obtain a more precise diagnostic evaluation.

TECHNOLOGY READINESS LEVEL



REFERENCES

The technology is used by INO-CNR, National Institute of Optics - National Research Council, and by the University of Florence, Department of Physics; but also in other project (e.g BRAIN initiative (USA), Italian Ministry of Education, University and Research.

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