Fast optical clearing method with excellent structural preservation for three-dimensional volume imaging

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Although various tissue optical clearing methods have been developed to reduce light scattering, improve image quality, and thus to observe three-dimensional structures without physical sectioning, they suffer from various drawbacks such as time-consuming, tissue distortion, or fluorescence quenching etc.

To overcome these limitation, we developed a new optical clearing method named C-MATCH. Using 1-mm thick brain tissues, we have evaluated the performance of C-MATCH by comparing other previous optical clearing methods and found that C-MATCH outperforms others in most aspects, especially in excellent and rapid clearing capability with minimal three-dimensional structural deformation only 1.84 % decreased. In addition, C-MATCH retains more than 90 % of GFP fluorescence in the tissue even 4 days after clearing. We further found that C-MATCH is fully effective with tissues from other organs.

Together, we found that C-MATCH is the best optical clearing method so far for overcoming the limitations of previous methods and for analyzing 3D molecular signatures of thick tissues without structural deformation.

[1] Zhu et al. "Ultrafast optical clearing method for three-dimensional imaging with cellular resolution" PNAS June 4, 2019 116 (23) 11480-11489
[2] Peng Wan, Jingtan Zhu, Jianyi Xu, Yusha Li, Tingting Yu, and Dan Zhu "Evaluation of seven optical clearing methods in mouse brain" Neurophotonics 5(3), 035007 (25 August 2018).

C-MATCH has been licenced to and is commercially available at Crayon Technologies, Inc. (www.crayontech.com)