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METHODS FOR RAPID CLEARING OF TISSUE AND 3D IMAGING

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Value Proposition: *Tissue processing and rapid imaging method for improving tissue clearing and visualization.*

Technology Description

Researchers at Washington University in St. Louis have developed a new refractive index matching solution containing iohexol, sucrose, urea, propyl gallate, and iodixanol, and a method for rapid imaging with epifluorescent widefield microscopy as a novel method of 3D reconstruction of images. Seeing a tissue in 3D allows for novel anatomic studies and information to be gathered. Current solutions use organic solvents that require dehydration of tissues through alcohols. This approach shrinks tissue and sometimes prevents accurate anatomic information from being obtained. In addition, some dyes or fluorescent proteins lose their fluorescent properties in organic solutions; other solutions, whether organic or aqueous, contain toxic or even highly toxic components.

This new refractive index matching solution is nontoxic and aqueous for improved lab safety and improved retention of signals that are lost in organic solvents, is non shrinking and does not distort tissues, quickly penetrates and achieves refractive index matching within the tissue, does not include sugars in the solution, allowing for the prolonging of the solution shelf-life compared to others on the market. The invention also allows for very rapid data acquisition that is made possible through the rapid coupling of acquired images with image processing.

Publications

Lee DD, Telfer KA, Davis DL, Smyth LCD, Ravindran R, Czepielewski RS, Huckstep CG, Du S, Kurashima K, Jain AK, Kipnis J, Zinselmeyer BH, Randolph GJ. ADAPT-3D-accelerated deep adaptable processing of tissue for 3-dimensional fluorescence tissue imaging for research and clinical settings. Sci Rep. 2025 Aug 29;15(1):31841. doi: 10.1038/s41598-025-16766-z. Erratum in: Sci Rep. 2025 Sep 22;15(1):32625. doi: 10.1038/s41598-025-19773-2. PMID: 40883418; PMCID: PMC12397274.

Applications

- 3D Imaging
- Pathology (evaluation of organs for transplant)

Key Advantages

- Significantly reduces the time it takes to optically clear samples
- Improves the range of stains/dyes/approaches that can be used in 3D imaging
- Reduces the time it takes to acquire a 3D image
- Improves the safety pf tissue clearing, while reducing tissue distortion
- Accelerates data acquisition and reduces costs

Patents

Patent application filed

Related Web Links – Gwendalyn Randolph Profile; Randolph Lab