TECH OFFER
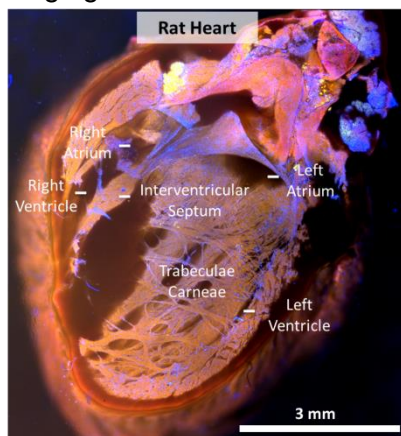
UV FLUORESCENCE MICROSCOPE: Portable microscope for quick and low-cost fluorescence imaging

KEY INFORMATION

TECHNOLOGY CATEGORY:

Healthcare – Imaging

Electronics - Microscopy

TECHNOLOGY READINESS LEVEL: TRL 4

COUNTRY: SINGAPORE

ID NUMBER:

Patents: Fluorescence microscope illuminator, PCT/SG2022/050771, filed 24 Oct 2022.

Know-Hows: Composition of staining kits, imaging consumables and AI software for image analysis

Publication: Deep ultraviolet-excited fluorescence histology with fibre optic illumination for tissue microtopography and quantitative mapping. BioRxiv (2022). https://doi.org/10.1101/2022.12.28.

OVERVIEW

Our UV fluorescence microscope provides an integrated solution for imaging and analysing fluorescence samples in a quick, low-cost and portable manner. Using deep UV excitation, we can achieve extremely superficial UV penetration in thick samples and capture multicolour fluorescence images with high signal-to-noise ratio. Conventional confocal microscopy does not allow for fresh samples to be imaged – they must be fixed, embedded and sectioned thinly prior to staining and imaging. Other significant downsides of confocal microscopy include the use of high-powered lasers, long imaging time and large footprint. In contrast, our technology offers a simple workflow to minimise the time from sample to image significantly – from days to minutes. Our sample preparation protocol utilises fluorescent dyes for staining structures within fresh tissues rapidly and does not require specialised and time-consuming molecular biology procedures such as fixation and sectioning. The imaging is quick and allows for automated image acquisition over large areas to visualise entire organs. Our AI analysis software also provides automated image processing such as quantification of features, which can be customised for specific applications.

TECHNOLOGY FEATURES & SPECIFICATIONS

The technology consists of a portable fluorescence microscope for the imaging of thick, fresh tissues for a variety of clinical and biology applications.

- The microscope allows rapid, multiplexed fluorescence imaging (< 5 min)
- The microscope provides a resolution of 1.0 µm (10x objective)
- The microscope allows automated scanning of large areas (7 x 7 mm in 5 min)
- The sample preparation is minimal - cut, stain and mount (< 3 mins; no fixation or sectioning required)
- The microscope is portable (30 x 30 cm)
- The microscope provides surface imaging of thick samples as a replacement for conventional confocal microscopy
- The staining solution is quick acting (1 min) and provides histology images comparable to gold-standard H&E images
- The analysis software provides image recolouration and quantification of features of interest

POTENTIAL APPLICATIONS

The applications include but are not limited to:

- Histology imaging
- Tumour boundary imaging in surgery
- Spatial omics study
- Surface microtopography
- Quantification of cell viability in 3D cell and tissue cultures
- Tracking tissue responses to drug treatment
- Pathogen identification for food safety testing

UNIQUE VALUE PROPOSITION

- The technology offers a quick, low-cost and portable method of visualizing fluorescent samples with minimal sample preparation
- The competitive technology utilizes UV light for excitation which allows multicolour emission and provides high signal-to-background ratio in images
- The fluorescence microscopy platform can be utilised for various applications by changing the staining reagents to visualize different structures of interest, e.g. tissue structures, pathogens
- The form factor of the UV microscope is portable compared to existing fluorescence microscopes, allowing for real-time imaging directly in the field
- The imaging protocol significantly shortens the time from sample to image from days to minutes
- The consumables cost (imaging cassettes) is competitively cheaper than existing histology preparations