

Optical fiber probes for *in vivo* imaging of functional cells using optical coherence tomography and fluorescence

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Background:

A fluorescence fiber optic probe system that enables high accuracy intramural recordings of transmembrane potentials to be acquired in excitable tissues has been recently developed at The University of Auckland by an interdepartmental collaboration. We plan to improve this system by incorporating multiwavelength recording and an optical coherence tomography probe so as to make possible acquisition of several fluorescence signals simultaneously with structural images.

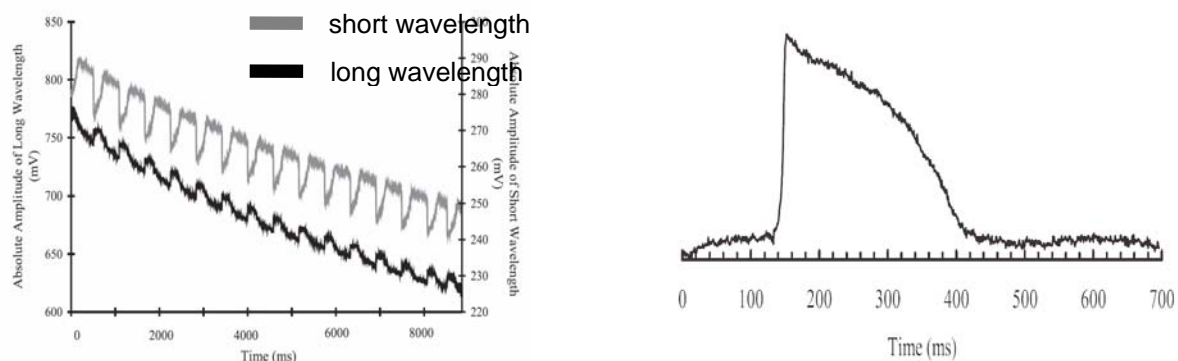
Outcomes:

- Specialised fibre optic probes suitable for multi-wavelength fluorescence imaging and optical coherence tomography (OCT) imaging.
- Capable of recording local functional and structural measurements in organs and tissues.

Progress to date:

We have developed a novel fluorescence imaging system using optical fibres for real-time intramural functional imaging. Thanks to this probe, cellular-level electrical activities in cardiac muscles can be recorded in both *in vivo* and *in vitro* preparations.

We have also already added multiwavelength capabilities and the device is currently being tested in Brussels



Dual wavelength signals from a typical intramural site (left). Motion components in short and long wavelength signals are matched and subtracted to recover action potential (right).

Future work:

- Implementation of an array detector of fiber probes to perform intramural 3-D functional mapping on a macroscopic scale with a microscopic resolution.
- Integration of the OCT probe with the fluorescence probe.