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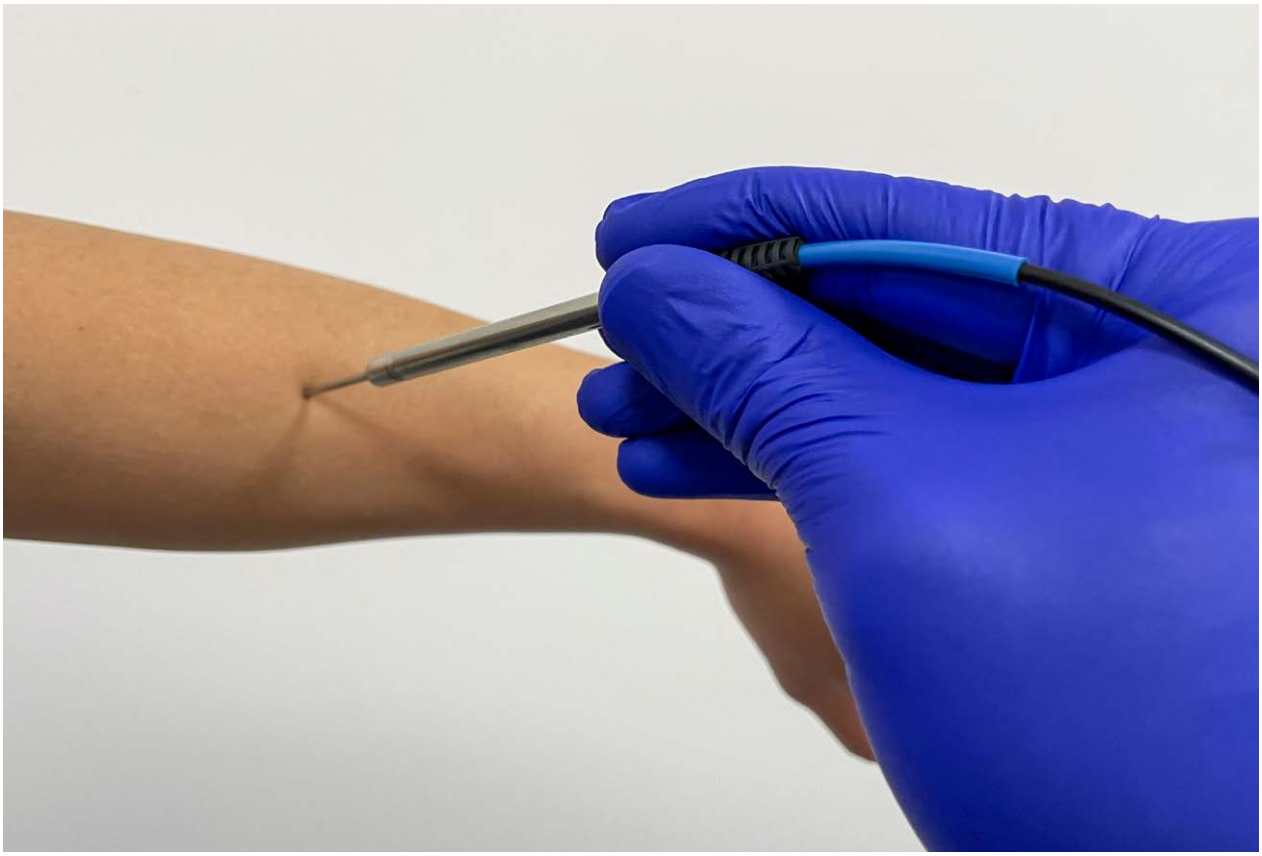
Virsa™ Raman analyser used for in vivo biological studies

Virsa Raman analyser

The Virsa™ Raman analyser is ideal for developing clinical applications of Raman spectroscopy. It is available with a clinically-ready fibre-optic probe developed in partnership with EmVision, leaders in medical fibre probes. The system is robust, transportable, and suitable for research in a clinic or operating theatre. It can aid in the translation of Raman technology into clinical applications.

In vivo measurements

The Virsa analyser and probe are optically matched to ensure efficient light coupling with maximum sensitivity and low noise, enabling the analysis of complex biological systems. It uses a 785 nm laser to minimise contributions from sample fluorescence. The included WiRE™ software has full spectral acquisition, processing and modelling functions to develop classification models to determine the status of diseased and heathy tissue, for example.



High efficiency and compact probe

The in vivo fibre probe consists of a central illumination fibre with surrounding collection fibres, and a two-component lens for efficient light illumination and collection. The high efficiency of the Virsa analyser ensures high signal-to-noise spectra are acquired in the shortest possible time.

The probe is 100 mm long and only 2.1 mm in diameter, making it suitable for in vivo use. It is coupled to the Virsa analyser with 1.5 m fibres; these are flexible, allowing you to easily position the probe, either manually or by robot.

Sampling

You can make direct contact and close proximity measurements from tissue as well as immersion measurements in aqueous solutions. This gives you great flexibility in the measurements you perform.

The probe is normally put in direct contact with the region to be analysed. This makes it ideal for in vivo use as optimum focus is naturally achieved.

Stability

All the internal components of the probe are permanently fixed in position, ensuring accurate alignment is maintained even if the fibres to the Virsa analyser are coiled or moved between or during measurements. This, coupled with the high stability of the Virsa analyser, results in repeatable consistent measurements.

Probe cleaning

The probe is made of biocompatible materials (fused silica and stainless steel) and can be easily cleaned by wiping the tip with a cloth soaked in water or isopropanol. It can also be sterilised for in vivo use.

The probe is incompatible with chemicals such as methylene chloride, strong acids / bases, acetone, methanol and methyl ethyl ketone.

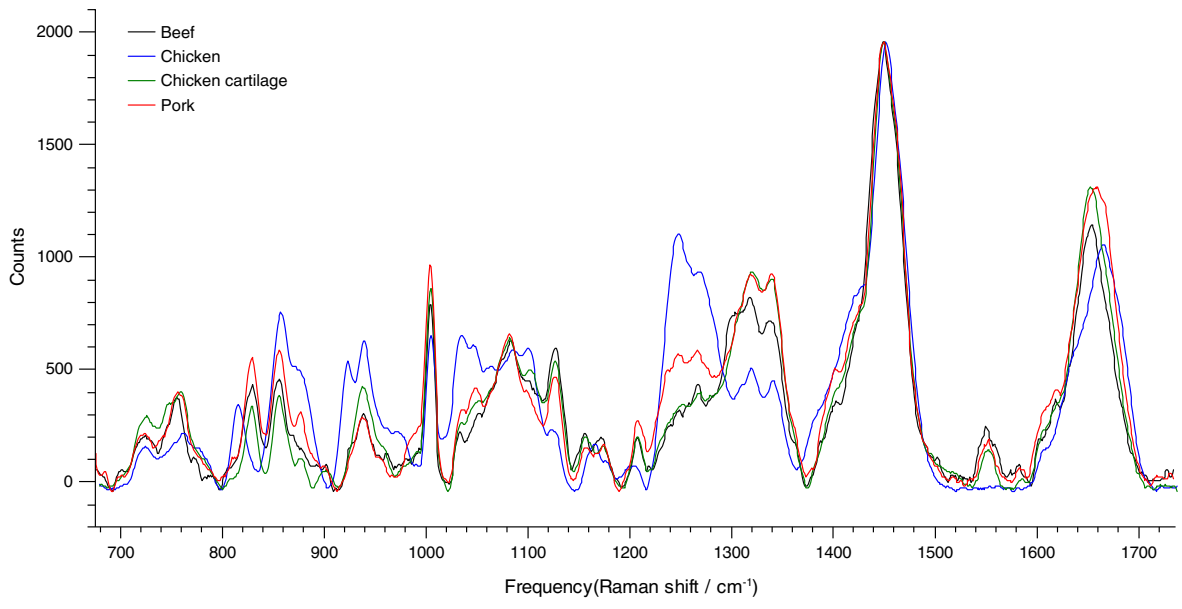
Tissue classification

In this example, we illustrate how the Virsa analyser coupled with the in vivo probe can be used to distinguish between different tissue types.

We collected spectra from ex vivo beef, pork and chicken samples, using the probe in direct contact with the tissue. We then generated a model to classify the tissue types.

Small variations could be detected between the spectra from beef, chicken and pork muscle tissue, and chicken cartilage. This was possible thanks to the high spectral resolution of the Virsa Raman analyser.

We used 190 spectra (40 beef, 70 chicken, 40 pork, 40 chicken cartilage) to build a principal component-linear discriminant analysis (PCA-LDA) classification model. With this, we could reliably assign unknown tissue to one of the four groups. This achieved sensitivity and specificity values of above 99.8%.



Average Raman spectra from beef, chicken, and pork muscle, and chicken cartilage tissue.

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Specifications

Parameter	Value
Excitation wavelength	785 nm
Laser power	~ 120 mW
Spectral range	350 cm^{-1} to 3900 cm^{-1}
Illumination spot size	500 µm
Probe NA	0.22
Spectral resolution	< 5 cm^{-1}
Spectral dispersion	< 1 cm^{-1} $pixel^{-1}$
Working distance	Direct contact, close proximity or immersion
Probe body	Rigid 304 stainless steel
Window material	Fused silica
Tip diameter	2.1 mm
Tip length	100 mm
Fibre length	1500 mm
Temperature range	15° C to 70° C
Laser class	Class 3B
Virsa analyser dimensions	H 178 mm × W 436 mm × D 541 mm
Virsa analyser mass	15.3 kg
Power requirements	100 V AC to 200 V AC, 50 Hz to 60 Hz, 160 W

Want to learn more? Contact our spectroscopy team to discuss your specific requirements.

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*The Virsa Raman analyser is designed for Research Use Only (RUO) and not for use in diagnostic procedures.

**We specially configure the Virsa analyser during build to ensure optimum performance with the in vivo probe. The Virsa system cannot then be used efficiently with other types of probe.

Laser safety

Class 3B laser product - Standard system for operation with laser wavelengths from 405 nm to 830 nm

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