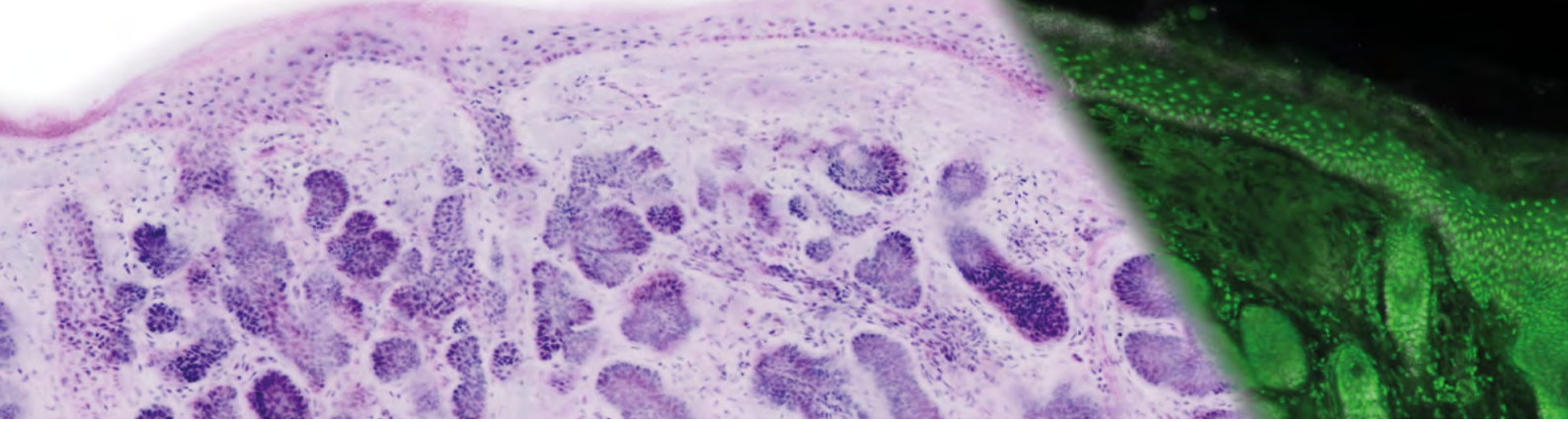


Instant Digital Pathology

Confocal Laser Scanning Microscopy

VivaScope® 2500 – Ex Vivo

VivaScope

MAVIG

Intraoperative analysis of excised tissue in just a few minutes

VivaScope 2500 is a confocal laser scanning microscope designed specifically for the analysis of biopsies and the assessment of tumour margins during surgery. Samples can be examined directly after an excision without lengthy procedures.

Speed counts – an alternative to frozen sectioning

- Minimal Preparation
- Direct Assessment
- Considerable Time Savings
- Tissue Integrity
- Remote Diagnosis – Telemedicine

Minimal Preparation

Tissue preparation takes less than one minute. Imaging can begin immediately after.

Direct Assessment

The images directly reveal the morphology in subcellular resolution.

Considerable Time Savings

Compared to conventional frozen or paraffin sections, the time required to assess the excised tissue is dramatically reduced.

Tissue Integrity

The examined tissue remains unharmed by the procedure and can be processed for histology later on.

Remote Diagnosis – Telemedicine

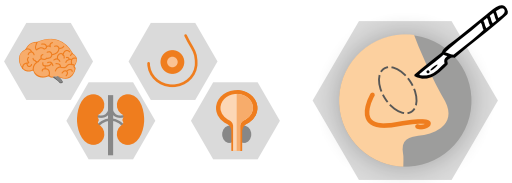
The pathologist can remotely evaluate the images immediately after scanning.

The workflow – staining procedure & image acquisition

Tissue can be examined immediately after an excision without lengthy procedures. This allows for the direct assessment of tissue right in the operating room.

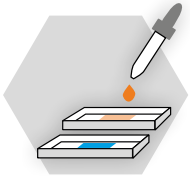
1 Tissue Removal

The tissue can be examined directly after excision without fixation.



2 Staining Procedure

The tissue sample is stained with a fluorescent dye in less than one minute, then mounted on a glass slide.



3 Confocal Imaging

The VivaScope 2500 scans the excised tissue and reveals the cellular morphology in optical sections. Scan time for a tissue sample of 8 x 8 mm ~ 00:50 min / 16 x 12 mm ~ 02:10 min.

4 Remote Diagnosis – Telemedicine

During surgery, a pathologist can evaluate biopsies or tumour margins directly on site or via remote access.

5 Finalise Surgery

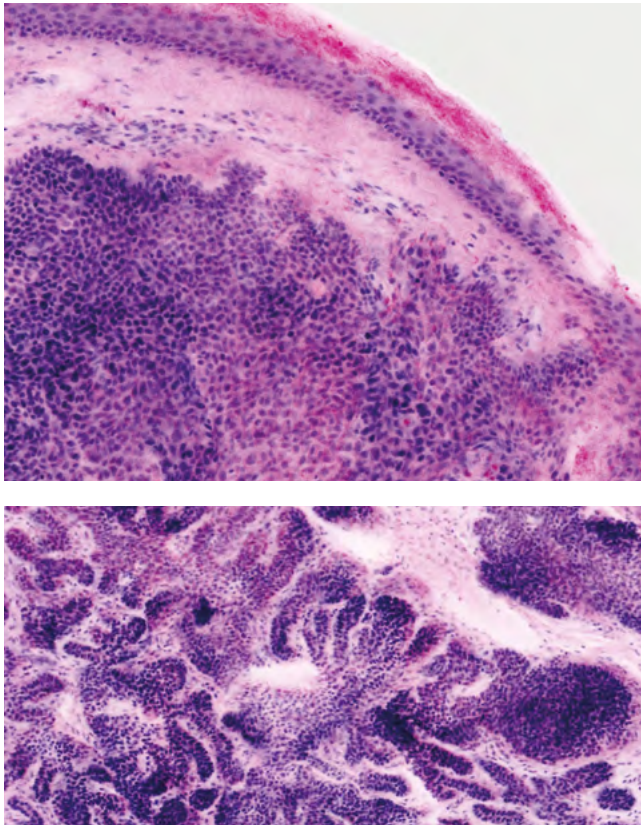
After histopathological confirmation of tumour free margins, the surgery can be completed.

Duration: ~ 5 min.

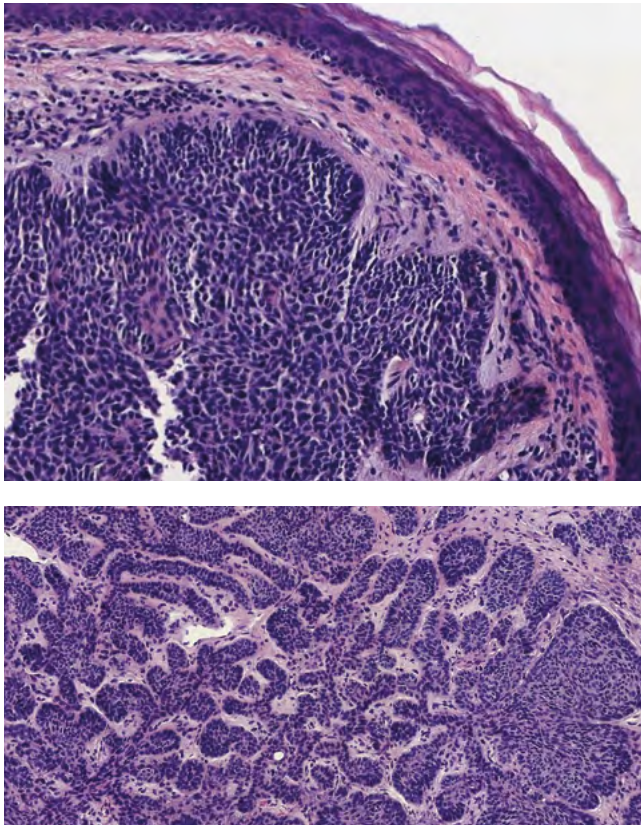
Pseudo-coloured images correlate to H&E

The device's software uses an algorithm to translate the acquired image information into colours that resemble H&E.
The pseudo-coloured images contain similar information to conventional histology and can be examined at any magnification up to 550 x.

VivaScope 2500



H&E



Images courtesy of Dr. Javiera Pérez-Anker. Different subtypes of basal cell carcinoma, acquired with VivaScope 2500 (left) and after H&E staining (right).

Groundbreaking innovation in surgery

Samples can be examined directly after an excision without time consuming procedures. Tissue preparation and staining take only minutes. For easy portability, the VivaScope 2500 may be installed on a movable table and thus can be used in different locations.

VivaScope 2500

Medical applications

VivaScope technology provides images for fast diagnosis of biopsies and intraoperative tumour margins. Surgical workflows and patient management can be improved substantially. VivaScope technology is well-validated in dermatology, especially Mohs surgery. According to recent studies, using the VivaScope in urological procedures offers radically new treatment pathways. Additionally, pilot studies show a great potential for various other fields like lung, breast, thyroid, colon and brain tissue.

Dermatology

Urology

Gynaecology

Pathology

Further applications

Selected publications

Ex Vivo Confocal Fluorescence Microscopy for Rapid Evaluation of Tissues in Surgical Pathology Practice. Krishnamurthy S et al., Arch Pathol Lab Med. 2018

Evaluation of breast tissue with confocal strip-mosaicking microscopy: a test approach emulating pathology-like examination. Abeytunge S et al., J Biomed Opt. 2017

Fluorescence confocal microscopy for pathologists. Ragazzi M et al., Modern Pathology 2013

Find out more at
vivascope-pub.com

VivaScope® 2500 in dermatology

Confocal microscopy of unfixed tissue using a VivaScope revolutionises diagnosis and surgical workflows in dermatology. Directly after an excision or biopsy, fresh tissue can be prepared and imaged in less than five minutes.

Dermatology

The acquired images reveal subcellular details of the examined tissue and provide information similar to histology. Non-melanoma skin cancers and inflammatory diseases can be identified with excellent correlation to histopathology.

Mohs Surgery

Confocal microscopy replaces frozen section histology during Mohs surgery, reducing the time needed to complete surgery by more than 50 %. Integrated in a surgical workflow, the VivaScope scans provide information equivalent to H&E or frozen section histology slides without the need for a laboratory and in just a few minutes. Reliability of the technology has been assessed in numerous clinical studies, showing very high sensitivity and specificity.

Diagnostic Biopsies

Only few minutes after taking a biopsy, the histology of the tissue can be evaluated and the presence of a tumour determined. Appropriate treatment of the skin lesion can thus begin immediately.

References

Basal Cell Carcinoma Characterisation Using Fusion Ex Vivo Confocal Microscopy: A Promising Change In Conventional Skin Histopathology. Anker JP et al., Br J Dermatol. 2019

Diagnostic accuracy of ex vivo fluorescence confocal microscopy for Mohs surgery of basal cell carcinomas: a prospective study on 753 margins. Longo C et al., Br J Dermatol. 2018

Ex vivo fluorescence confocal microscopy for intraoperative, real-time diagnosis of cutaneous inflammatory diseases: A preliminary study. Bertoni L et al., Exp Dermatol. 2018

Basal Cell Carcinoma

Image courtesy of Dr. Javiera Pérez-Anker, Hospital Clinic of Barcelona.

Urology

VivaScope® 2500 in urology

Confocal microscopy of unfixed tissue using a VivaScope revolutionises diagnosis and surgical workflows in urology. Fresh tissue can be imaged immediately after an excision or biopsy, with the entire procedure taking less than five minutes.

Prostate Biopsies

The analysis of standard biopsies takes less than 5 minutes, allowing for radical changes in the surgery workflow. Pathologists can access the images remotely to provide a diagnosis, independent of their location, enabling decisions to be taken and treatments commenced whilst the patient is still present.

Radical Prostatectomy

Recently, instant examination using a VivaScope 2500 has been performed during robot-assisted radical prostatectomy where non-neoplastic and cancerous prostate tissue was compared to a histopathological diagnosis. Preliminary results show an overall substantial diagnostic agreement of 91 % between confocal and histopathological diagnoses (n=89).
(Puliatti.S et al., BJU Int. 2019)

Urothelial Carcinoma

In a second study, the diagnosis of high-grade/low-grade urothelial carcinoma in bladder and ureter has been assessed. Preliminary results showed a 100 % accordance between the grading of FCM images and the final histopathology of all bladder urothelial carcinoma specimens (n=8).

References

Real-time assessment of surgical margin during radical prostatectomy: a novel approach with fluorescence confocal microscopy for the evaluation of peri-prostatic soft tissues.
Rocco B et al., BJU Int. 2020

Ex vivo fluorescence confocal microscopy: prostatic and periprostatic tissues atlas and evaluation of the learning curve.
Bertoni, L et al., Virchows Arch. 2020

Ex-vivo Fluorescence Confocal Microscopy: The First Application For Real-Time Pathologic Examination of Prostatic Tissue.
Puliatti, S et al., BJU Int. 2019

Acinar prostatic adenocarcinoma with atypical glands

Image 1

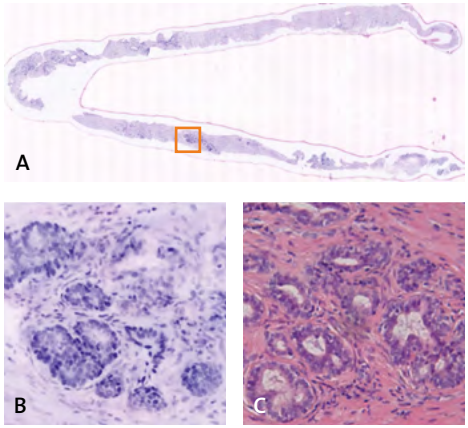


Image 2

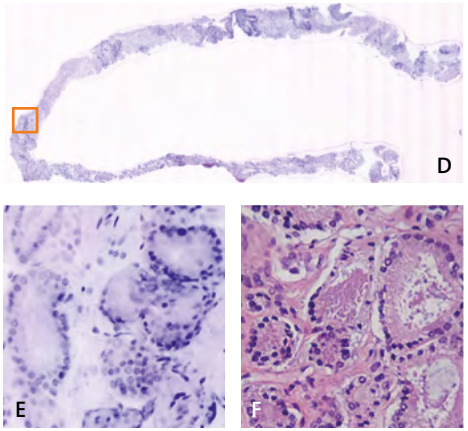
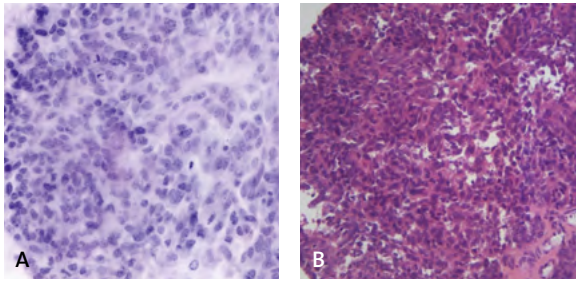


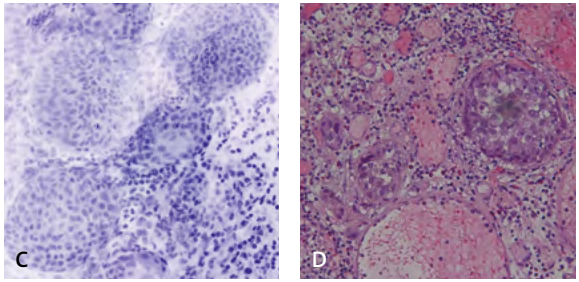
Image 1 – Normal prostatic glands with inflammatory component: (A) ex vivo FCM image of prostatic biopsy; (B) zoomed image enhances visualisation of tissue and cell morphology details; (C) corresponding H&E image

Image 2 – Acinar prostatic adenocarcinoma with atypical glands: (D) ex vivo FCM image of prostatic biopsy; (E) zoomed image; (F) corresponding H&E image

Urothelial carcinoma in ureter and bladder



High-grade urothelial carcinoma in ureter with nuclear pleomorphism and mitotic activity:
(A) ex vivo FCM image (B) corresponding H&E image



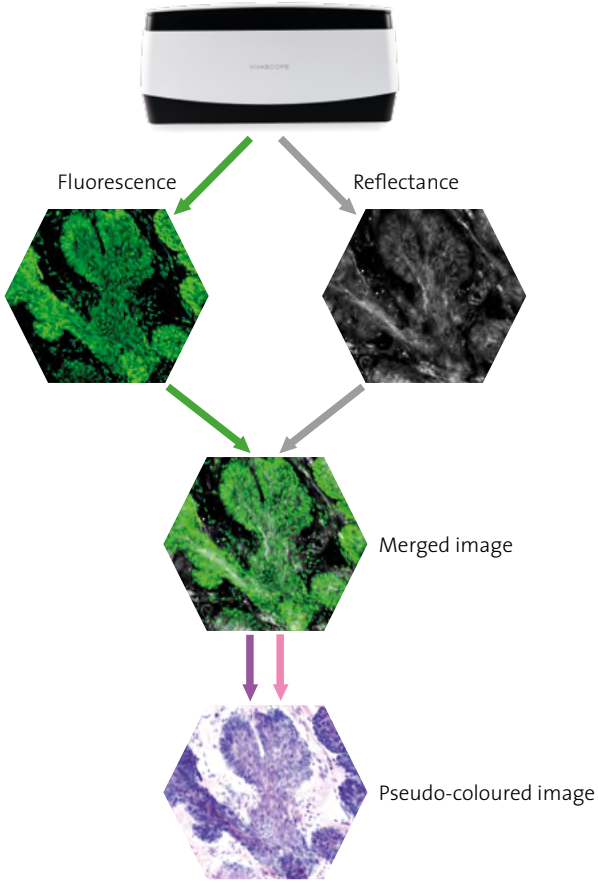
Urothelial carcinoma in bladder: nests of atypical cells in the corion: (C) ex vivo FCM image (D) corresponding H&E image

Image courtesy of Dr. Stefano Puliatti, Dr. Laura Bertoni, Dr. Paola Azzoni, Dr. Luca Reggiani-Bonetti and Prof. Bernardo Rocco, University of Modena and Reggio Emilia, Italy.

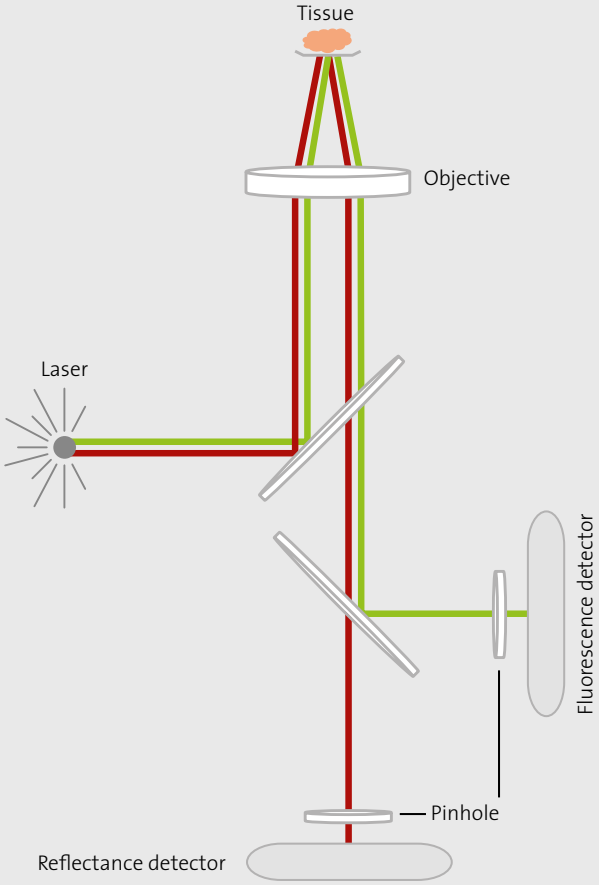
VivaScope® 2500: Simultaneous reflectance and fluorescence confocal microscopy

Like H&E staining, VivaScope images are generated from two components. Two lasers of different wavelengths create two distinct images, a fluorescence image and a reflectance image. Both signals are scanned simultaneously and are used to create pseudo-coloured images.

Imaging Process



Technology



VivaScope® 2500 technology – key advantages

VivaScope technology is based on confocal microscopy and acquires images of superb optical resolution and contrast. VivaScope images allow for direct pathological diagnosis during surgery. VivaScope devices are characterised by the following unique features.

Two Lasers of different Wavelengths

A 488 nm laser (blue, fluorescence signal) and a 638 nm laser (infrared, reflection signal) are used simultaneously. Both signals are acquired and correlated in real-time.

Pseudo-coloured Images

A built-in algorithm translates the reflectance and fluorescence signals into H&E-like pseudo-coloured images. The resulting images contain similar information to conventional histology.

Macro Image

The digital camera provides a colour image of the specimen. This macro image correlates precisely with the confocal image and thus allows for easy tissue navigation, visualisation of tissue marking dye and simplified selection of regions of interest.

Advantages over Cryosectioning

Adipose tissue often is difficult to handle during cryosectioning. However, fat cells can easily be imaged and evaluated using the VivaScope technology. Additionally to that, tissue is not damaged during the imaging process and can be used for further analyses.

Tissue Flattening

A patented tissue flattening solution simplifies examining excised tissue, regardless of its shape.

Remote Diagnosis – Telemedicine

A pathologist can evaluate the images immediately after the scan; directly on site or via remote access.

VivaScope® 2500 – technical data

Optical features	
Optical resolution	Horizontal < 1.25 µm at centre of field of view, vertical < 5.0 µm at centre of field of view
Imaging depth	Adjustable up to 200 µm (dependent on tissue type)
Single field of view size	550 µm x 550 µm
Image resolution	1024 x 1024 pixels (single field of view), 0,5 µm/pixel

Other specifications	
Maximum sample size	25 mm x 25 mm
Maximum image resolution	51.000 x 51.000 pixels
Operating wavelengths	488 nm & 638 nm
Objective	Caliber I.D. StableView™ gel immersion 38x
Magnification	Seamless zoom up to 550x
Macro camera	5 megapixel full scale colour
Laser classification	Class I
Laser signal strength	Adjustable laser power allows for optimised image quality

Device features	
Dimensions (LxWxH)	25 x 52.5 x 25 cm (Scan head only)
Weight	17.2 kg
Power source	220 – 240 V, 50 Hz
Typical scan times	8 x 8 mm ~ 00:50 min / 16 x 12 mm ~ 02:10 min / 20 x 20 mm ~ 04:25 min

VivaScope – a part of MAVIG

MAVIG, founded in 1921, designs, manufactures and markets personal protection devices and X-Ray accessories, as well as ceiling- and table-mounted equipment. MAVIG develops and distributes VivaScope products throughout Europe, Middle East, CIS and Africa.

VivaScope

MAVIG VivaScope is specialised in the development and distribution of confocal laser scanning microscopes in various fields of medicine as well as the cosmetic and pharmaceutical industries.

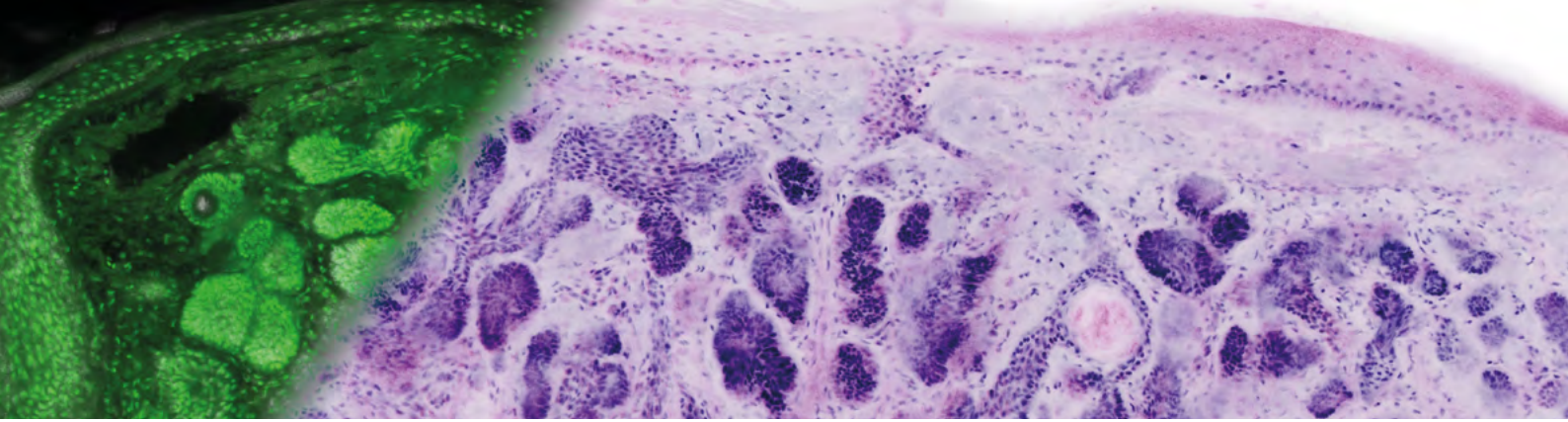
Confocal laser scanning microscopy allows for rapid and precise differentiation between pathogenic and healthy tissue. VivaScope products are used for medical applications in vivo and ex vivo.

Introductory on-site Training

After the installation of a VivaScope, users are provided with a training course, during which the essential knowledge for the daily routine is taught. Presentations, manuals, imaging guidelines and publications are provided to support the training.

Training by Experts

In a clinical setting, users obtain further knowledge about VivaScope applications from renowned experts.
The course focuses on staining protocols, tissue handling and imaging tips as well as expert image interpretation.



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