

ALL OPTICAL PREPARATION OF THIN TISSUE SAMPLES WITH A LASER MICROTOME

Holger Lubatschowski^{1,2,*}, Fabian Will², Ole Massow², Sabine Przemeck¹

¹Rowiak GmbH, Garbsener Landstr. 10, 30419 Hanover, Germany

²Laser Zentrum Hannover e.V., Hollerithallee 8, 30419 Hanover, Germany;

*E-mail: hl@rowiak.de

KEY WORDS: Microtomy, Tissue Preparation, OCT

To prepare histological sections, biological tissue has to be frozen or dehydrated and embedded in resin or paraffin before it can be sectioned by a conventional microtome. This process is time consuming and leads to artefacts. Ultra short laser pulses can be used to cut biological tissue into thin slices without any previous preparation of the tissue.

Focussing ultra short laser pulses (pulse duration 200 fs) into biological tissue, optical breakdown occurs within the focus of the laser pulse due to nonlinear absorption. This process is called photodisruption and can be used to process the tissue with μm or even sub μm precision. Because the used wavelength is in the near infrared, the laser can penetrate into the tissue which enables three dimensional cuts inside biological sample (Fig.1).

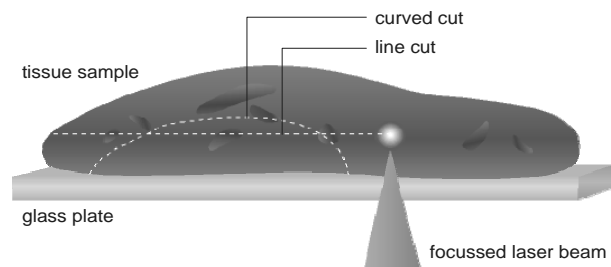


Fig 1: Operation principle of the Laser Microtome

Combined with Optical Coherence Tomography (OCT), structures within the biological samples can be imaged noninvasively with a resolution down to the low μm -range.

The combination of ultra short laser pulses for cutting of biological tissues as well as imaging via OCT opens up a wide range of new preparation techniques.

Different biological soft and hard tissue samples were sectioned into thin (10-100 μm) films and analysed by light microscopy and SEM. The thermal damage of the probes was below 1 μm . Because no fixation was necessary, even living probes could be prepared for microscopy or other applications.