Impact and Outcome

Impact

- Strong participation of private sector players: three out of five partners are SMEs

- Project goals set based on medical end-user needs

- Tremendous benefits for the patients due to earlier diagnosis accompanied by a substantial reduction of overall healthcare costs

- Building the foundation for further growing European strengths in the emerging optoacoustic imaging market

- Development of a series of strong industrial ambitions, promote technical excellence and product creation advancing European competiveness and leadership

Outcome

- New User-friendly, light-weight portable scanner for various applications

- Cross-fertilizing Innovation platform that brings optical, ultrasound, software/mathematics and clinical stakeholders to impact photonics with a novel skin imaging modality

- strong value chain to deliver RSOM to clinical markets

- Foundation for additional potential products to be developed and traded by the participating SMEs

Impressum

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INNODERM website: www.innoderm2020.eu

Innovative Dermatology Healthcare based on Label-Free Spectral Optoacoustic Mesoscopy

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INNODERM Concept

Vision

INNODERM aims at developing a new portable and light-weight instrument for early diagnosis of skin cancer facilitating earlier detection, more accurate treatment follow-up and improved disease monitoring.

Concept

INNODERM will build upon the concept of Raster Scan Optoacoustic Mesoscopy (RSOM) that can visualize features of healthy and morbid skin with markedly superior contrast and specificity. The new device sends short light pulses to the skin and detects ultrasound waves generated in response to light absorption by skin molecules and structures. Tomographic analysis of the ultrasound waves can reveal unprecedented volumetric views of skin constituents and disease manifestations at resolutions and depths never reached before by an optical method. Then, by using light pulses at different colors, accurate spectroscopic information is revealed not only for morphological, but also biochemical features of skin, providing accurate and specific diagnostic information.

Overall Goal

The development of the new handheld device during the course of INNODERM promises to lead to substantial benefits for the patients as well as healthcare cost savings by reducing the number of unnecessary biopsies and offering individualized treatment and monitoring towards precision dermatology.

# Challenges and Objectives

Challenges

The current state of the art care in dermatology, visual inspection and all- optical methods come with significant limitations and greatly affect the performance of the current methods:

- Penetration depth -> difficulty to visualize features under the tissue surface
- Specificity and contrast: poor performance of current modalities
- User experience: highly subjective interpretation of results, dependent on the experience of the physician due to the lack of standardized, objective and reliable methods

Objectives

- Design of a portable, light-weight and scalable clinical RSOM prototype
- Pre-clinical validation of the RSOM ability
- Quantitative measure of improvements in disease detection and monitoring
- Development and update an exploitation plan for RSOM market introduction.

Fig.: Imaging of tumor vasculature in a mouse model acquired with raster scan optoacoustic mesoscopy (RSOM).
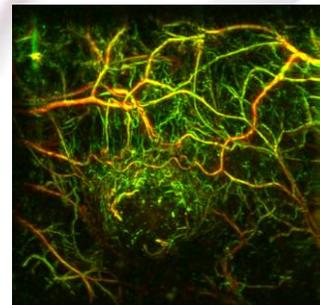
Clinical Needs

- **Distinguish pre-cancerosis from carcinoma** more **easily**

- **Distinguish benign nevi from melanoma** ("black cancer")

- **Rapid screening of transplantation patients** since they are more prone to skin cancer ("white cancer") due to their immuno-suppression

- **Reliable cut-off for tumor borders**

- **Reliable cut-off for tumor depth** (especially in the sentinel lymph node) since clinical decisions are based on the penetration depth of the tumor

- **Identification of melanocytic origin in amelanomic melanoma**, because it is often diagnosed too late and metastasis already occurred

- **Identification of origin** (B or T cell lymphomas)

- **Early and fast analysis of different malignant manifestations** (TIME is a big factor for therapy and the current standard of practice, namely histology, takes a couple of days before the results are available)

- **Distinguish between allergic and irritated areas of the skin:** so far, assessment is only done by eye and there is an urgent need for an objective readout

- **Clinical feasibility of the system:** it should be fast and cost-effective