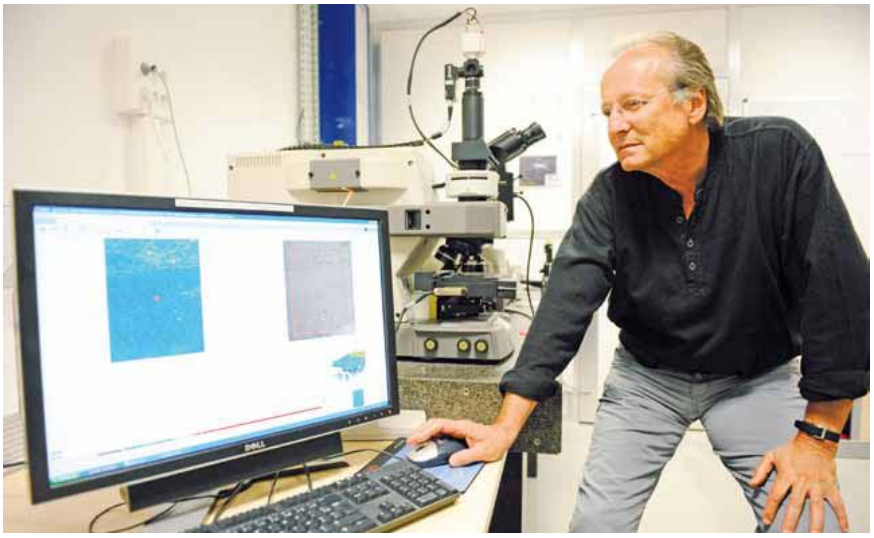
MEDICINE

Infrared **in health care**

Doctors use a wide range of procedures to screen and diagnose diseases. The thought had probably not crossed their minds, however, that infrared synchrotron radiation might become a complementary tool in this "hunt" for diseases, including those at their earliest stages.



The technique consists of probing a biological tissue sample with different wavelengths ranging in the IR region. Below, Paul Dumas, in charge of SMIS beamline.

To distinguish healthy tissue from diseased tissue, particularly before symptoms appear; make an early diagnosis so as to choose the treatment adapted to the disease; evaluate the effects of the treatment so that the dose administered can be adapted to reduce side effects: all problems that doctors try to solve and for which infrared spectroscopy (IR) could, in some cases, bring answers.
Easy and simple to set up, the technique consists of probing a biological tissue sample with different wavelengths ranging in the IR region. Each type of molecule that makes up the tissue vibrates at a specific frequency. When the wavelength of the light matches one of the vibration frequencies of the molecule, this light is partially absorbed. The range of wavelengths absorbed composes a spectrum, then providing a key to follow the biocomposition of this tissue and its changes.
The decoding of molecular assemblies and their modifications can also reveal, very early on, abnormal composition of the tissue, or the changes induced by a treatment. This approach has been developed on the SMIS beamline at SOLEIL and the medical community is gradually becoming more aware of its potential.

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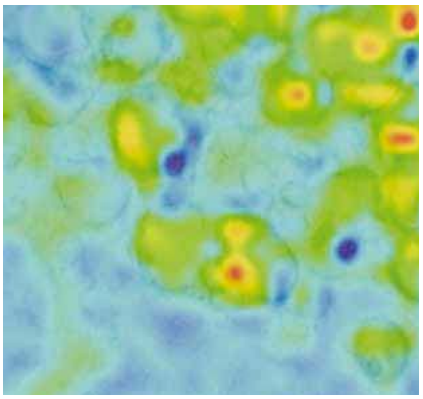

IR spectroscopy image of a steatosic liver tissue section.

Three examples of application

1 From steatosis to cancer, via cirrhosis: infrared spectroscopy reveals the specific traits of these liver diseases from their earliest stages of development.

2 Renal calculi: by ascertaining the composition of the microcrystals that make up the calculi, IR spectroscopy allows the cause of the disease to be diagnosed and the appropriate treatment to be chosen for the patient.

3 Cancerous cells of the blood, the lung or the brain: through a follow-up with IR spectroscopy, it is possible to fine-tune the treatment that annihilates these cells, by a combination of visible light radiation and medication.

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