

Indian group develops tools for oral cancer diagnosis

A research group at the Centre for Advanced Technology (CAT, Indore, India) has developed autofluorescence techniques for diagnosing cancers of the oral cavity, breast and cervix, using nitrogen-based lasers.

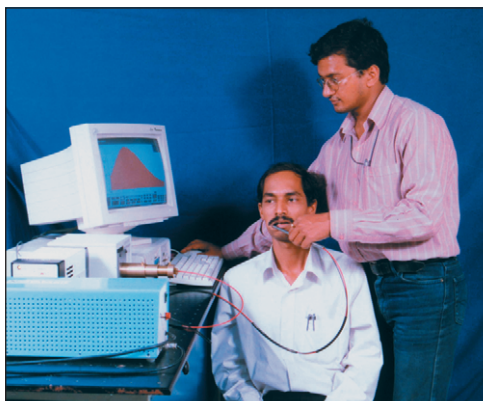
The group has developed a nitrogen-laser-based portable fluorimeter, consisting of a sealed-off nitrogen laser, a spectrograph coupled to a gateable intensified CCD (ICCD) camera, and a fibre optic probe to excite and collect fluorescence from the tissue. Both *in vitro* and *in vivo* studies have been carried out using prototype units.

While *in vitro* studies used tissues from the oral cavity, breast and uterus, *in vivo* studies were conducted on oral cavity and uterine cervix tissues. The *in vitro* studies show that while the sites of malignant breast tissue were considerably more fluorescent than benign tumour and normal tissue sites, the reverse was the case with tissue from the oral cavity.

A pilot study involving 25 patients with histopathologically confirmed squamous-cell carcinoma of the oral cavity has also been completed. The prototype unit has been installed at the Government Cancer Hospital, Indore, to enable a detailed clinical evaluation of technique for oral cancer diagnosis.

“Very little appears to have been done on the *in vivo* use of autofluorescence spectroscopy for diagnosis of cancer of oral cavity”, says Pradeep Kumar Gupta (Biomedical Applications Section, CAT). “The system used by us is conventional and similar systems have been used for studies on cancer of uterine cervix. Elsewhere such systems use commercially available lasers and other accessories, but we have manufactured everything except the ICCD detector and the spectrograph.”

The discrimination algorithm, developed to analyse autofluorescence spectra, could differentiate the squamous-cell carcinoma of the oral cavity from normal squamous tissue with a sensitivity and specificity



Nitrogen-laser-based system for oral cancer diagnosis developed at Center for Advanced Technology, Indore, India

Courtesy of CAT, Indore, India

towards cancer of 86% and 63%, respectively. “The reason for the quite low specificity values appears to be the fact that most of the patients who participated in this study had advanced stage malignant disease”, says Gupta.

Various measurements on tissue fluorescence suggest a significant variation in the concentration of the

fluorophores in different tissue types. While concentration of NADH (reduced nicotinamide adenine dinucleotide) is higher in malignant breast tissue compared with benign tumour and normal breast tissue, the reverse is true for tissues from the oral cavity where NADH concentration is higher than in normal oral tissues. These results have been confirmed by enzymatic measurements of NADH concentration in malignant and normal tissues from breast and oral cavity.

In India and other South Asian countries, oral cancers are some of the most common types of cancer, and a high consumption of chewing tobacco means that incidence levels are rising. Optical techniques hold considerable promise for *in situ*, near real-time, and early diagnosis of cancer. Researchers say there will be considerable demand for optical diagnosis techniques once they are clinically established.

Dinesh C Sharma

Cancer vaccination: dendritic cells hold the key

The detection of cancer cells by the immune system and the induction of specific and effective defence mechanisms is a common aspect of many developing therapeutic concepts. An especially potent, antigen-specific stimulation of T lymphocytes can be achieved by dendritic cells.

Researchers in Austria (Department of Surgery, Allgemeines Krankenhaus, Vienna, Austria) have completed a phase I trial with this novel therapy. Lead researcher Michael Gnant said: “We have conducted a phase I dendritic-cell based vaccine (DC-01) trial in 20 patients. More than 150 vaccinations have been given so far, and side-effects were extremely mild.” The patients had stage IV pancreatic, hepatocellular, cholangio-cellular, or medullary thyroid cancer. There were no toxic-effect-related withdrawals.

“We observed several unconventional clinical courses in these

patients, including unexpected tumour remissions and dramatic tumour marker responses”, said co-researcher Josef Friedl, a member of the surgical team. “We are now planning a trial of dendritic-cell-based vaccines to treat patients with minimal residual disease. This will be the first known application of dendritic cells in adjuvant therapy of solid tumours. We have chosen patients with pancreatic cancer for this adjuvant phase III trial, because of the poor prognosis these patients have despite radical surgical resection. Thus, we want to randomly assign 66 patients to either receive standard chemotherapy (three cycles of gemcitabine 1800 mg/m² on days 1 and 14, every 4 weeks) or the experimental treatment (six vaccinations with 1–1.5 x 10⁷ autologous dendritic cells pulsed with autologous tumour cells, every 2 weeks)”, Gnant explained.

Gunther Heinz