

Research

Singapore has successfully developed novel cancer diagnostics, which have enabled their doctor to make early detection of certain types of cancers. This is done by adopting physical science techniques as in photonics imaging and bio-imaging techniques. Not known to many, the Centre is the leader in Singapore in pioneering non-invasive optical methods of cancer diagnosis. The techniques adopted allow what is not normally visible to the naked eye to be detected by optical imaging. Once the information is picked up, the doctors can then run them through a database to enable them to make an informed medical decision. Associate Prof. Malini Olivo, who heads the team of five fulltime scientists at the Laboratory of Photodynamic Diagnosis and Treatment, explained, "At NCCS physical science laboratory we have people who study how we can use physical science techniques for clinical applications. "Thus, we look at the application of optical imaging and spectroscopy, and how they allow us to access to entirely different optical information on tissue constituents, which can greatly enhance tissue diagnostics."

Florescence imaging and spectroscopy offer a means of assessing both the structural and the biochemical progression of the disease. Clinical studies have achieved promising results such as in cancer of the bladder, lung and oral cancer. "With the use of certain drugs, we are able to make the growth glow under a particular wavelength and determine whether the tumours are harmless or malignant," said Prof. Malini, who studied in London before going to Sweden and Canada to do research in bio-medical physics.

Achieving these breakthroughs has not been easy. The team of scientists and engineers has to work closely with the clinicians so as to ensure that whatever they test in the laboratory can be translated into practice in the wards.

Among the innovative uses of physical science, is the development of photodynamic therapy to treat cancer patients through the use of light-activated drugs for selective tissue destruction. "The patients selected for this treatment are often not good candidates for chemotherapy or radiation therapy. What the doctors do is to give the patients drugs which will be activated when the light is shone on them."

"The drug, which is non-toxic, will control the cancer at its location. However, the drug will not be able to prevent the spread of the cancer to other parts of the body," added Prof. Malini. The advantages of photodynamic therapy are that the treatment is very straightforward with no systemic side effects. It can be effective in targeting disease sites which are close to vital organs, such as in tumours of the head and neck. First, the photosensitising drug is delivered, either topically or intravenously, and after a set time has elapsed, it is optimally concentrated in the target tissue, relative to normal tissue. Light, usually from a laser, is then directed onto the target site and rapid cell destruction will occur. The photosensitiser absorbs the energy of the light and transfers it to the molecular oxygen. Through a highly reactive species known as "singlet oxygen", the cancer cells are destroyed.