



• Posted: Sun, Aug 24 2008. 11:22 PM IST

IISc develops sensitive technology for diagnosis

The electro-chemical technology allows detection of an antigen at one-hundredth of present concentrations

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Bangalore: Physicists at the Indian Institute of Science, or IISc, say they have developed a new technology that can significantly enhance the sensitivity of a class of widely used diagnostics and even facilitate early-stage detection of several diseases, including cancer and cardiovascular disorders.

Some 150 existing in vitro diagnostics use a laboratory technique called latex agglutination test, or LAT, which detects antibodies or antigens in a variety of body fluids including blood, saliva and urine. However, the detection limits of such tests are restricted to a certain concentration of the antigen (any foreign substance that generates antibodies in the body), even though there have been attempts to increase detection at low concentrations.

The new electro-chemical technology developed by Ajay K. Sood, a professor at IISc's department of physics, and his team allows detection of an antigen at one-hundredth of present concentrations.

This technique allows quantification, so one can tell how old or serious the infection is

Agglutination tests use the principle of natural affinity between a receptor (protein molecule) and a ligand, which attaches to a receptor for a cellular function, and works on specific ligand-receptor recognition. In diagnostics, colloidal particles are coated with receptors which when left in the fluid sample seek out their matching ligands and form lumps. By passing electric current through a mixture of receptor-coated micro-particles and corresponding ligands, researchers showed that the sensitivity of tests increased almost 100 times.

Applying perpendicular electric field to the confining plates reduces randomness in the movement of particles and induces directed motion which enhances the recognition. "As a result, even low concentrations of the antigen (infection) can be detected," said Sood.

Unlike the present positive or negative diagnosis, this technique allows quantification; that is, one can tell how old or serious the infection is. Sood has tested it on commercial kits for rheumatoid arthritis. Having published his research earlier this year in *Clinical Chemistry*, Sood has filed a patent application.

Sood's technique was also applied on a yet-to-launch typhoid diagnostics called typhigen-kit, developed by the Defence Research and Development Establishment (DRDE) in Gwalior, which reduced time in the traditional Widal typhoid test from seven days to one.

"Using this (Sood's) technique, sensitivity in typhigen went up dramatically," said G.P. Rai, joint director, DRDE, whose team has developed the kit and transferred the technology to an Indian diagnostic company.

The global in vitro diagnostics market was worth \$38 billion (Rs1.65 trillion at present) in 2007 and is expected to grow at 6.7% annually until 2012, according to market research firm RNCOS.

The Indian market, currently dominated by services, was worth Rs12,587 crore in 2007, 44% of which was accounted for by diagnostic and pathology lab test services, according to MarketAndResearch.

Most of the diagnostics sold in India are technologies licensed from overseas and imported antibodies, said Shama Bhat, chairman and managing director of Bhat Bio-Tech India (P) Ltd in Bangalore. "This (Sood's) is an ideal technology, but it needs to be made more user-friendly and packaged for an easy read-out (of the findings)," said Bhat.

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