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Macro Chip revolution

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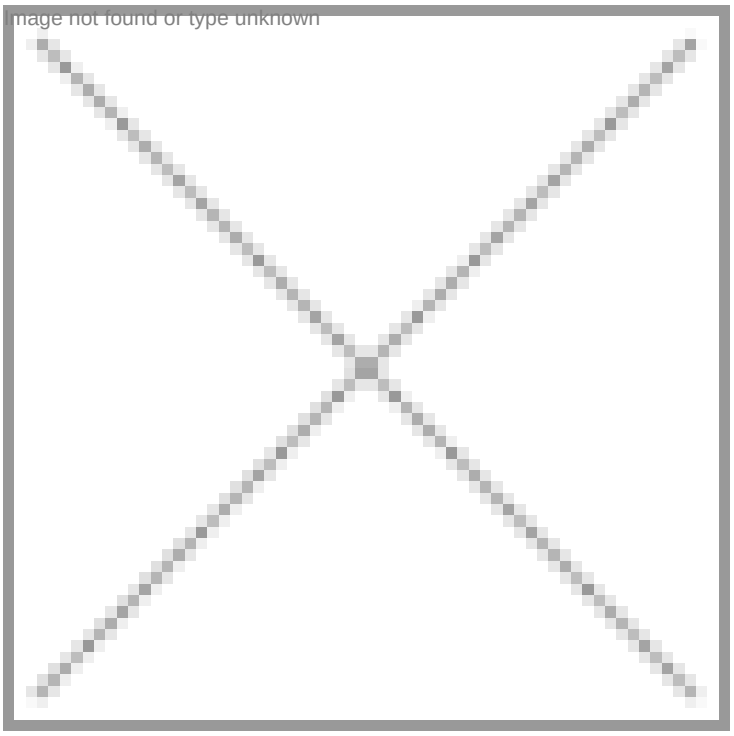

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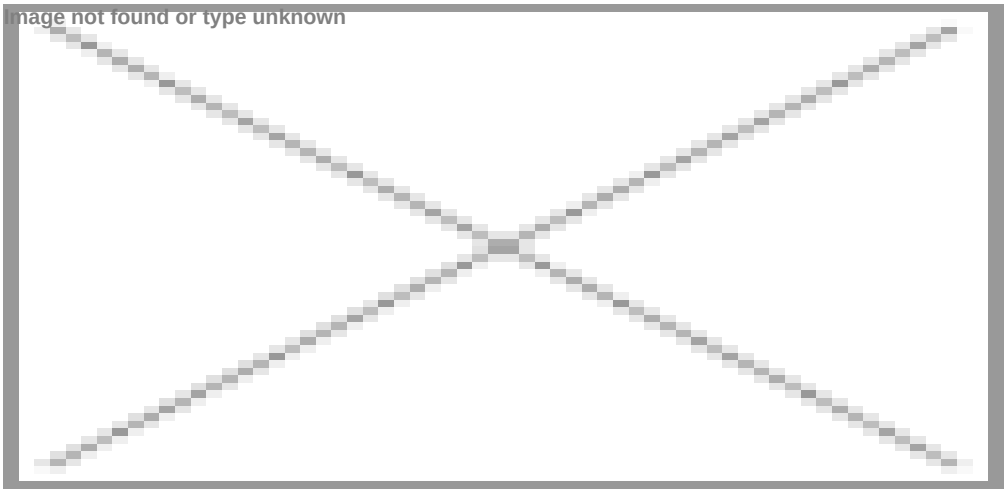

XCyto Screen *range of products, which is based on molecular diagnosis, has redefined the scope of diagnostics by facilitating simultaneous investigation for multiple infections. It flaunts inimitable quality with futuristic DNA macro-chip technology.*

XCyto Screen range of products includes specific and sensitive diagnostic kits that would help to detect over 15 microorganisms responsible for the infection to both eyes and brain. XCyton Diagnostics, the Bangalore-based molecular diagnostics company, launched its XCyto Screen range of products in September 2007. The core concept of these innovative diagnostic products is based on nucleic acid amplification and macro-chip.

XCyto Screen DNA Macro Chip

There are seven specialized diagnostic kits included under XCyto Screen. Among them XCyto Screen Keratoconjunctivitis, XCyto Screen Endophthalmitis, XCyto Screen Uveitis and XCyto Screen Retinitis are DNA macro-chips for the detection of infections to the eye, which are developed in collaboration with Sankara Nethralaya, Chennai; LV Prasad Eye Institute, Hyderabad; Center for Cellular & Molecular Biology; Hyderabad and AIIMS, New Delhi, NMITLI of CSIR funded the project.

XCyto Screen Meningitis is the DNA macro-chip used for diagnosing meningitis in children and is being tested at NIMHANS, Bangalore. While, XCyto Screen Encephalitis is the DNA macro-chip for diagnosing the causative agent encephalitis and is being evaluated at NIMHANS. Funded by DBT, XCyton has also launched the XCyto Screen HPV kit, a DNA macro-chip for genotyping human papilloma viruses, considered as the main cause of cervical cancer.

Inexpensive and innovative technique

While commenting on the uniqueness of XCyto Screen, Dr Ravi Kumar, MD, XCyton Diagnostics, said, "Identifying the particular microorganism that is responsible for the infections in patients' remains the greatest challenge. Patients are subjected to series of costly diagnostic procedures to identify the exact reason for the infection as further treatment will be decided on the outcome of the diagnosis. Sometime the delay in identification would lead to dysfunction of the affected organ or in others it might even lead to the death of the person."

"XCyto Screen range of products, which is based on DNA amplification and macro-chip technology, is an attempt to make the diagnostic process simpler for the doctors and effective and economical for the patients as it allows simultaneous investigation for multiple infections instead of sequentially looking for one infection after the other. This will dramatically lower the cost of the diagnostic protocol," pointed out Dr Ravi Kumar.

XCyton Diagnostics is using the XCyto Screen range of products as service packages and many of the prominent hospitals in Bangalore and Hyderabad are making use of XCyton's service and they are satisfied with the accurate result they get from this novel diagnostic technique. XCyton also plans to market the product aggressively in the coming years by setting up diagnostic labs in collaboration with the major hospitals; XCyton is also planning to reach out to the overseas market.

The young and energetic team of researchers at XCyton Diagnostics is improvising the DNA macro-chip to convert it as an automated one that can be fixed in the laboratory and can be operated without the help of a technical expert. The new kit will be called as Lab-on-a-Chip and will bring diagnostic to the bed side.

The other ongoing projects at XCyton Diagnostics include a chip for detecting Multi Drug Resistant Tuberculosis, being developed based on the work carried out at Earth Institute, Columbia University, Manhattan. XCyton is also developing a series of other DNA macro-chips for the simultaneous detection of various microbes- viruses, bacteria, fungi and parasites that cause acute encephalitic syndrome, septicimia, detection of antibiotic resistance marker and fever.

How a DNA macro-chip works?

XCyto Screen DNA Macro Chip that is currently used in the diagnosis of eye infection, meningitis and meningoencephalitis, detects the presence of the nucleic acid of the causative organism, which are very few in number.

The specimen collected from the patient is processed to extract the nucleic acid. To identify the causative agent the signature genes of the causative agents are amplified. The amplification is done in such a way that all the ingredients required to amplify the signature genes of all the probable causative agents are provided in a single tube. At the end of amplification the task is to identify which causative agent's gene actually got amplified among the probable. This identification is done using the DNA macro-chip. 12 â€“ 50 of short, synthetic, signature sequences of the signature gene are embedded on the surface of the chip. The amplified product is denatured and allowed to renature on the chip. Further by enzymatic reaction a colored spot develops. The orientation of the spots will let one identify which organism signature gene got amplified and thus can arrive at the cause of the infection.

The sensitivity of the test is high due the amplification of the signature gene and the specificity of the test comes from the DNA macro-chip where the amplified signature gene is chemically identified by its complimentary sequence.

"XCyto Screen is our breakthrough product"

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-Dr Ravi Kumar, MD, XCyton Diagnostics

What prompted you to develop XCyto Screen? How did you come up with the idea?
We wanted to redefine our path in the year 2003 from immunodiagnostics to something different. The cost of the diagnostic kits for public health has fallen miserably as the government promoted import of diagnostic kits. The number of players has also increased that brought down our business. We shifted our focus to molecular diagnostics for critical illness, where most of the diagnostic companies shy away.

How did XCyton succeeded in developing DNA macro-chip-based diagnostic kits?
In 2005, we received financial assistance from NMITLI of CSIR to develop Vision Chip. We collaborated with Sankara Nethralaya, Chennai;
LV Prasad Eye Institute, Hyderabad; Center for Cellular & Molecular Biology; Hyderabad and AIIMS, New Delhi. That wasthe beginning of the whole journey of DNA macro-chip. The work on Vision Chip helped us to address all the scientific and technical issues.

What are the unique features of XCyto Screen?
There are 14 different infections that affect the eyes. In normal diagnosis four to five tests are conducted using the eye fluidto trace out the exact microbes responsible for the infection. Our vision chip allows simultaneous tests for detecting all the microbes and is ridiculously simple. In a disease-based approach one has to undergo several tests. We are following syndrome-based approach that saves time and thereby saves lives of patients suffering from critical illness.

XCyto Screen ensures sensitivity and specificity as the DNA macro-chip can check for the exact DNA amplification. There are seven specialized DNA macro-chips included under XCyto Screen for diagnose of keratoconjunctivitis, endophthalmitis, uveitis, retinitis, meningitis, encephalitis and human papilloma viruses.

What were the challenges that XCyton faced while developing XCyto Screen?

Replacing fluorescence with color for labeling strands, prior to their mutation and maintaining maximum accuracy in DNA amplification were the main challenges. We solved that problem within the four walls of XCyton Diagnostics. We had to make something unique, which could uniformly amplify the genes, without making a bias. Some genes were easy to amplify while some other were difficult to amplify. To tackle that, we used enormous amount of computing and bioinformatics. I consider XCyto Screen as our major breakthrough product. All the credit goes to our dedicated team of researchers.

How are you promoting XCyto Screen range of products?

XCyto Screen is now used for providing diagnostic services. Our market base is in Bangalore and we will extend that tosome other cities also. We are in the process of discussion with many hospitals in all major cities. We can operate from Bangalore for those hospitals that can send us samples within 12 hours. In places where it is difficult to shift the samples we want to put up labs. Our market is very specialized. Earlier we were addressing all hospitals, now we know where to target. It took a lot of time for us to realize the market trend.

What are the other major projects in the pipeline?

To take the product to the market we need a huge marketing infrastructure. We have finished experimentation and are ready to market XCyto Screen across the country. In 2006, we got investment from Nadathur Holdings and Investments Pvt Ltd, the investment firm established by N S Raghavan, founder and former joint managing director of Infosys. XCyton will start operations in Vietnam and Gulf in the coming year. XCyton is currently developing a series of other DNA chips for the simultaneous detection of various microbes that cause brain infections, septicemia and fever. XCyto Screen diagnostic kits will be automated to convert it into simple tabletop equipment.

J Pradeep Kumar