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Indian doctors achieve breakthrough in Nanogeneseq technology

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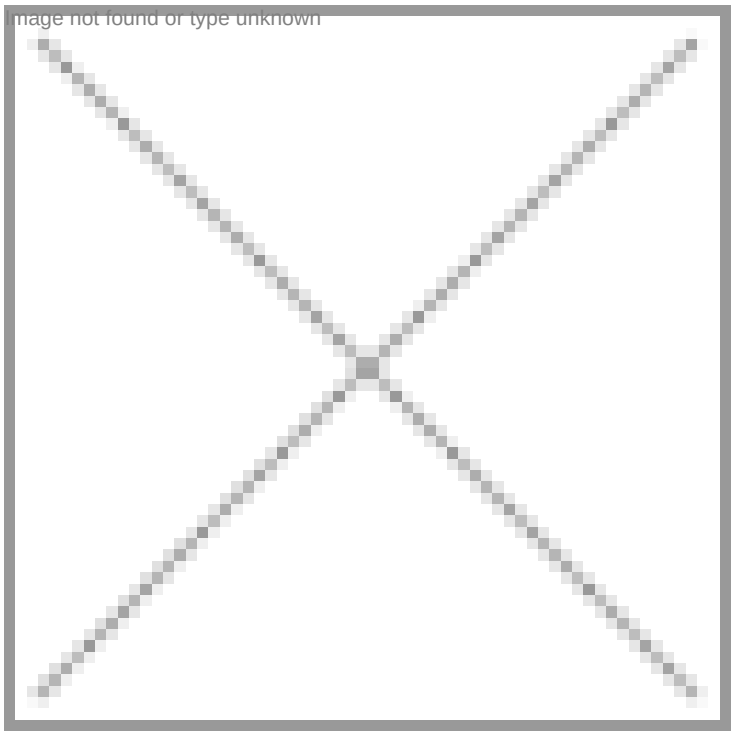

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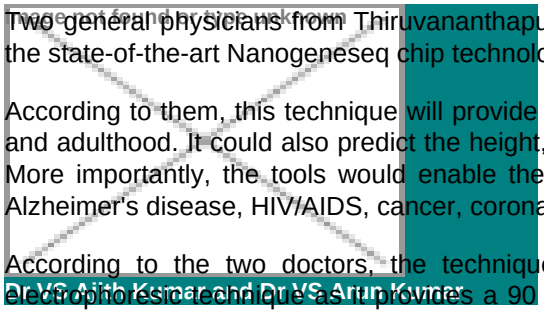


Dr VS Ajith Kumar and Dr VS Arun Kumar

Two general physicians from Thiruvananthapuram in Kerala, Dr VS Ajith Kumar and Dr VS Arun Kumar, have made use of the state-of-the-art Nanogeneseq chip technology to evolve a technique to prepare a genetic horoscope of a newborn.

According to them, this technique will provide insight on a variety of diseases that could affect the child in its growth phases and adulthood. It could also predict the height, weight, color, physical attributes, eating habits and even romantic tendencies. More importantly, the tools would enable the medical community to predict and treat a wide range of diseases including Alzheimer's disease, HIV/AIDS, cancer, coronary artery disease and several others.

According to the two doctors, the technique using Nanogeneseq chip is much superior to the conventional capillary electrophoresis technique as it provides a 90 percent perfect picture compared to the latter that can give only a 30 percent idea of the structure of DNA. Overlapping problems associated with conventional techniques is also solved using the new technology. The proteins in the cells could be more clearly picturized using the nanogeneseq chip. The samples used for DNA sequencing is blood, saliva, spinal cord or any body fluid taken from the child's body.

The Nanogenseq chip is used in conjugation with Helinaser (Helical Nano Laser) that scans the sequences and finally establishes the horoscope. The technique has been patented in 90 countries through the Patent Co-operation Treaty and the technology is likely to be transferred to a global partner. Ultimately the technology will lead to the development of a "Digital Gene Card" that each one of us will carry throughout our lives. Treatment of diseases including medicines and its dosage will

be based on the gene card, the doctors said.

R Sreekumar, CyberMedia News

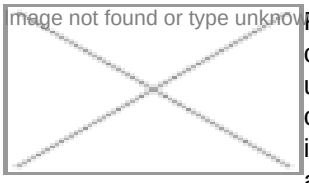
Artificial retina in the making

For the visually impaired, there seems to be light at the end of the tunnel. Research is being conducted under the Boston Retinal Implant Project on a retinal prosthesis, which on implantation in the eye could restore the sight of millions. The device would use a digital video camera mounted on a pair of glasses, coupled via a miniature transmitter to a retinal implant array underneath the retina. The array's electrodes would stimulate surviving nerve cells in response to images from the camera, providing a small patch of vision. The project aims to develop a microelectronic retinal implant to restore vision to patients with age-related macular degeneration and retinitis pigmentosa.

Scientists are currently testing the implant design, which has unique features that improve its safety, function and performance. Research has shown that materials tested in animals seem to be biocompatible and might be eventually used in a human implant. Till date, in vivo tests have been done on six patients. It has been found that patients who have been blind for decades can see images in response to electrical stimulation of the retina. Also, the most typical single image seen by patients is relatively small. This result provides hope that many such small images could be created at once (by stimulating many electrodes at one time) to produce the perception of an object. Presently, a variety of studies are being pursued to collect information that is needed to obtain Phase I FDA approval to test the safety of the device following implantation in a human. The project hopes to test a permanent prosthesis by 2006.

The idea of a retinal implant was conceptualized in the 1980s by Dr Joseph Rizzo and Professor John Wyatt, who initiated a collaboration between the Massachusetts Eye and Ear Infirmary-Harvard Medical School and the Massachusetts Institute of Technology. As the project grew, the center for innovative visual rehabilitation was established at the Boston VA Hospital to centralize the research and development effort.

Zebrafish offers immunity clues



For the first time, researchers have sequenced all 36 genes of novel receptors that appear to play a critical role in the innate immune protection of Zebrafish. This achievement could lead to a better understanding of infectious diseases and certain cancers. Till date, this is genetically the most complex system of innate immune receptors described and can be related to receptors in humans involved in Natural Killer cell (NK cells) function. In the human body, NK cells kill malignant cells and those cells infected with certain viruses.

The Zebrafish scientifically known as Brachydanio rerio is a small species of freshwater aquarium fish. It is increasingly serving as an animal model for the study of genetic diseases. Like humans, it has two types of immune systems-innate and adaptive. Innate immune systems provide a first line of defense against foreign microorganisms. But, humans and other jawed vertebrates have also evolved more customized or adaptive immune systems, which use an arsenal of antibodies and T-cell receptors to fend off diverse pathogens and prevent repeat attacks.

The principal investigator of the study, Gary Litman, Hines Professor of Pediatrics, working at the Children's Research Institute at the University of South Florida along with his colleagues is trying to tease out details about the evolutionary transition from innate to adaptive immunity with powerful new biotechnology techniques. They searched the genome of the Zebrafish and identified a class of genes, called Novel Immune-Type Receptor (NITR) genes, which are predicted to be capable of recognizing a wide range of surface molecules. A portion of the NITR genes is very similar to variable region genes of antibodies and T-cell receptors. They hope to use the fish as a tool to better understand how innate immunity may ignite adaptive immune response and to investigate potential therapies for immune deficiencies in humans.

Their paper, titled "Resolution of the novel immune-type receptor gene cluster in zebrafish," has appeared in the Proceedings of the National Academy of Sciences.

Human chromosome 5 unveiled

Four years after publicly revealing the official draft human genetic sequence, researchers have reached the halfway point in deciphering the book of life. Chromosome 5 is the latest completely sequenced chromosome to join the ranks taking the tally

of deciphered chromosomes to 12. Now there are another 12 more chromosomes to decode. As the new sequence reveals, this chromosome is a genetic behemoth containing key disease genes and a wealth of information about how humans evolved.

This is the second of three chromosomes that the Department of Energy Joint Genome Institute (JGI) has finalized in collaboration with colleagues at the Stanford Human Genome Center (SHGC). JGI, in partnership with SHGC, completed the sequencing of three of the human genome's chromosomes-numbers 5, 16 and 19-which together contain some 3,000 genes, including those implicated in forms of kidney disease, prostate and colorectal cancer, leukemia, hypertension, diabetes and atherosclerosis.

Chromosome 5, the largest to be completed thus far, is made up of 180.9 million genetic letters-the As, Ts, Gs, and Cs that compose the genetic alphabet. These letters spell out the chromosome's 923 genes, including 66 genes that are known to be involved in human disease. Another 14 diseases seem to be caused by chromosome 5 genes, but they haven't yet been linked to a specific gene.

FDA approves the first ever total artificial heart

While efforts are on to develop an artificial retinal implant to restore vision, another group of researchers have developed a total artificial heart. Christened as "CardioWest", the
temporary heart is a pneumatic, biventricular, implantable bridge-to-transplant system for non-reversible heart failure patients awaiting heart transplants. The device has been approved by the US FDA for patients at risk of death from biventricular heart failure. Significantly, this is the first FDA-approved temporary total artificial heart, though numerous devices that replace major parts of the heart are presently in the market.

CardioWest completely replaces the patient's diseased heart and immediately restores normal blood pressure and cardiac output, facilitating recovery of end-organ function, such as the kidney and liver. As a result, patients become better candidates for transplantation. The device offers full circulatory support, the shortest blood path and exposure to artificial surfaces and the highest level of cardiac output when compared with other artificial heart systems previously tested. Researchers who worked on the forerunners to today's mechanical hearts in the 1960s assumed that such devices would need to function flawlessly for years. At the time, heart transplants were not seen as a practical therapy because the implanted organs were quickly rejected by the patient's immune system. The idea of a permanent implanted artificial heart persists but, once the development of drugs that suppress organ rejection created a transplant industry, doctors began to study artificial hearts as short-use tools to keep patients alive until natural hearts became available.

CardioWest has been developed by SynCardia Systems, a start-up based in Tucson and privately held developer of biomechanical cardiac replacement and assisted devices.