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Delhi University researchers unveil clean leather processing technology

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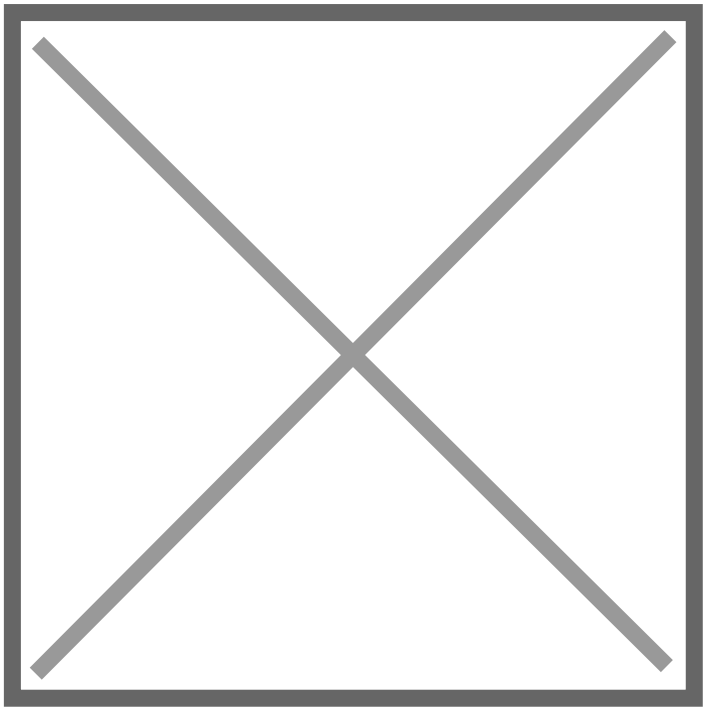


Researchers working at the department of microbiology, Delhi University, South Campus, have developed an enzyme-mediated leather processing technology, which is claimed to be environment friendly and does not compromise on the final quality of the leather. The researchers have demonstrated the removal of hairs from skin (dehairing) in just 6-8 hours. The complete hair comes out from the hair follicle, which can be used as a byproduct by the tanners. And the flesh removed (defleshing) from the skin can be exploited for the extraction of dehydroxy amino acids and the left over can be used for manure making or for animal feed improvement. This research work is part of a three-year project conceived under the New Millennium Indian Technology Leadership Initiative (NMITLI) scheme aiming at the ambient preservation of leather, its processing and the waste treatment.

Leather processing in India is one of the oldest technologies. Shoe making was in fact pioneered in India. And many tanneries were established. Conventionally, leather processing is done by strong chemicals leading to the production of toxic byproducts. Realizing the pollution problem in recent years, many tanneries have been closed due to the hazardous effluents produced. Since India is the second largest in leather processing after Brazil, there has been a long felt need to develop an alternate procedure, which is least polluting, economically viable with no compromise on quality. And this was an important mandate of the project under the NIMITLI scheme. Dr T Ramasami, director, Central Leather Research Institute (CLRI), heads the project. Twelve coordinated groups including the Pune University, Agarkar Research Institute, National Chemical Laboratories, Madurai Kamaraj University, Centre for Cellular and Molecular Biology, Department of Microbiology, South Campus, Delhi University have been working on different aspects of the project. The first phase of the project has been completed successfully.

The microbiology department of Delhi University was involved in the enzyme mediated leather processing aspect of the project. The researchers did the initial screening of organisms, isolated the suitable microbe, studied its biological properties and characterized it. Then they developed the technology for its mass production and scale up processes. Dr RK Saxena, head, department of microbiology, University of Delhi, observed, "If we are able to provide a viable, environment friendly technology to the tanneries in Chennai, Kolkata, Kanpur and in the extreme North then the turnover of processed leather can be increased greatly in the country."

A chip hotline for medical emergencies

Two US-based companies have developed the world's first implantable microchip for human use. The sub-dermally implanted Radio Frequency Identification Device (RFID) has been christened "VeriChip". Each chip is about the size of a grain of rice and contains a unique 16-digit verification number that is captured by briefly passing a scanner over the insertion site. This identification number could open the medical details of the person stored in a central database

According to the chipmakers, the recommended location of the microchip is in the triceps area between the elbow and the shoulder of the right arm and the brief outpatient "chipping" procedure lasts just a few minutes involving local anesthetic followed by quick, painless insertion of the chip. Once inserted just under the skin, the VeriChip cannot be seen by the human eye. A small amount of radio frequency energy passes from the scanner energizes the dormant chip, which then emits a radio frequency signal transmitting the verification number. The captured 16 digit number links medical details of the person stored in a central database via encrypted Internet access.

Recognizing the importance of such a facility during an emergency, the chip has been approved by the US FDA for medical use in the US. But at the same time the chip could open a critical window for radio tracking humans and has the potential to replace passports, ID cards and even credit cards.

New tool reveals molecular signature of cancer and HIV

Scientists have designed a new molecular tool, LigAmp, to pinpoint DNA mutations among thousands of cells, the equivalent of searching for a single typo in an entire library of books. Preliminary studies in a small number of cell lines and body fluids show the ultra-sensitive test may help detect microscopic cancer and HIV drug resistance. "Other molecular tests make it very difficult to locate a mutation in a particular cell surrounded by thousands of other cells that don't have the mutation," said James Eshleman, who led the study with colleagues from the Johns Hopkins Department of Pathology and Kimmel Cancer Center. "LigAmp essentially filters background 'noise' caused by normal cells and reveals specific mutations."

The researchers say that sensitive tests to locate mutations could identify cancer in patients at high-risk for the disease. Such tests could even help detect a recurrence of cancer by monitoring whether the number of mutations rises above a predetermined threshold value. In addition to cancer detection, the Hopkins mutation-finder appears able to detect drug-resistant HIV. The team tested it on blood samples from a handful of patients with HIV and located DNA mistakes in the virus itself that make it resistant to certain antiretroviral drugs. Results of analyses of the new test were published in the November issue of Nature Methods.

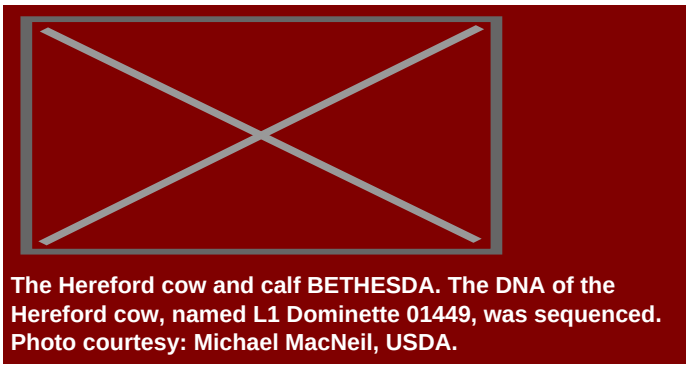
"We designed LigAmp to improve how we look for extremely subtle variations in viral and cellular DNA," says Eshleman, an associate professor of pathology and oncology and associate director for the DNA Diagnostics Laboratory at Johns Hopkins. "The molecular code of normal cells may look identical to cancerous except for a single rung in the DNA ladder-structure."

The test works by creating a molecular "magnet" with an affinity for the DNA mistake, also known as a point mutation. If the mutation is found, the magnet binds to it and inserts a bacterial gene. The bacterial gene serves as a red flag and produces a fluorescent color visible to powerful computer programs.

In their studies, the Hopkins investigators tested LigAmp on colon cancer cell lines, blood from HIV patients, and fluid from cancer patients' pancreatic ducts. Single mutations in colon cancer cells and drug-resistant HIV viruses were detected at dilutions of up to 1 in 10,000 molecules. Further analysis of LigAmp with larger sample sizes and blinded panels of clinical samples currently is under way.

Bovine genome assembled

The first draft of the bovine genome sequence has been deposited into free public databases for use by biomedical and agricultural researchers around the globe. Contributors to the $53 million international effort to sequence the genome of the cow (Bos taurus) include: the National Human Genome Research Institute (NHGRI), which is part of the National Institutes of Health (NIH); the US Department of Agriculture's Agricultural Research Service and Cooperative State Research, Education, and Extension Service; the state of Texas; Genome Canada through Genome British Columbia, The Commonwealth Scientific and Industrial Research Organization of Australia; Agritech Investments Ltd, Dairy Insight Inc. and AgResearch Ltd, all of New Zealand; the Kleberg Foundation; and the National, Texas and South Dakota Beef Check-off Funds.



The Hereford cow and calf BETHESDA. The DNA of the Hereford cow, named L1 Dominette 01449, was sequenced. Photo courtesy: Michael MacNeil, USDA.

A team led by Richard Gibbs at Baylor College of Medicine's Human Genome Sequencing Center in Houston carried out the sequencing and assembly of the genome. Additional work aimed at uncovering more detailed information about individual bovine genes-a process referred to as full-length cDNA sequencing-is being conducted by a team led by Marco Marra, at the British Columbia Cancer Agency in Vancouver.

Researchers are continuing sequencing and plan to have a six-fold draft of the bovine genome completed sometime in the first half of 2005. They are also comparing the bovine genome sequence with those of the human and other organisms that have already been sequenced. Results of these analyses will begin to be published in the public databases in the next several months.

Sequencing of the bovine genome began in December 2003. The breed of cattle selected for the bulk of the sequencing project was Hereford, which is used in beef production. Sequencing at lighter coverage will be carried out in additional cattle breeds, including the Holstein, Angus, Jersey, Limousin, Norwegian Red and Brahman. The competed Bovine Genome Sequencing Project will allow detailed tracking of the DNA differences between these breeds to assist discovery of traits for better meat and milk production and to model human disease.

Living "Brain" invented

A University of Florida scientist has grown a living "brain" that can fly a simulated plane, giving scientists a novel way to observe how brain cells function as a network. The "brain", a collection of 25,000 living neurons, or nerve cells, taken from a rat's brain and cultured inside a glass dish, gives scientists a unique real-time window into the brain at the cellular level. By watching the brain cells interact, scientists hope to understand what causes neural disorders such as epilepsy and to determine noninvasive ways to intervene. As living computers, they may someday be used to fly small unmanned airplanes or handle tasks that are dangerous for humans, such as search-and-rescue missions or bomb damage assessments.

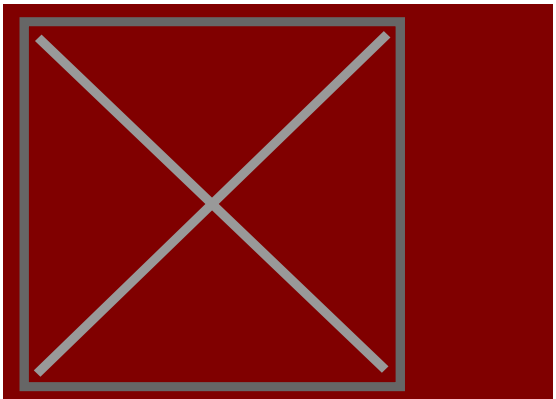
"We're interested in studying how brains compute," said Thomas DeMarse, the UF professor of biomedical engineering who designed the study.

While computers are very fast at processing some kinds of information, they can't approach the flexibility of the human brain, DeMarse said. In particular, brains can easily make certain kinds of computations such as recognizing an unfamiliar piece of furniture as a table or a lamp that are very difficult to program into today's computers. "If we can extract the rules of how these neural networks are doing computations like pattern recognition, we can apply that to create novel computing systems," he said.

DeMarse experimental "brain" interacts with an F-22 fighter jet flight simulator through a specially designed plate called a multi-electrode array and a common desktop computer. "It's essentially a dish with 60 electrodes arranged in a grid at the bottom," DeMarse said. "Over that we put the living cortical neurons from rats, which rapidly begin to reconnect themselves, forming a living neural network, a brain."

Scientists find Nanowires capable of detecting individual viruses

Harvard University scientists have found that ultra-thin silicon wires can be used to electrically detect the presence of single viruses, in real time, with near-perfect selectivity. These nanowire detectors can also differentiate among viruses with great precision, suggesting that the technique could be scaled up to create miniature arrays easily capable of sensing thousands of different viruses. The work was reported in the recent issue of the Proceedings of the National Academy of Sciences.



This prototype biochip contains nanowire transistors that can detect the presence of individual viruses. The tubes carry fluid samples to and from the chip.

"Viruses are among the most important causes of human disease and are of increasing concern as possible agents of biowarfare and bioterrorism," said author Charles M Lieber, Mark Hyman Jr., professor of chemistry in Harvard's Faculty of Arts and Sciences. "Our work shows that nanoscale silicon wires can be configured as ultra-sensitive detectors that turn on or off in the presence of a single virus. The capabilities of nanowire detectors, which could be fashioned into arrays capable of detecting literally thousands of different viruses, could usher in a new era for diagnostics, biosafety, and response to viral outbreaks."

Lieber and his colleagues merged nanowires conducting a small current with antibody receptors for certain key domains of viruses such as agglutinin in the influenza-A virus. When an individual virus came into contact with a receptor, it sparked a momentary, telltale change in conductance that gave a clear indication of the virus's presence. Simultaneous electrical and optical measurements using fluorescently labeled influenza-A confirmed that these conductance changes corresponded to binding and unbinding of single viruses from nanowire devices.

In addition to influenza A, the Lieber group tested nanowire arrays outfitted with receptors specific to paramyxovirus and adenovirus. The researchers found the detectors could differentiate among the three viruses both because of the specific receptors used to snag them and because each virus binds to its receptor for a characteristic length of time before dislodging-leaving only a minuscule risk of a false positive reading.

"The fact that a nanowire array can detect a single virus means that this technology is the ultimate in sensitivity," Lieber said. "Our results also show that these devices are able to distinguish among viruses with nearly perfect selectivity."

Lieber's co-authors are Fernando Patolsky, Gengfeng Zheng, Oliver Hayden, Melike Lakadamyali, and Xiaowei Zhuang, all of Harvard's departments of chemistry and chemical biology, physics, and division of engineering and applied Sciences. The work was supported by the Defense Advanced Research Projects Agency, National Cancer Institute, Ellison Medical Foundation, Office of Naval Research, and Searle Scholar Program.

Source: Lieber Group, Harvard University

Case University engineers develops sliver-sensor

Miklos Gratzl, an associate professor of biomedical engineering and researcher at the Case School of Engineering, has developed for the first time a "sliver-sensor", a fully functional, minimally invasive, microscopic new monitor that can be placed just under the skin and seen with the naked eye for very accurate, continuous examination of glucose level for diabetics and other bodily fluid levels with the help of simple color changes.

Colors in the tiny sensor, which is smaller than the tip of a pencil, gradually change from orange (low glucose levels) to green and then to dark blue as levels increase. A deep, darker blue signifies the highest glucose level that can occur in diabetics. Gratzl and co-principal investigator Koji Tohda, a biomedical engineering researcher at Case, believe the implications for improving the quality of life of diabetics would be substantial.

"Many diabetics could greatly benefit from this technology, freeing them from having to take samples from their fingers several times a day to monitor blood sugar levels," Gratzl said. "The monitor could also help doctors with close monitoring of

electrolytes, metabolites and other vital biochemicals in the body, primarily those of critically ill patients."

Gratzl and Tohda's research also may benefit future astronauts. The research is being funded by NASA and the John Glenn Biomedical Engineering Consortium at NASA Glenn Research Center and partially by Vision Sensors LLC, a Cleveland-based start-up. Tohda's expertise in the area of optode technology helped point the researchers in the direction of using color changing molecules to detect ionic levels as they vary with changes in glucose. The sensor, which is one to two millimeters long and 100 to 200 micrometers wide, penetrates the skin easily and painlessly so users may insert or reinsert it themselves when needed and can be operational at least for several days at a time. It can be monitored by eyesight and by electronic telemetry.