WEST LAFAYETTE, IN, USA: Researchers at Purdue University in the United States have developed a technique using spun-sugar filaments to create a scaffold of tiny synthetic tubes that might serve as conduits to regenerate nerves severed in accidents or blood vessels damaged by disease. The sugar filaments are coated with a corn-based degradable polymer, and then dissolved in water, leaving behind bundles of hollow polymer tubes that mimic those found in nerves, said Riyi Shi, an associate professor in Purdue’s Weldon School of Biomedical Engineering and Department of Basic Medical Sciences.

The scaffold could be used to promote nerve regeneration by acting as a bridge placed between the ends of severed nerves. The approach also might have applications in repairing blood vessels damaged by trauma and disease such as atherosclerosis and diabetes, Shi said.

The researchers are initially concentrating on the peripheral nerves found in the limbs and throughout the body because nerve regeneration is more complex in the spinal cord. About 800,000 peripheral nerve injuries are reported annually in the United States, with about 50,000 requiring surgery. The new approach represents a potential alternative to the conventional surgical treatment, which uses a nerve ‘autograft’ taken from the leg or other part of the body to repair the injured nerves. Researchers are trying to develop artificial scaffolds to replace the autographs because removing the donor nerve causes a lack of sensation in the portion of the body where it was removed.

The first step in making the tubes is to spin sugar fibers from melted sucrose. “It’s basically like making cotton candy,” said biomedical engineering doctoral student Jianming Li, who is a member of Shi’s research team. The sugar filaments were coated with a polymer called poly L-lactic acid. After the filaments were dissolved, hollow tubes of the polymer remained. The researchers then grew nerve-insulating cells called Schwann cells on these polymer tubes. These cells automatically aligned lengthwise along the tubes, as did nerve cells grown on top of the Schwann cells.

Nerve cells grew not only inside the hollow tubes but also around the outside of the tubes. “This finding is important because the increased surface area may accelerate the regeneration process following an accident,” Li said.

The researchers also discovered that the polymer tubes contain pores that are ideal for supplying nutrients to growing nerve cells and removing waste products from the cells. The work was done using cell cultures in petri dishes, but ongoing work focuses on implanting the scaffolds in animals.

“The method for creating the scaffolds is relatively simple and inexpensive and does not require elaborate laboratory equipment,” Shi said. “We used the same kind of sugar found in candy and a cheap polymer to make samples of these scaffolds for a few dollars. The process easily lends itself to mass production. It is a unique idea, and the simplicity and efficiency of this technology distinguish it from other approaches for nerve repair.”

A provisional patent application on the material has been filed.

(Edited by Daniel Zimmermann, DTI)
Research adds colour to gum disease detection

According to lead researcher Dr Ahmed Khocht, DDS and Associate Professor of Periodontology, test results among 73 patients have shown a strong correlation between the patients with gum disease detected by traditional clinical evaluation methods and those detected with the oral strip, suggesting the strips would be a comparable screening method.

The colour reaction was scored based on a colour chart and the scores were compared with scores from the plaque index, gingival index, attachment levels and bleeding on probing.

“The strip changes from white to yellow depending on levels of microbial sulphur compounds found in the saliva,” said Dr Khocht. “A higher concentration of these compounds means a more serious case of gum disease, and shows up a darker shade of yellow.”

Because periodontal disease can affect a person’s overall health, it’s important to have a screening method like the oral strips that is quick and easy for clinicians to use, according to Dr Khocht. “The faster we can find out the disease is present, the sooner we can begin treatment,” he said. “And because the strips can change colour, they can also act as a benchmark to help doctors find the right treatment for their patient and monitor their progress.”

(Edited by Daniel Zimmermann)

Stains mistaken as tooth decay

Penny Palmer
DT UK

LONDON, UK: Stains on teeth are often mistaken for signs of decay, according to new research. A study of 200 private dental patients in the UK found that in over 60 per cent of cases, stains that were hard to remove were mistaken for decay. The stains were only identified using an advanced device that cleans teeth with a blast of fine abrasive particles.

Dental researchers examined a particular ‘premolar’ situated between the front and back teeth and found signs of decay in 78 per cent of cases. But 63 per cent of them turned out to be false alarms when they were examined again, using the CrystalAir abrasion device instead of mirrors and scrapers. The research suggests that stained teeth may result in dentists drilling unnecessarily.

Dr Robin Horton, from the Wayside Dental Practice in Harpenden in Hertfordshire, who co-led the study, claimed that “traditional dental check-ups have led to unnecessary dental treatment for millions of patients.” The CrystalAir abrasion device blasts away dirt, debris and stains using a narrow stream of aluminium oxide particles propelled by helium. It is used in conjunction with a laser probe that can detect deeply hidden decay by shining a light beam through the tooth. The research found that using the two systems together was 70 per cent more accurate in picking up decay than traditional techniques.

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Games technology to help in future dental training

Ray McHugh
UK

GLASGOW, UK: Dentists of the future could be using games technology to hone their clinical skills. Three final-year dental students at the University of Glasgow Dental School have developed the concept of using Wii technology to help dental students practise their operative skills.

The students were announced the winners of The Dental Innovation Technology Ideas Award last week. The competition challenged final-year students to develop an idea for a new piece of technology or innovation in the dental field.

The winning idea suggests the use of the Nintendo Wii console and special software to simulate operative techniques. The wireless controllers would be used by dental students to control the handling of instruments on a virtual patient on the screen. The controllers would also be used to provide sensory feedback to the user.

“Simulation of clinical procedures is normally carried out in the operative techniques lab. However, dental students sometimes have limited opportunity to practise their techniques outside of the lab,” said Dr. David Watson of the University of Glasgow Dental School.

“The use of Wii technology could be a really innovative and cost-effective solution which students could use to improve their manual dexterity.”

There is considerable research to back up the concept of using video games to improve dentists’ coordination, and the Wii-based application would complement the simulation technology already used in dental schools worldwide,” Dr. Watson added.

The students—Pearse Hanigan, David Lagan and Adam Gray—were presented with a cheque for £300 and a glass obelisk by Craig Leaver, CEO of Dental Innovation, the competition sponsor.

Leaver said: “We received over 40 entries for the competition, all of which were of an extremely high standard. The judging panel were impressed by the depth of research and hard work which had gone into the submissions, which made it very difficult to choose an outright winner. However, we were struck by the inventiveness of adapting an existing piece of technology in a very novel way.”

“We are absolutely delighted that Glasgow Dental School has given us the opportunity to host this annual award,” he added. “As more dental practices become reliant on digital systems, it is vital that students are up to speed with the latest technologies. We hope the award will inspire them to think about how technology can be applied in practice for greater efficiency and better patient care.”

(Edited by Daniel Zimmermann)