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Smart glove to help leprosy sufferers avert injury

A smart glove, developed partly by researchers at the University of Cape Town, could help leprosy patients avert injury to their hands. The glove is currently being tested at the Leprosy Mission Hospital in New Delhi, India, and uses technology which tracks pressure points on the palms and fingers. In this way it prevents injuries to patients' hands as a result of nerve damage and sensory loss.

Using an off-the-shelf fabric glove, Dr Sudesh Sivarasu from the Department of Human Biology at UCT modelled a stretchable glove that uses a revolutionary fabric with built-in nano-sensors. A patient with hand nerve damage cannot feel the heat from a metal mug of tea; this is where the smart glove is very useful. "We've created an artificial sense of touch. The fabric picks up haptic factors such as roughness, temperature, pressure and humidity," says Dr Sivarasu.

Some 95% of people in the world are naturally immune to leprosy, caused by *mycobacterium leprae* and resulting in progressive damage to skin, nerves, limbs and eyes. Although the disease is curable, patients often suffer a "secondary tier" of injury and disability because they can't feel heat or pressure. In many cases this destroys tissue and results in amputation.

The glove also maps the individual's hand usage to establish where the pressure variations are during simple domestic activities such as cutting wood or cooking. These are recorded to show where ulcers are likely to develop. "Because of wound infection, the digits are the first to go in leprosy patients and amputation usually follows," adds Dr Sivarasu.

According to 2012 statistics, there are 232,000 new cases of leprosy each year and India has the highest concentration (about 56% of the global burden) of leprosy, followed by Brazil. In South Africa, the figures are low, some 50 to 70 new cases annually, predominantly in the Eastern Cape and KwaZulu-Natal.

In September this year, Dr Sivarasu presented a paper on the smart glove at the International Leprosy Congress in Brussels, Belgium, where he and Sathish Kumar Paul, his PhD student based in India, won the Young Scientist Award and Best Oral Presentation Award.

Many diseases are treatable – but the means of treatment unaffordable. Born and educated in India, Dr Sivarasu experienced the despair of seeing a loved one die because of the high cost of medical intervention in India. In South Africa, where 90% to 95% of medical equipment is imported with a mark-up of up to 300%, the excessively high cost is passed on to the patient.

This has motivated Dr Sivarasu to develop indigenous technology. Together with his team of postgraduate students, they have come up with a number of innovative, inexpensive solutions to common medical problems. "We're thinking out of the box," he says. "Too often we get stuck in a cycle of novelty and academic outcomes. We want to be able to make things easier, make it cost-effective – and get it to the masses."

Dr Sivarasu also looks at the uniqueness of the patients themselves. For his PhD (which he obtained at 26), he developed a high-flexion artificial knee implant for Eastern cultures, where people squat or sit on low platforms. Western prostheses don't provide the 120-degree flexion extension - the range needed for comfort when semi-squatting.

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