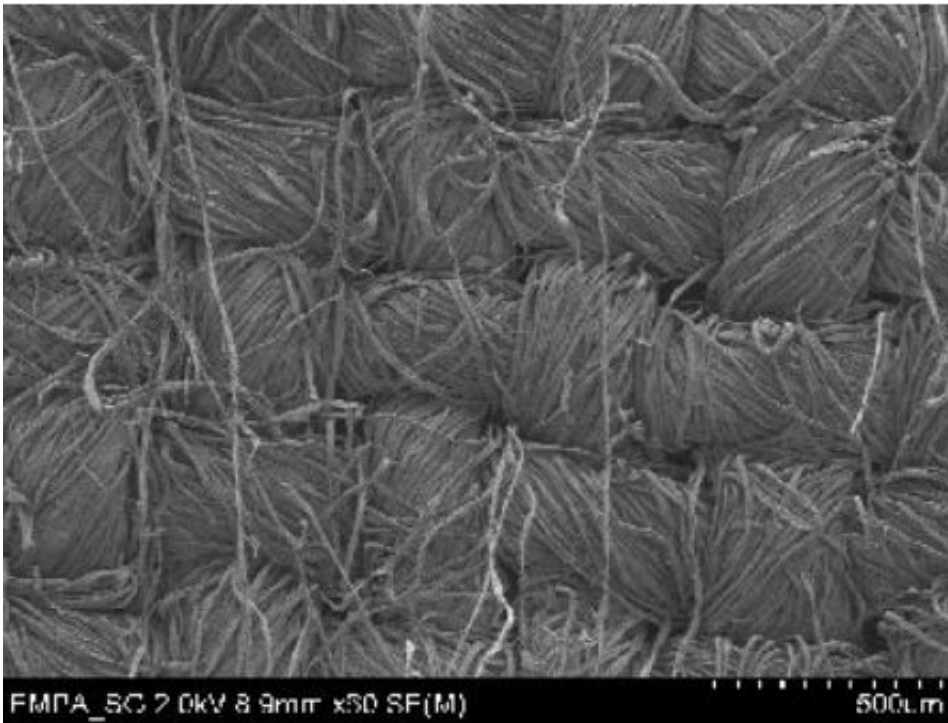


Textile pressure ulcer prevention: Improving quality of life for the bedridden

November 16 2012, by Jost Dubacher



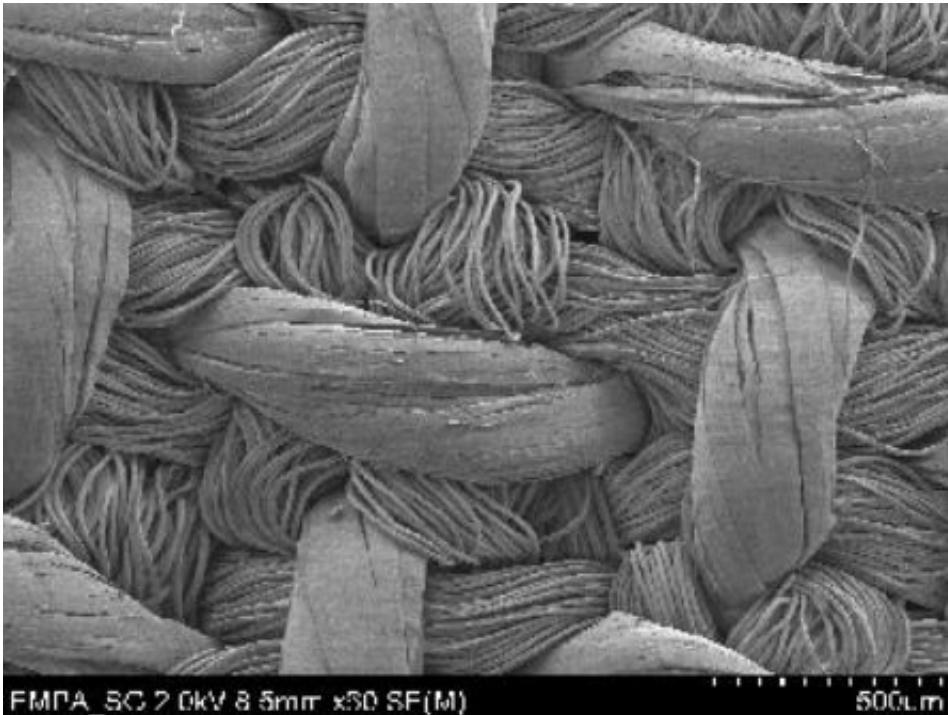
A scanning electron microscope (SEM) image of a conventional cotton bedsheet, as used every day in hospitals.

Immobile patients are in constant danger of developing pressure ulcers on the skin. Empa, Schoeller Medical and the Swiss Paraplegic Centre have worked together to develop a special sheet that is gentle on the skin and helps to make patients more comfortable.

The skin is the most versatile of our organs: It protects the body from environmental effects, contributes to the body's immune system and supports [metabolic functions](#) such as breathing. The skin is always in action. Lack of movement is anathema to it. If a patient does not move, the ever higher [moisture levels](#), pressure and effects of gravity lead to circulatory disorders. This increases the amount of toxic tissue, resulting in ulcers which can lead to life-threatening complications.

This affects two groups of patients in particular: the elderly and paraplegics. There is an up to 50 per cent higher risk of these persons developing [bedsores](#) during a hospital stay, despite all the advances in methods of care. Four out of five paraplegics develop a pressure ulcer at least once in their life.

[Medical technology](#) has recognized the problem. There are many approaches to increasing the comfort of those at risk of developing pressure ulcers. But some of these methods are not sufficiently effective, while others – such as mattresses with changing areas of pressure – are still very expensive.



A scanning electron microscope (SEM) image of the new bed linen showing the dot-matrix like structure. The structured textile surface reduces the contact area with the skin and, thanks to the microscopic spaces between the matrix points, enables the material to absorb moisture.

Bed linen is the solution

Anke Scheel, senior physician at the Swiss Paraplegic Centre (SPC) in Nottwil, Canton Lucerne, did therefore not hesitate when Empa asked the center to become involved in a project to develop a new kind of bed linen. "It seemed such a simple solution," recalls Scheel, "that's what I liked about it."

The project is led by Siegfried Derler, who works at the Department of Protection and Physiology at Empa in St. Gallen. The trained physicist has devoted several years to research into the skin and [friction](#), and he is currently working on the development of skin-friendly materials and

surfaces.

Derler has been researching the medical phenomenon of [pressure ulcers](#) since 2006. Back then he launched an initial CTI project for textile pressure ulcer prevention along with the Schoeller Group, a leading international provider of technical textiles. The results were very encouraging, and three years later the partners decided to raise the stakes, inviting the SPC to get involved.

Fewer points of contact thanks to special textile structure

"We evaluated marketable synthetic fibers," explains Derler, "and developed a material with a kind of dot matrix surface." This special textile structure has two advantages: firstly, it produces fewer points of contact and less surface contact with the skin, and secondly, the microscopic spaces between the dots can absorb moisture. What followed was a highly exciting Ping-Pong process between the Empa test labs and the R & D department of Schoeller in Sevelen, Canton St. Gallen. The industrial partner optimized its weaving techniques, and Siegfried Derler's team tested the new samples on its sophisticated skin models.

By the end of 2009 they were ready: The laboratory results were good enough for the fabric to be tested in hospital beds at the SPC in Nottwil. Twenty paraplegics at the end of their first rehabilitation period offered to act as a test group. Although their skin had already changed as a result of their disability, it had not yet suffered the effects of years of inactivity.

Better circulation and greater comfort

Over a period of eighteen months, experts at Empa and the medical staff in Nottwil regularly checked the patients' blood circulation as well as the redness, elasticity and moisture levels of the affected parts of the skin. The subjective wellbeing of the subjects was recorded in a questionnaire.

And the results were more than satisfactory: The patients sweated less, their blood circulation improved, and they felt significantly more comfortable than in conventional sheets. "We have shown that our method of bedsores prevention using textiles is effective," says Hans-Jürgen Hübner, CEO of Schoeller Medical. He is currently subjecting the new sheet to tough tests at Schoeller in Sevelen in order to show how it behaves after repeated use and cleaning.

Next spring Schoeller Medical hopes to launch its innovation on a commercial basis. "We are currently building up an international distribution system," says Hans-Jürgen Hübner. He already has one potential customer in the Swiss Paraplegic Centre, which, thanks to the initial positive results, is interested in using the new sheets on a wider basis. "What's more," says Anke Scheel, "some of our patients would be interested in using the sheets at home."

Provided by Swiss Federal Laboratories for Materials Science and Technology

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