

Press release

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Nordic Combined athletes as guinea pigs at Empa

Sweating for science!

Six Nordic Combined athletes from the Swiss national squad have spent the past few days as guinea pigs in a climate chamber at the Empa in St. Gall, sweating in the name of science. Their efforts will assist researchers to learn more about thermophysiology, the aim being to develop better functional textiles. These new materials will help athletes, both at hobby and top level, to achieve their best performances as they “sweat blood”.

Michael Hollenstein has been jogging for about 20 minutes at a speed that has brought him to the limits of his physical capabilities. Then the top athlete takes a quick break, during which sports physician Dr. Hansueli Backes takes a sample of his blood, just a few drops drawn from an earlobe. And then it's back to the treadmill for Hollenstein, at the same murderous pace. Quite literally, in fact, for the athlete is running on a runner's treadmill in the cramped climate chamber at the Empa St. Gall, so despite his sweat-inducing efforts he remains in the same place. Instead of running in the open air, as he usually does, Hollenstein, one of the Swiss Nordic Combined national team, is running indoors in a small room under carefully controlled environmental conditions – the air temperature is maintained at a constant 28°C and the relative humidity held at 50%. It is not surprising that the perspiration is streaming down the sportsman's body, given that he is running under conditions simulating a warm summer's day, but this is in fact the intention, for Michael Hollenstein is sweating for science! He is a guinea pig in an experiment in which Empa scientists are investigating the process of human thermoregulation. The aim of the trial is to gather data to help develop optimally functional textiles for sports usage.

Sweating in comfort

As anyone who has ever done physical work on a hot day knows, these conditions make the sweat pour from every pore. This of course is the body's way of preventing itself from overheating. Damp, sweaty clothes are uncomfortable, however, especially when the wet material clings to the skin. “Functional” clothing can provide help in this situation by supporting the body's evaporative cooling process. Such garments are therefore particularly attractive for sportsmen and sportswomen, at both professional and hobby level. In its “Sweat Management” project, Empa researchers are investigating

the effects of clothing on human body temperature control, a process known scientifically as thermoregulation. "For the human body every kind of clothing acts like an insulator and has an influence on the thermoregulation process," says project leader Andreas Jack, of the Empa's Protection and Physiology Laboratory. "We are looking for ways to minimize this insulating effect in textile materials." This topic has been the subject of research at the Empa for some time now. In fact in order to simulate human perspiration the institute has developed its own sweating robot call Sam ("sweating agile mannequin"), an articulated dummy that perspires through innumerable minute openings just like a human being. But Sam is no substitute for live experimental subjects who voluntarily work themselves into a sweat in the service of science. Such human guinea pigs are necessary to analyze individual differences in thermoregulation, and to record the subjective comments of individual participants in the trials.

Nordic Combined athletes on the treadmill

For Nordic Combined athletes such as Seppi Hurschler and Michael Hollenstein this means three 40 minute sessions on a runners treadmill – once clad only in shorts, once wearing a conventional runner's suit, and finally a session in a suit newly developed by Empa. In contrast to conventional sports suits, different parts of the new garment are made of different materials to suit the various parts of the body. By using this "body mapping" technique, as it is called, Andreas Jack and his colleagues intend to offer optimal support to the body's own thermoregulation activities, in end effect using appropriate combinations of materials to create a kind of second skin.

But why do these top athletes bother making such strenuous efforts? "It is by all means a win-win situation for us," says Hippolyt Kempf, Nordic Combined Olympic gold medal winner in 1988 and currently head of Nordic Sports at the Swiss National Ski Association. Apart from the financial aspects, Kempf and his athletes receive medically accurate reports on their state of fitness, and how this changes in response to repeated bout of strenuous physical activity.

For their part, Empa and its project partners – the Swiss Army Procurement Center „armaswiss“ and the Swiss textile manufacturer Christian Eschler AG – are able to collect measurement data from top-level athletes to compare with data from hobby sportsmen and women who also take part voluntarily in the trials. After all, optimized sports clothing should not just be available to the elite few but also to the wider basis at fun level.

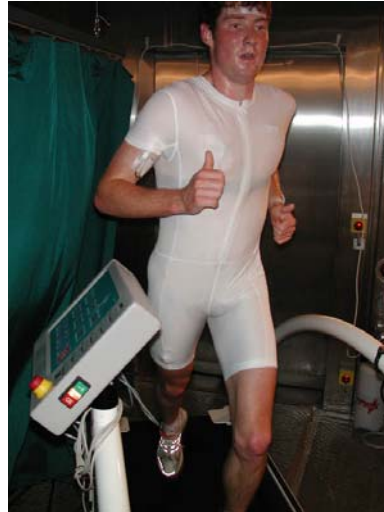
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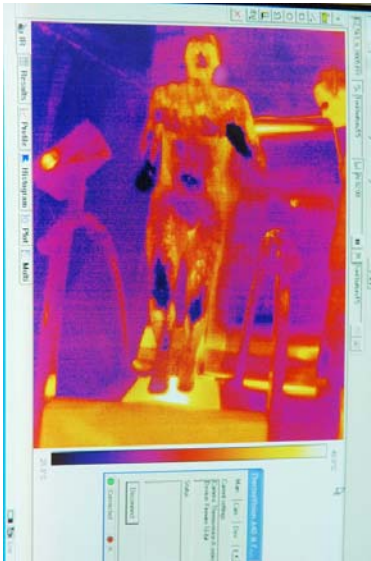
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Michael Hollenstein on the treadmill in the environmental testing chamber at the Empa St.Gall. The sensors which transmit data to the computer are clearly visible in the left image.



An infrared image showing the heat distribution on the athlete's body.