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Microneedle platform for continuous monitoring of biomarkers in interstitial fluid

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The presence of many relevant biomarkers in interstitial fluid puts forward this bodily fluid as an analyte of interest for continuous monitoring of health indicators. Although research and industry have aimed many efforts in the direction of a continuous monitoring, to date there is not yet a system capable of that.
One of the reasons that hampers the development towards continuity of the system is that most of the concepts are based in the analysis of blood, which sampling needs to be sparse and controlled in time.

In recent reports, it has been shown that it is possible to extract interstitial fluid from the skin[1, 2]. Most interestingly, the fluid can be collected by minimally invasive methods, which is a preferred feature in a continuous analysis scenario, as it can help to avoid the risk of infection and discomfort in the patient.

In this report we present the concept that we envisage for a continuous monitoring system in which interstitial fluid is sampled and analyzed on chip. By means of extracting the fluid from the skin with a painless insertion[3] of hollow microneedles (shown in fig.1), it is possible to obtain a continuous sampling for *in* situ analysis of the concentration of present biomarkers. We are currently developing the integration of a microneedle array with an electrochemical/optical sensor to take care of the analysis of the collected biomarkers.

Our final goal is to offer a system for continuous monitoring of the active metabolism of the individual. This would be helpful in the scenario of efficient treatment of various medical conditions, but also in the sport arena. The system could enable training programmes of elite athletes to be tailored to the subject during and after training.
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Fig.1 Hollow silicon microneedle array, with heights of 300 µm and a bore hole of around 50 µm of diameter.

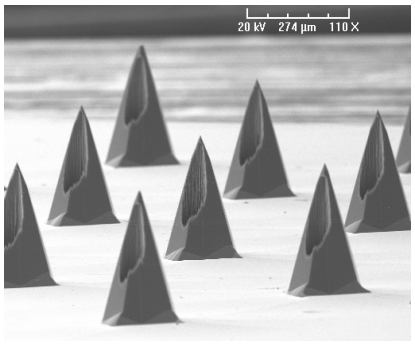
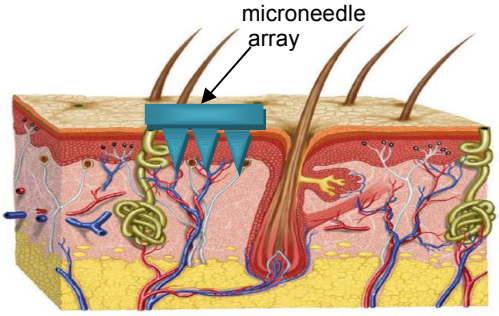


Fig.2 Extraction of interstitial fluid from skin. The needles don't reach the dermis, where nerve connections appear and would send pain signals to the brain



References

1. Mukerjee, E. V.; Collins, S. D.; Isseroff, R. R.; Smith, R. L., Microneedle array for transdermal biological fluid extraction and in situ analysis. *Sensors and Actuators A: Physical* **2004,** 114, (2–3), 267-275.
2. Mitragotri, S.; Coleman, M.; Kost, J.; Langer, R., Analysis of ultrasonically extracted interstitial fluid as a predictor of blood glucose levels. *Journal of Applied Physiology* **2000,** 89, (3), 961-966.
3. Kaushik, S.; Hord, A. H.; Denson, D. D.; McAllister, D. V.; Smitra, S.; Allen, M. G.; Prausnitz, M. R., Lack of pain associated with microfabricated microneedles. *Anesthesia and Analgesia* **2001,** 92, (2), 502-504.