

Mass Spectrometry of Living Subjects

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In science fiction movies, it happens all the time: A small device is briefly held against the skin of a sick crewmember and seconds later the monitor displays what ails him. This futuristic image could someday be real.

Researchers from the ETH in Zurich, Switzerland, describe a first step in this direction in the journal *Angewandte Chemie*: a new method of sampling living biological organisms for direct mass-spectrometric examination. By using a beam of nitrogen, substances from the skin of a test subject can be directed into a mass spectrometer for rapid and precise analysis. Aside from rapid clinical diagnosis without blood samples, this new technique could be enlisted for research into metabolic processes, doping tests, defense against terrorism, and the inspection of foods.

In recent years, mass spectrometry has developed into an important analytical technique for biological samples. For the actual analysis, the matrix of the sample must be removed so that the desired analytes can be accurately detected. This complicated sample preparation makes routine examinations with high sample throughput difficult.

The new process developed by Renato Zenobi and his group works without needing such efforts. Instead of introducing samples into an electrospray mass spectrometer (ESI-MS) in solution, as in the usual procedure, and atomizing them with a gas, the analytes in the new process are “sucked” right off the surface.

Nitrogen is blown through a small nozzle onto the sample surface, such as the skin of a test subject. When the gas strikes the surface, it takes up semivolatile substances. The gas stream is then directed right into the electrospray source of the mass spectrometer. Here it crosses a stream of charged water droplets that take up the molecules of interest and charge them. Analysis takes only seconds.

This method allows chemical “fingerprints” to be taken from human skin. For example, it is possible to detect if someone is a smoker, or if a test subject has had a cup of coffee. The researchers were able to detect traces of explosives and model substances for chemical weapons. “This new method is not technically complicated,” explains Zenobi, “ordinary electrospray mass spectrometers can quickly and easily be adapted.”

Mass screening of food could also be carried out rapidly, inexpensively, and reliably with this new technique. Frozen samples like meat or fish do not even need to be thawed. Spoiled food can be detected by a characteristic change in its molecular fingerprint.

Citation: Renato Zenobi, Neutral Desorption Sampling of Living Objects for Rapid Analysis by Extractive Electrospray Ionization Mass Spectrometry, *Angewandte Chemie International Edition* 2007, 46, No. 40, 7591–7594, doi: 10.1002/anie.200702200

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