Nanowire network measures cells' electrical signals

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ELECTRICAL signals from different parts of the same cell have been simultaneously recorded for the first time, thanks to a new technique for attaching nanowire probes. This could aid the study of how heart, muscle and brain cells function and communicate.

The method uses a device called a nanowire field effect transistor (NWFET). This consists of a silicon wire just 20 nanometres in diameter attached to metal electrodes on a substrate of silicon dioxide. The nanowire, which sticks out by 30 to 40 nanometres, can be used as a probe to amplify the electrical signals produced by anything it touches.

Many NWFETs can be fabricated on the same substrate, allowing several signals to be measured at the same time. The difficulty had been in growing the cells directly over the nanowire arrays. It was a matter of chance whether cells grew in the right place for the signals to be measured.

Now Charles Lieber at Harvard University and colleagues have created a technique that overcomes this problem. They grow heart cells taken from chicken embryos on transparent polymer substrates and then transfer the cells to the nanowire array. Each cell is then positioned over up to 10 nanowires with the aid of a microscope. "We can do measurements that weren't possible before," says Lieber.

Besides making simultaneous measurements from different parts of the same cell, the wires can record the signals produced by several cells in the same tissue culture at the same time. For example, the team was able to measure the "contractile wave" produced by heart cells to coordinate beating as it passed through the culture (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0902752106).

Cell biologists will be able to use the technique to study electroactive cells such as neurons, cardiac cells and muscle cells, as well as the effects of drugs on these cells. As the wires can penetrate the cells, the signals can be studied from the inside. The technique could even be used to improve the interface between the body and medical implants, such as drug delivery devices and artificial limbs, Lieber says.

This technique could improve the interface between the body and artificial limbs

Zhong Lin Wang at the Georgia Institute of Technology in Atlanta says the technique will eventually give new insights into cell function, such as how neurons communicate with one another. "It is very advanced research," he says.

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