Drug Discovery & Development

Dramatically More Sensitive Ion Channel Antenna

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WARF: P130074US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing methods for enabling rapid analysis of ion channel activity using a radio-frequency antenna.

Overview

Nearly half of all diseases involve ion channels – channels in cell membranes that control the flow of ions into and out of cells. Certain channels open in response to natural signal molecules as well as drug molecules. A crucial step in the development of new drugs is determining how they affect ion channels, either adversely or therapeutically.

Such analysis can be performed using a patch-clamp system, in which a micropipette measures small electrical changes across a cell membrane caused by an electrode inserted into the cell wall. This deduces the flow of ions through the cell's channels.

Yet the sensitivity needed to measure such small current flows is limited by electrical components. Improved patch-clamp designs have used tank circuitry to provide higher sensitivity. Still, such systems have been hampered by data acquisition speed and resolution.

The Invention

UW–Madison researchers have developed a new antenna for analyzing ion channel activity. The antenna and circuitry can be used to amplify a signal produced from a capacitance change at a single nanopore.

Specifically, the antenna provides radio frequency measurements of electrical changes (impedance) in cell walls. It has two lobes spaced apart, and is shaped like a variant of the 'bow-tie' design to support high gain and broad bandwidth. It is placed around a nanopore made of glass, quartz or other material. A radio frequency signal applied across the antenna lobes determines changes of electrical flow across the cellular membrane when positioned appropriately.

Applications

- High throughput drug screening for ion channel activity

Key Benefits

- Sensitivity is improved by an order of magnitude.
- May better resolve the fine interactions between drugs and ion channel activity
- Employs standard hardware
- Higher frequency signals help measure extremely small impedance changes

Additional Information

Related Technologies

- For more information about patch-clamping techniques using a tank circuit for high throughput drug screening, see WARF reference number P08037US.

Tech Fields

- Drug Discovery & Development : Preclinical testing

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854