

Neurotransmitter current not flowing through ion channels

August 29 2007

In studying how neurotransmitters travel between cells -- by analysis of events in the dimensions of nanometers -- Cornell researchers have discovered that an electrical current thought to be present during that process does not, in fact, exist.

These results were reported July 22 in the online edition of the journal *Nature Cell Biology* by Cornell researchers Liang-Wei Gong and Manfred Lindau, applied and engineering physics, as well as their colleague Guillermo Alvarez de Toledo at the University of Seville, Spain.

Lindau explained that neurotransmitters and hormones are stored in neurons -- nerve cells -- in small packets, membrane-bound vesicles, typically 30 to 300 nanometers in diameter (a nanometer is one-billionth of a meter). When a cell is stimulated by electrical activity, calcium ions enter the cell and the vesicles release their contents by fusion with the plasma membrane surrounding the cell.

Prior experiments had suggested that the vesicles contain ion channels that carry charged neurotransmitters from the cell vesicle out of the cell, generating an electrical current flowing out of the cell.

Lindau and colleagues report in their paper that there is no such current present. Their experiments further showed that, instead, the charge compensation is generated by the influx of positive sodium ions from the outside into the vesicles, a process known as electrodiffusion.

"Therefore, the ion channels in these vesicles must play a different role that is yet to be discovered," Lindau explained.

Source: Cornell University

Citation: Neurotransmitter current not flowing through ion channels (2007, August 29) retrieved 24 April 2024 from <https://phys.org/news/2007-08-neurotransmitter-current-ion-channels.html>

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