DUAL PATCH PIPETTE RECORDINGS IN HIPPOCAMPAL NEURONS: EVIDENCE THAT LONG Ca2+ TAIL CURRENTS REFLECT Ca2+ CHANNEL ACTIVITY AT RESTING POTENTIAL.

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We have previously reported the presence of a long-lasting Ca2+ or Ba2+ tail current which outlasts a depolarization pulse by several hundred to thousand milliseconds in cultured and adult hippocampal neurons. This tail current could arise from Ca2+ channel activity at resting potential or, alternatively, from inadequatie space clamp of the large apical dendrite or from non-Ca2+ currents.

To resolve this issue, we conducted experiments in cultured neurons using dual patch pipette recordings. Simultaneous recordings from the soma and from mid-way along the dendrite were performed on the same cells. Current clamp recordings at the dendritic pipette showed that the dendritic voltage response mirrored the depolarization command step given at the somal pipette, including a rapid return to -70 mV. Further, simultaneous voltage clamp of the dentrite and soma did not selectively reduce the somal tail current, indicating that the Ca2+ tail is not of dendritic origin. In addition, servering or applying Cd2+ to the dendrite did not selectively reduce the tail at the soma. A series of pharmacologic/ionic manipulations ruled out non-Ca2+ currents as the basis for the tail.

Thus, the long Ca2+ tail currents reflect true Ca2+ channel activity at resting potential levels, apparently due to a reversible voltage-shifted mode of the channel, and may mediate a major unrecognized pathway of Ca2+ entry.
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