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Neuronal activity backpropagating in dentate circuit

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Hippocampal sharp waves / ripples (SPW-Rs) are high-frequency oscillations emitted mainly during slow-wave sleep or quiet rest states and play a key role in memory consolidation. While SPW-Rs are initiated in the CA3 subregion and propagate to the downstream CA1 subregion, we observed that they also propagate back to the dentate gyrus. However, neither the role of CA3-to-DG SPW-Rs backpropagation nor its propagation mechanism has been fully understood. We previously demonstrated that the subthreshold membrane potentials of hilar mossy cells reflect the activity of SPW-Rs initiated in acute brain slice preparations. We thus hypothesize that mossy cells relay CA3 SPW-Rs backward to the dentate gyrus. Using *in vitro* whole-cell current-clamp technique, we simultaneously recorded the membrane potentials of up to five mossy cells in combination with recordings of local field potentials from the CA3 *stratum pyramidale*. Information theoretical analysis revealed that the activity patterns of SPW-Rs predict the combinatorial dynamics of the membrane potentials of multiple hilar mossy cells. For further confirmation, we conducted *in vivo* whole-cell recordings from mossy cells together with recordings of local field potential of the CA1 subregion in urethane anesthetized mice. We thus concluded that mossy cells are responsive to specific patterns of ripple information at the subthreshold level. Our research approaches further elucidation of brain information dynamics and will provide a new perspective to an information processing mechanism.