

Proteins synthesized in dendrites can sustain local long-lasting long-term potentiation (L-LTP) but cannot be captured by other synapses

Agnès VILLERS, Emile GODAUX and Laurence RIS - Department of Neurosciences, University of Mons, Belgium

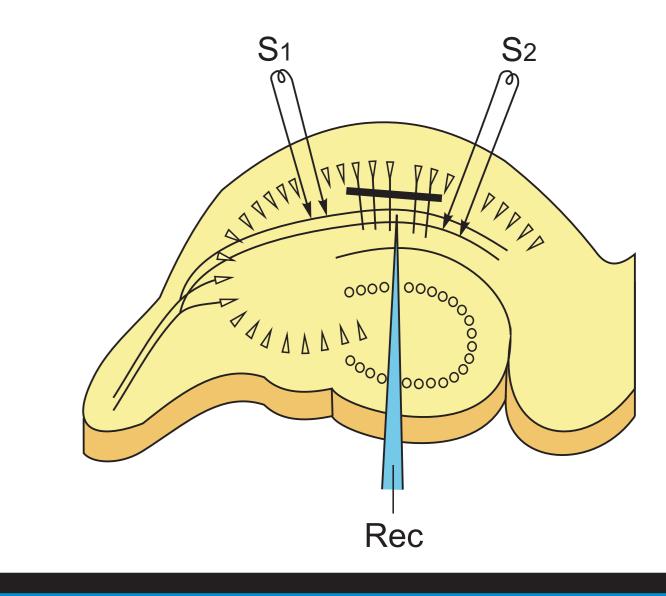
INTRODUCTION

Long-term potentiation (LTP) is a lasting increase in synaptic strength induced by high frequency stimulation of the presynaptic fibers. For its late phase, beyond 2-3 hrs after its induction, LTP necessitates synthesis of new proteins in the postsynaptic neurons. At first, it was believed that these proteins were synthesized in the soma. However, more recently, it has been proved that translation of mRNAs could also take place in dendrites.

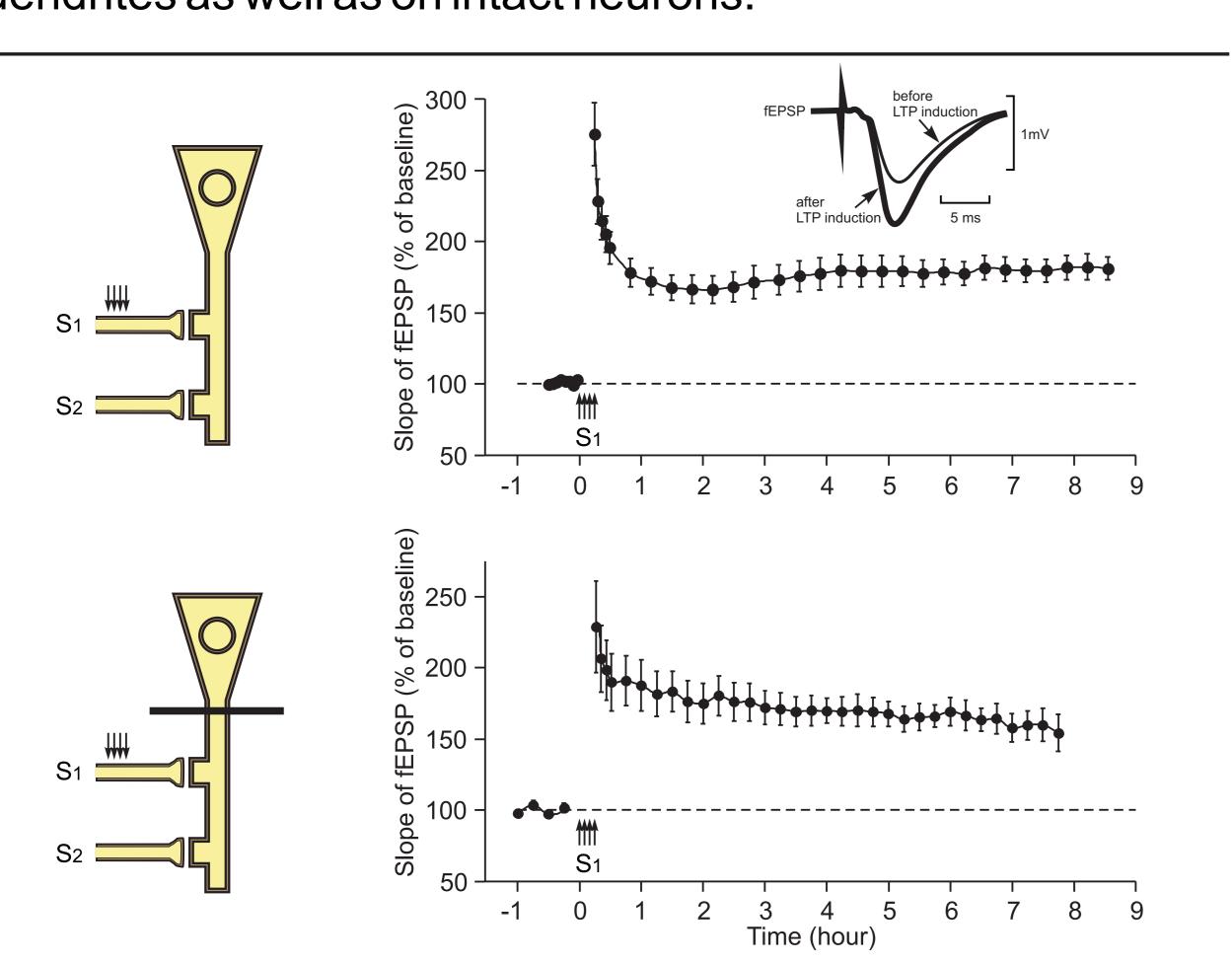
Hence the question asked here: is a dendritic protein synthesis able to sustain an LTP lasting more than 2-3 hours?

METHODS

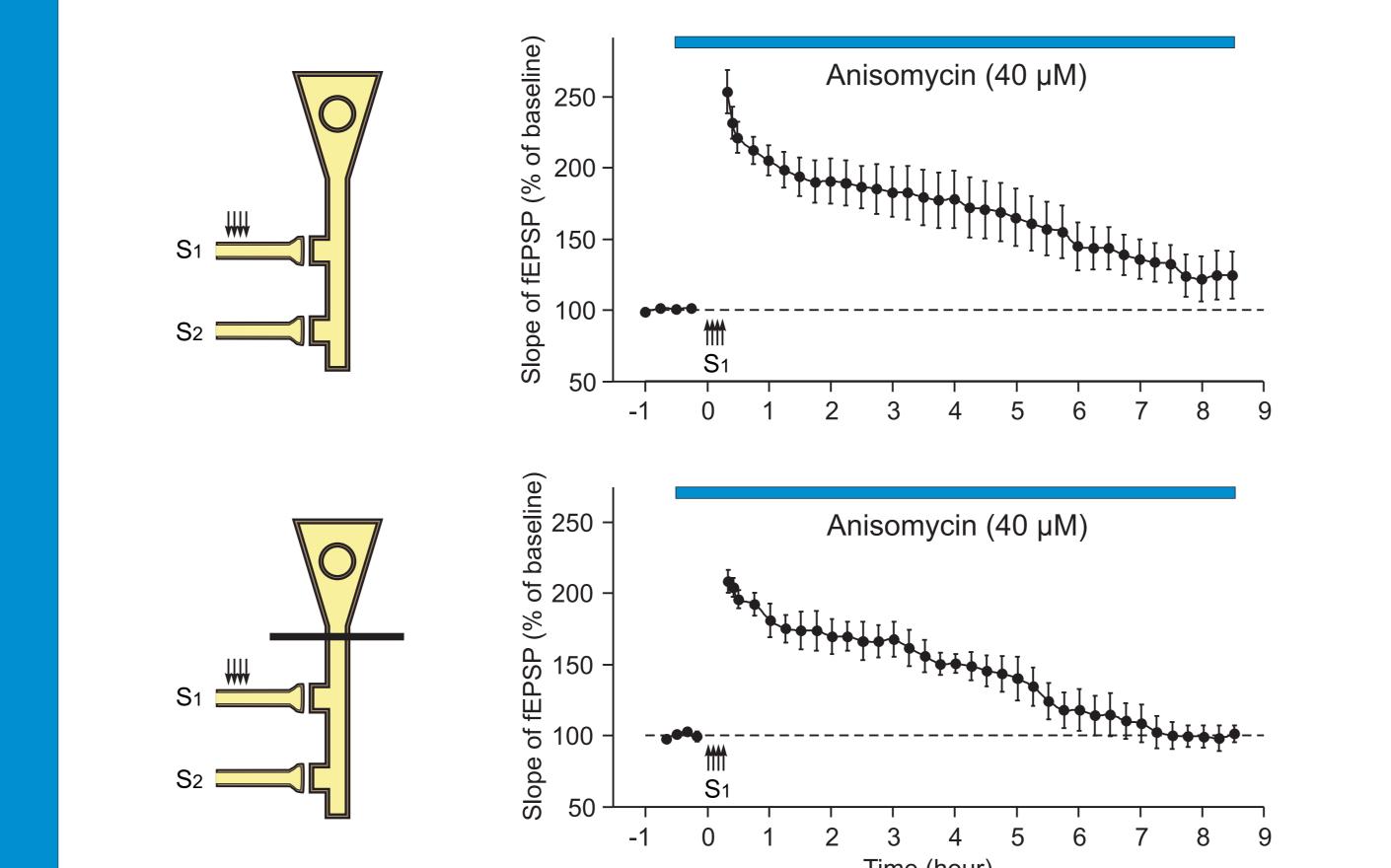
- Synaptic strength was tested on hippocampal slices by stimulating the Schaffer's collaterals and recording the evoked field EPSP in the CA1 region for 8 hours.
- LTP was induced either by a STRONG (4 trains) or a WEAK (1 train) stimulation.
- In the CA1 region, dendrites can be severed from their somas using a razor cut.



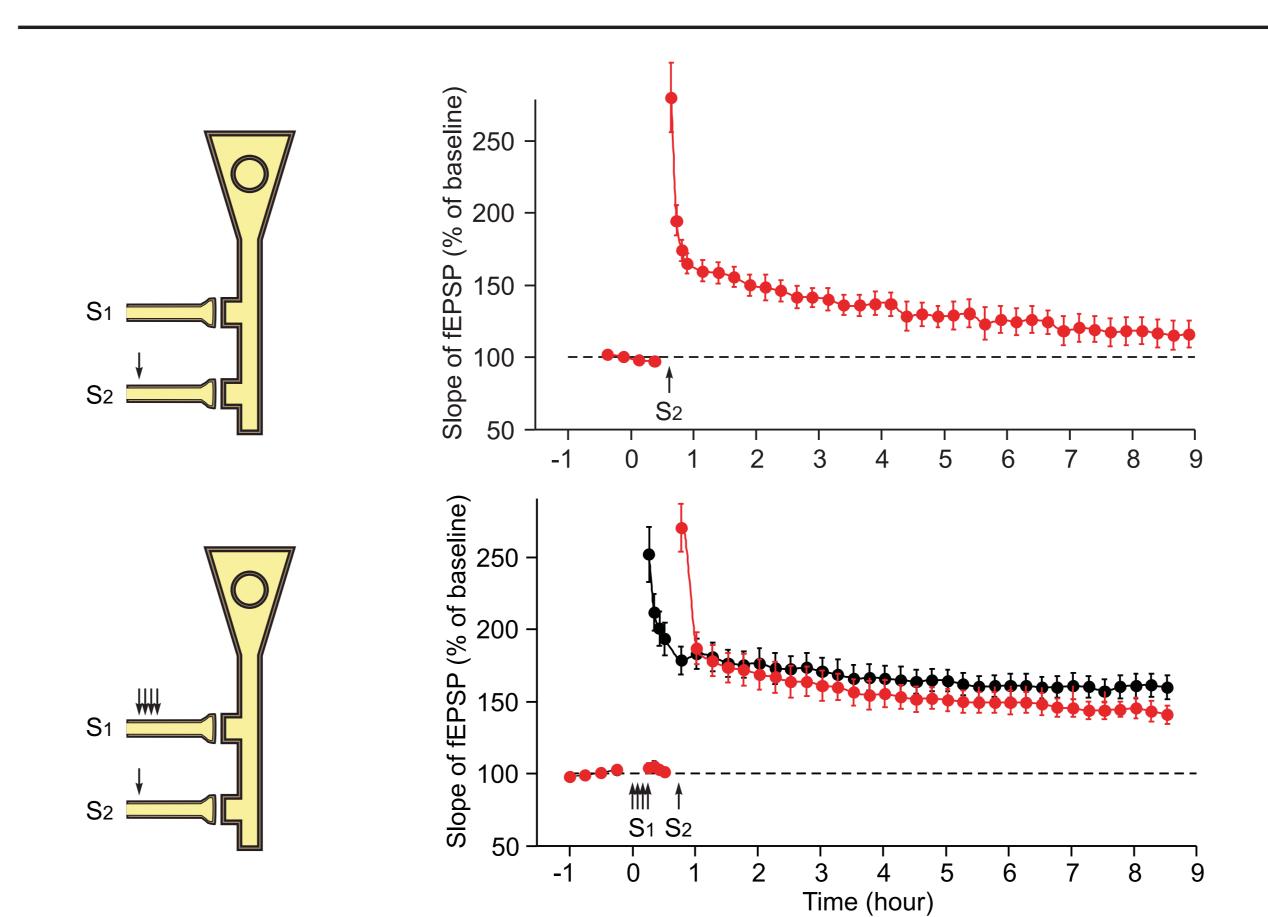
A long-lasting LTP (8 hours) was observed on isolated dendrites as well as on intact neurons.



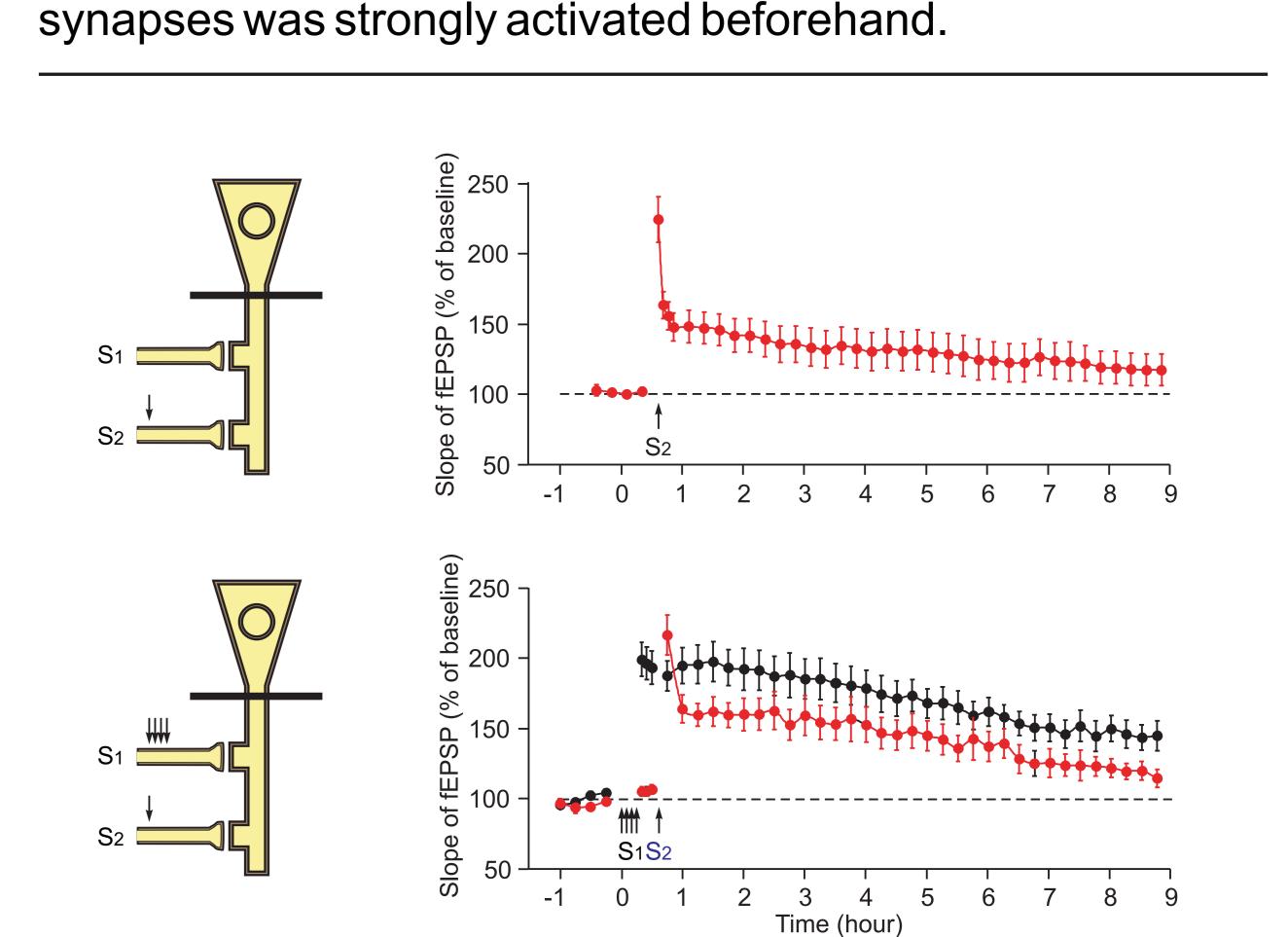
In both preparations, the late phase of LTP was blocked by anisomycin, a protein-synthesis inhibitor.



In intact neurons, a weak activation of a group of synapses triggered a long-lasting LTP if another group of synapses was strongly activated beforehand.



In isolated dendrites, a weak activation of a group of synapses DID NOT lead to a long-lasting LTP even if another group of synapses was strongly activated beforehand.



CONCLUSIONS

- . Local synthesis of proteins in dendritic spines is an important mechanism contributing to the late phase of long-lasting LTP.
- 2. After their synthesis in dendritic spines, the resulting proteins do not spread to neighboring synapses.