Oral Presentation

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HCS 6346
Integrative Neuroscience
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Paper

- Bidirectional Modification of Presynaptic Neuronal Excitability Accompanying Spike Timing-Dependent Synaptic Plasticity
- Chen-yu Li, Jiang-teng Lu, Chien-ping Wu, Shu-min Duan, and Mu-ming Poo
- Shanghai Institute of Biological Sciences and UC Berkeley
- Neuron, Vol. 41, 257-268, January 22, 2004

Background

- STDP LTP increases synaptic efficacy
- STDP LTD decreases synaptic efficacy
- STDP LTP increases presynaptic excitability

Research Questions

- STDP LTD decreases presynaptic excitability?
- How?

Research Methods

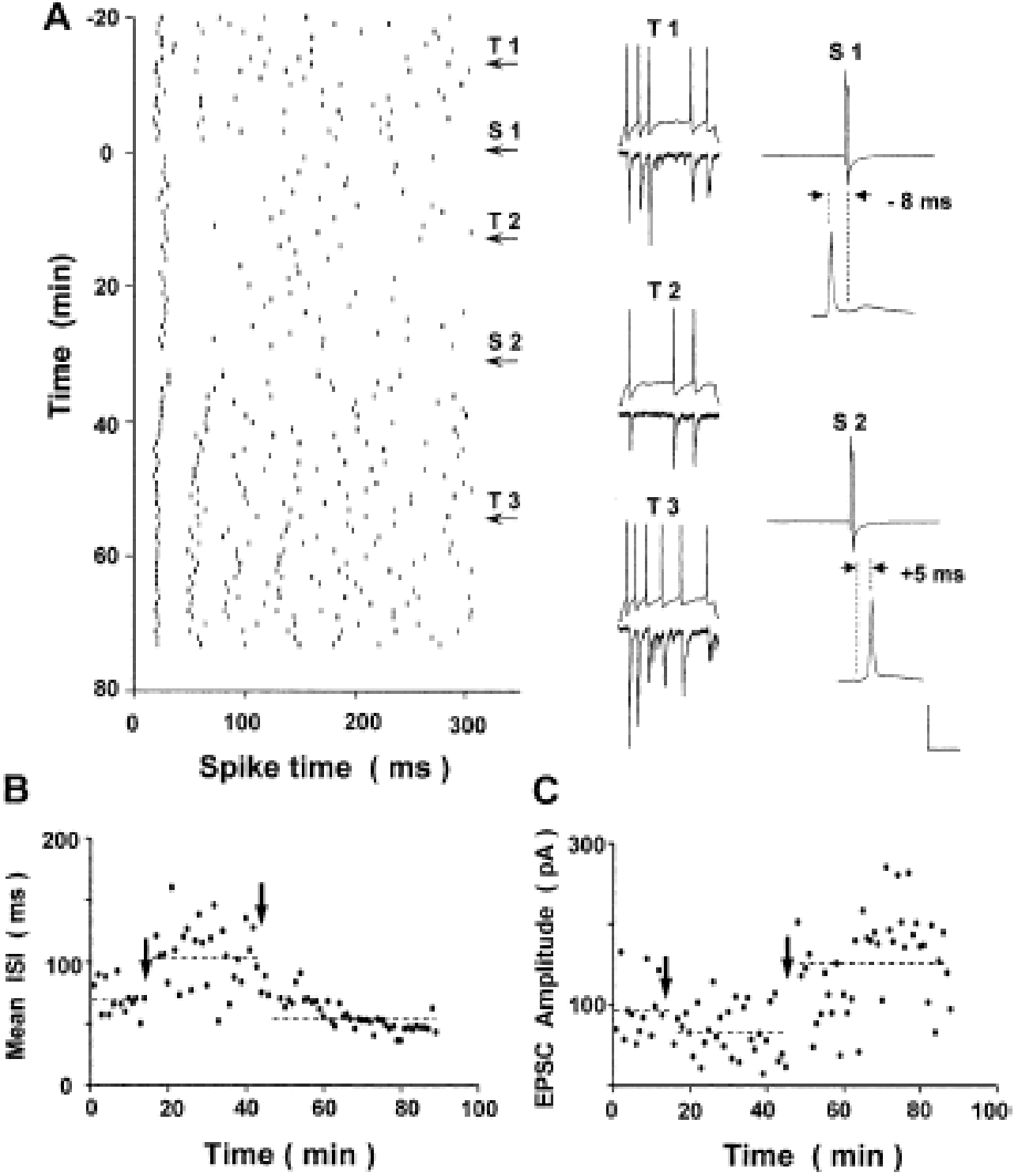
- Cultured rat neurons and cortical slices

- Repetitive coactivation to induce STDP
- Measured pre- ISIs and post- EPSCs

- Ca^{2+} channel blockers and Ca^{2+} buffers
- PKA and PKC inhibitors
- Blocked K^{+} and non-K^{+} channels

Research Findings

- STDP LTD decreases presynaptic excitability
- Requires postsynaptic Ca^{2+} elevation
- Requires presynaptic PKA and PKC
- Presynaptic slow-inactivating K^{+} channels
- Different from excitability increase mechanism


A
-20
0
20
40
60
80
Time (min)
T 1
S 1
T 2
S 2
T 3
0
100
200
300
Spike time (ms)
T 1
S 1
- 8 ms
T 2
S 2
T 3
+5 ms
B
200
100
0
Mean ISI (ms)
0
20
40
60
80
100
Time (min)
C
300
100
EPSC Amplitude (pA)
0
20
40
60
80
100
Time (min)

Take-home Message

- STDP LTP increases synaptic efficacy
- STDP LTP increases presynaptic excitability
- The quick get stronger and quicker

- STDP LTD decreases synaptic efficacy
- STDP LTD decreases presynaptic excitability
- The slow get weaker and slower

Questions/Discussion

- General and specific?
- Backpropagation?