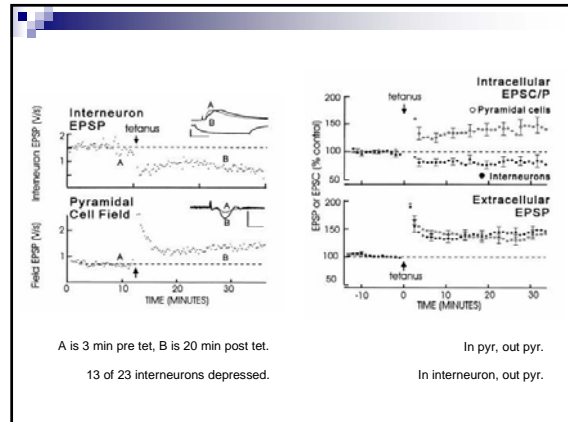
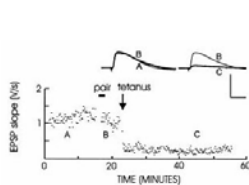


## Interneuron LTD, pyramidal LTP.

- 100 Hz tetanus to CA3 afferents in rats.
- Whole-cell recording from interneuron and CA1 pyramidal cell simultaneously.
- Intracellular voltage and current clamp in interneuron.
- Intracellular and extracellular voltage clamp in CA1 pyramidal cell.
- Field EPSP slope, EPSC amplitude.



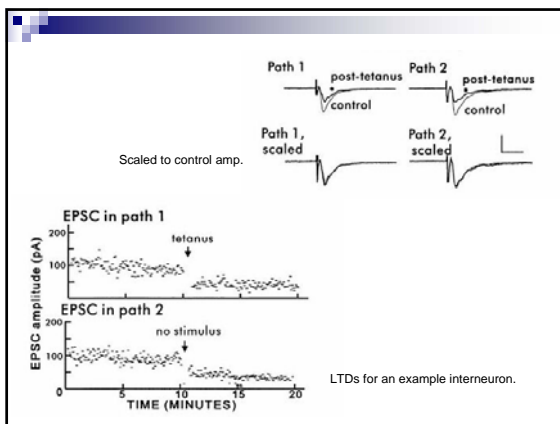
## Pairing paradigm on interneurons.



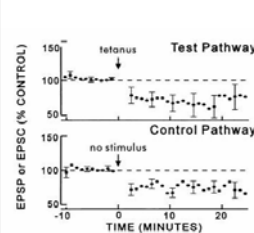
- 60 one Hz pulses with depolarization to -10 mV.
- 5 min post pair EPSP at B is 103% of A.
- 5 min post tetanus EPSP at C 85% of A.
- LTD even without depolarization.

## Interneuron synaptic specificity.

- Pyramidal cells homosynaptic, can show LTD after low frequency stimulation.
- Stimulate one pathway to interneuron, see what happens to another afferent.
- Measure EPSCs for both paths, apply tetanus to only one.
- Polysynaptic event due to CA1 feedback?

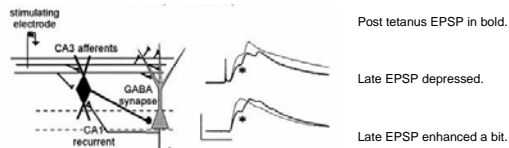


## Stimulated vs. unstimulated paths.



- 4 voltage clamps, 4 current clamps.
- Control path means electrode on opposite side of 1<sup>st</sup> stimulating electrode, 850  $\mu$ m apart.
- Paired facilitation?

- Initial EPSP from CA3 Schaffer afferents.
- Late EPSP possibly from CA1 pyramidal recurrent collaterals in feedback.
- Initial EPSP always depressed.
- Late EPSP depressed in 13 of 23 cells.



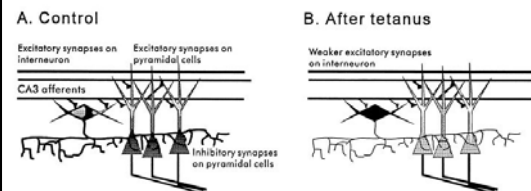
## Why do we see a LTD?

- Heterosynaptic glu afferent in neostriatum.
- LTD not presynaptically driven.
- NMDA calcium influx not triggering LTD.
- LTD at negative potential.
- Extracellularly released protein?
- Activity in other cells?

## How do epileptic seizures arise?

- Single interneuron inhibiting many pyramidal cells.
- Dormant basket cells releasing GABA – disinhibit to see hippocampal sclerosis.
- Feedforward inhibition is reduced.

## Proposed mechanism of epilepsy.



## Concluding remarks.

- LTD in hippocampal interneurons.
- Simultaneous LTP in interneurons and LTD in pyramidal cells.
- LTD not synapse specific.
- LTD interneurons form two anatomical classes.
- Applications to epileptic research.

## Extra notes.

- LTD by selective decrease in AMPA receptors.
- Norepinephrine from locus coeruleus induces LTD but not at GABA receptors.
- Laezza 2004: blocking NMDA tetanus induces LTD, hyperpolarization depolarization can prevent LTP.