Introduction

- Gamma-aminobutyric acid: GABA
  - Main inhibitory neurotransmitter
  - Inhibits the release of glutamate, monoamines, and acetylcholine
  - Sedative, anticonvulsant, relieves anxiety, and relaxes muscles
- MATLAB network model
  - Sourced from model studying grid cell firing in rat brains
- This experiment focused on firing rates of grid cells with varying GABA concentrations

Methods

- Changed GABA conductance
- Baseline GABA conductance: 1.40E-5 mS
- Conductances decreased and increased at 4% increments
- Min: 3.92E-06 mS and max: 1.68E-05 mS reached when neuron firing ceased

Results

- Figure 1: baseline GABA control conductance at 1.40E-5 mS
- Figure 2: the number of spikes in an eleven second interval of varying maximum GABA conductances. The presence of more decreased GABA conductances is due to the greater number of intervals of decrease needed to achieve flatlined neuronal activity.
- Figure 3: 64% GABA decrease with conductance at 5.04E-6 mS
- Figure 4: 16% GABA increase with conductance at 1.62E-5 mS

Discussion/Conclusions

- Initial decrease in GABA conductance from -4% to -40% generally increases the spike rate of grid cells
- -44% to -56% decrease: decreased firing
- -60 to -68% decrease: significantly increased firing
- Increase in GABA conductance from 4% to 12%: minor increased firing
- 16% increase: decreased firing
- generally, data shows GABA’s inhibitory effect

References


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