

Function of Glia

Debate over Glia function

- for many years neurons thought alone in neurotransmission
- glia consigned to supporting role (environment regulation, scaffolding, ...)

Recent state

- astrocytes has tendrils around synapses (Neural Threesom)
- chemical transmitters released by neurons seem to increase level of Ca^{2+} in astrocytes
- astrocytes release neurotransmitters accordingly and influence strength of synapse
- if glia are involved, brain is order of magnitude more complex

McCarthy's research

- current methods not specific enough, affecting neurons
 - genetically engineered mice in which astrocytes can't signal normally
 - mutation seems to have no effect
 - criticism - "atom bomb approach"
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- varying results among studies on different parts of brain

Haydon's experiment

- dispute over glia transmission - "bell curve"
- adult mice with astrocytes prevented to release Ca^{2+} in hippocampus
- synaptic transmission affected on medium level of stimulation

Astrocytes and memory

- astrocytes involved in establishing memory
- memory is the result of long-lasting changes in synaptic activity usually involving NMDA receptors
- clamping (preventing an increase of) Ca^{2+} in astrocyte produces 25% reduction in NMDAR current in surrounding hippocampal area

Astrocytes and memory

- astrocytes are connected by channels
- domain under influence of a single astrocyte larger than astrocyte reach
- this suggest possibility of neurotransmitter in astrocyte

- the contribution of glia to synaptic functions cannot be overlooked