Amacrine Cells

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Introduction:

Amacrine cells are found in the retina of the eyes. There are about 30 types of amacrine cells; each with its own specific stratification, shape and functions. They are inhibitory interneurons in the retina (GABAergic).

There are three broad classification of amacrine cells; wide -field amacrine cells, medium-field amacrine cells and narrow-field amacrine cells. The most frequent is narrow-field amacrine cells.

Amacrine cells are joined to ganglion cells, or other types of amacrine cells by GAP JUNCTIONS. Gap junction allows cell to cell direct transfer of ions and small molecules

1. **Narrow-field amacrine cells**: -'they allow linking of local synapse complexes to their parent cell types'.(1.) Multistratification of narrow-field amacrine cells allows them to have gap junctions that is excitatory in one part and inhibitory in the other.
2. **Medium-field amacrine cells**: - they are too large to create local synapses with dendrites and too narrow to carry out contextual functions presented by wide-field amacrine cells. "so, they degrade the sharpeness of receptions of ganglion cells".(1.) They also carry out UP and DOWN regulation function in local patches.
3. **Wide-field amacrine cells:** - allows feedback synapses with bipolar rod terminals. They get input from specific bipolar cells terminals and send their output signals to specific RGCs or amacrine cells. Example is a poly axonal amacrine cells which have separate axon and dendrites arbors; (the dendrites is narrow than the axon, so the input comes through the narrow zones and leaves through the wide zone across the retina).

Amacrine cells have three specific features: (3)

1. Their input and output synapses are always located on the dendrites
2. They carry out some of their processing function using cytoplasmic ca^{2+} as a medium.
3. Individual amacrine cells are independent. (they operate in different modes)

Functions of Amecrine cells:

The functions of amacrine cells have been linked to the RGCs. There are about 30RGCs and 15 have been accounted for so far. So, two amacrine cell per RGCs. RGCs are the only cells in the retina that can establish action potential, they receive indirect input from amacrine cells.

"Amacrine cells collect input from a central zone and send a wave of inhibition outward to other cells in the Inner nuclear layer."(1.) "They transmit signals in a two-way direction; directly from bipolar cells to ganglion cells or other amacrine cells."

Amacrine cells also carry out **paracrine functions** (1), they perform a role in the release of DOPAMINE. A dual neurotransmitter release (GABA and dopamine) regulate the light and dark adaptation.

Amacrine cells are "synaptically active" (2) in the IPL of the retina and they regulate the visual message presented to the ganglion cells.

Starburst amacrine cells carry out spatial inhibition. They produce inhibition in the presence of ACH. "eliminating ca^{2+} blocks light evoked by ACH release." (1) The main target of starburst amacrine cells are DSGCs.

GABA neurotransmitter are abundant in the retina and they help regulate the flow pf visual inputs from amacrine cells to ganglion cells.

Conclusion:

Amacrine cells regulate the activity of bipolar and ganglion cells in the retina. They help in release of neuroactive substance which controls sensitivity (light and dark adaptation) of the retina. They are inhibitory neurotransmitters.

Abbreviations: **RGCs**- Retina Ganglion Cells. **ACH-** acetylcholine. **IPL**- inner plexiform layer. **DSGCs-** direction-selective ganglion cells

Key words: Amacrine cells, inhibitory neurotransmitters.

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