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The structural and functional evidence for vesicular release from astrocytes *in situ*

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Highlights

- the recent experimental evidence for vesicular release from astrocyte *in situ* is discussed
- ultrastructural studies reveal the existence of vesicle-like structures in astrocyte
- in principle, astrocytes express the proteins/protein families implicated in vesicular release of transmitters
- different experimental strategies demonstrate a functional role of vesicular release from astrocytes

Abstract

The concept of the tripartite synapse states that bi-directional signalling between perisynaptic astrocyte processes, presynaptic axonal boutons and postsynaptic neuronal structures defines the properties of synaptic information processing. Ca^{2+}-dependent vesicular release from astrocytes, as one of the mechanisms of astrocyte-neuron communication, has attracted particular attention but has also been the subject of intense debate. In neurons, regulated vesicular release is a strongly coordinated process. It requires a complex release machinery comprised of many individual components ranging from vesicular neurotransmitter transporters and soluble NSF attachment protein receptors (SNARE) proteins to Ca^{2+}-sensors and the proteins that spatially and temporally control exocytosis of synaptic vesicles. If astrocytes employ similar mechanisms to release neurotransmitters is less well understood. The aim of this review is therefore to discuss recent experimental evidence that sheds light on the central structural components responsible for vesicular release from astrocytes *in situ*.