

## **Abstract**

Astrocytes, as one of the glial cell types, have many important functions in healthy functioning of the central nervous system (CNS) but also in its pathology. Since they play a key role in maintenance of ionic, neurotransmitter and water homeostasis in CNS, they possess the ability to regulate their volume. Hypo- or hyperosmotic stress can trigger regulatory volume decrease or increase in astrocytes in order to stabilize their volume. During aging, astrocytes undergo many changes together with the rest of the brain. In order to determine whether these alterations involve also regulatory volume mechanisms, we employed three dimensional morphometry, which comprises confocal microscope scanning of fluorescently labelled astrocytes in brain slices of EGFP/GFAP mice and quantification of astrocyte volume during different pathological stimuli. Time-dependent volume changes of hippocampal astrocytes were recorded while applying either hypoosmotic solution or solution with high extracellular potassium concentration. In the four different age groups studied in the experiment, several differences in volume changes were discovered together with some sex-dependent alterations in astrocyte volume. Additionally, in accordance with previous studies, two subpopulation of astrocytes were identified using hypoosmotic solution: low response astrocytes, with steady volume during whole application, and high response astrocytes, presenting marked swelling during application of hypoosmotic solution.

**Key words:** astrocytes, volume changes, aging, EGFP/GFAP mice, 3D morphometry