**THE ROLE OF ASTROCYTES IN STROKE**

**INTRODUCTION: WHAT IS STROKE?**

Stroke is the result of a permanent or transient focal occlusion or rupture of a major brain artery or one of its branches. It is a leading cause of disability and death worldwide, affecting almost 800,000 people every year in the United States alone. Eighty-seven per cent of strokes are ischemic, in which blood flow to the brain is reduced; the remaining 13% are haemorrhagic, in which a vessel ruptures and blood accumulates in the brain. From many years researchers was focusing in neurons as a treatment target, but at the present time most of them are trying to understand how important could be the astrocytes in this kind of pathologies. The objective of this review is to understand which is the role of astrocytes in stroke and which functions play in this pathology and, finally, to discuss whether these functions are beneficial or harmful for brain.

Stroke is caused by an interruption of cerebral blood flow that leads to stress, cell death, and inflammation. In general, stroke cascade is characterized by the following events: bioenergetic failure, acidotoxicity, excitotoxicity, oxidative stress and inflammation.

**STROKES PHYSIOPATHOLOGY**

**OXIDATIVE STRESS**

Low levels of oxygen favours the glycolytic pathway such as anaerobic ATP production. The result is an accumulation of lactic acid ending in acidosis which promotes pro-oxidant and detrimental changes in neurons.

Astrocytes produce a number of antioxidants like Metallothioneins.

- Nrf2 specifically in astrocytes stimulates the transcription of antioxidant genes.
- Astrocyte specific overexpression of heat shock protein 72 or superoxide dismutase 2.

Astrocytes provide neurons antioxidants protecting them against oxidative stress.

**INFLAMMATION**

production and release of pro-inflammatory cytokines, such as tumour necrosis factor-α, chemokine, interleukins... by activated cells including astrocytes, microglia, neurons and endothelial cells, ends in neuronal and glial cell death during cerebral ischemia.

Pro-inflammatory cytokines can also induce the expression of adhesion molecules that are crucial for the infiltration of immune cells.

- Immune cells provide a defence against the invasion of pathogens.
- Inflammation is also involved in clearing damaged tissue, in angiogenesis, tissue remoulding and regeneration.
- High levels of cytokines and chemokine can induce apoptosis of neuronal cells and/or increase toxic nitric oxide levels, inhibit neurogenesis...
- Astrocytes actively surround and secrete inflammatory and fibroblasts cells.

**ASTROCYTES RESPONSE?**

**BENEFICIAL OR HARMFUL RESPONSE?**

- Astrocytes play many beneficial roles in stroke: reduce neurotoxicity oxidative stress, maintain the energy levels in neurons, notify the immune system, stop the inflammation and scar formation avoids the injury and inflammation progression.
- In delayed phase astroglial scar play a harmful role because it does not let synaptogenesis formation.

Astrocyte response is essential in a stroke. Nonetheless, in delayed phase scar formation inhibits axonal growth, which is important for the patients’ recovery. So, in future studies would be important study how stop the scar formation once the injury is controlled.

**REFERENCES:**


