Metabolic and Inflammatory Adaptation of Reactive Astrocytes: Role of PPARs

Iglesias J.

Morales L.

Barreto G.E.

Astrocyte-mediated inflammation is associated with degenerative pathologies such as Alzheimer?s and Parkinson?s diseases and multiple sclerosis. The acute inflammation and morphological and metabolic changes that astrocytes develop after the insult are known as reactive astroglia or astrogliosis that is an important response to protect and repair the lesion. Astrocytes optimize their metabolism to produce lactate, glutamate, and ketone bodies in order to provide energy to the neurons that are deprived of nutrients upon insult. Firstly, we review the basis of inflammation and morphological changes of the different cell population implicated in reactive gliosis. Next, we discuss the more active metabolic pathways in healthy astrocytes and explain the metabolic response of astrocytes to the insult in different pathologies and which metabolic alterations generate complications in these diseases. We emphasize the role of peroxisome proliferator-activated receptors isotypes in the inflammatory and metabolic adaptation of astrogliosis developed in ischemia or neurodegenerative diseases. Based on results reported in astrocytes and other cells, we resume and hypothesize the effect of peroxisome proliferator-activated receptor (PPAR) activation with ligands on different metabolic pathways in order to supply energy to the neurons. The activation of selective PPAR isotype activity may serve as an input to better understand the role played by these receptors on the metabolic and inflammatory compensation of astrogliosis and might represent an opportunity to develop new therapeutic strategies against traumatic brain injuries and neurodegenerative diseases. © 2016, Springer Science+Business Media New York.

Astrogliosis

Fatty acid oxidation

Glutamate

Glycolysis

Ketone bodies

Neuroprotection

PPAR

glucose

glutamic acid

glutamine

lactic acid

peroxisome proliferator activated receptor

peroxisome proliferator activated receptor alpha

peroxisome proliferator activated receptor delta

peroxisome proliferator activated receptor gamma

peroxisome proliferator activated receptor

astrocyte

astrocytosis

cell interaction

cell metabolism

cell structure

degenerative disease

fatty acid metabolism

gliosis

glutamate glutamine cycle

human

ischemia

macroglia

microglia

modulation

nervous system inflammation

nonhuman

protein function

Review

animal

astrocyte

biological model

gliosis

inflammation

metabolism

pathology

Animals

Astrocytes

Gliosis

Humans

Inflammation

Models, Biological

Peroxisome Proliferator-Activated Receptors