Quercetin Exerts Differential Neuroprotective Effects Against H2O2 and A? Aggregates in Hippocampal Neurons: the Role of Mitochondria

Godoy J.A.

Lindsay C.B.

Quintanilla R.A.

Carvajal F.J.

Cerpa W.

Inestrosa N.C.

Amyloid-? peptide (A?) is one of the major players in the pathogenesis of Alzheimer?s disease (AD). Despite numerous studies, the mechanisms by which A? induces neurodegeneration are not completely understood. Oxidative stress is considered a major contributor to the pathogenesis of AD, and accumulating evidence indicates that high levels of reactive oxygen species (ROS) are involved in A?-induced neurodegeneration. Moreover, A? can induce the deregulation of calcium homeostasis, which also affects mitochondrial function and triggers neuronal cell death. In the present study, we analyzed the effects of quercetin, a plant flavonoid with antioxidant properties, on oxidative stress- and A?-induced degeneration. Our results indicate that quercetin efficiently protected against H2O2-induced neuronal toxicity; however, this protection was only partial in rat hippocampal neurons that were treated with A?. Treatment with quercetin decreased ROS levels, recovered the normal morphology of mitochondria, and prevented mitochondrial dysfunction in neurons that were treated with H2O2. By contrast, quercetin treatment partially rescued hippocampal neurons from A?-induced mitochondrial injury. Most importantly, quercetin treatment prevented the toxic effects that are induced by H2O2 in hippocampal neurons and, to a lesser extent, the A?-induced toxicity that is associated with the superoxide anion, which is a precursor of ROS production in mitochondria. Collectively, these results indicate that quercetin exerts differential effects on the prevention of H2O2- and A?-induced neurotoxicity in hippocampal neurons and may be a powerful tool for dissecting the molecular mechanisms underlying A? neurotoxicity. © 2016,

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Alzheimer?s disease

Oxidative stress

Quercetin

Sod?/+ mice

?? aggregates

amyloid beta protein

hydrogen peroxide

quercetin

agents interacting with transmitter, hormone or drug receptors

amyloid beta protein

hydrogen peroxide

neuroprotective agent

protein aggregate

quercetin

reactive oxygen metabolite

superoxide dismutase

animal cell

animal experiment

animal tissue

Article

brain mitochondrion

brain nerve cell

cell viability

controlled study

drug determination

drug effect

embryo

hippocampal neuron

mitochondrial membrane potential

molecular dynamics

neuroprotection

neurotoxicity

nonhuman

oxidative stress

protein aggregation

rat

animal

hippocampus

metabolism

mitochondrion

nerve cell

nerve ending

neuroprotection

pathology

Sprague Dawley rat

transgenic mouse

Amyloid beta-Peptides

Animals

Hippocampus

Hydrogen Peroxide

Membrane Potential, Mitochondrial

Mice, Transgenic

Mitochondria

Neurons

Neuroprotection

Neuroprotective Agents

Neurotransmitter Agents

Oxidative Stress

Presynaptic Terminals

Protein Aggregates

Quercetin

Rats, Sprague-Dawley

Reactive Oxygen Species

Superoxide Dismutase