SUR1 receptor interaction with hesperidin and linarin predicts possible mechanisms of action of Valeriana officinalis in Parkinson

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Parkinson's disease (PD) is one of the most common neurodegenerative disorders. A theoretical approach of our previous experiments reporting the cytoprotective effects of the Valeriana officinalis compounds extract for PD is suggested. In addiction to considering the PD as a result of mitochondrial metabolic imbalance and oxidative stress, such as in our previous in vitro model of rotenone, in the present manuscript we added a genomic approach to evaluate the possible underlying mechanisms of the effect of the plant extract. Microarray of substantia nigra (SN) genome obtained from Allen Brain Institute was analyzed using gene set enrichment analysis to build a network of hub genes implicated in PD. Proteins transcribed from hub genes and their ligands selected by search ensemble approach algorithm were subjected to molecular docking studies, as well as 20 ns Molecular Dynamics (MD) using a Molecular Mechanic Poison/Boltzman Surface Area (MMPBSA) protocol. Our results bring a new approach to Valeriana officinalis extract, and suggest that hesperidin, and probably linarin are able to relieve effects of oxidative stress during ATP depletion due to its ability to binding SUR1. In addition, the key role of valerenic acid and apigenin is possibly related to prevent cortical hyperexcitation by inducing neuronal cells from SN to release GABA on brain stem. Thus, under hyperexcitability, oxidative stress, asphyxia and/or ATP depletion, Valeriana officinalis may trigger different mechanisms to provide neuronal cell protection.

GABAA

Neuroprotection

Parkinson disease

SUR1

Valeriana officinalis

4 aminobutyric acid

apigenin

flavone derivative

hesperidin

linarin

sulfonylurea receptor 1

unclassified drug

valerenic acid

valerian

Article

binding affinity

drug mechanism

drug protein binding

microarray analysis

molecular docking

molecular dynamics

neuroprotection

oxidative stress