Tanshinones and mental diseases: from chemistry to medicine

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Abstract: The prevalence of mental diseases, especially neurodegenerative disorders, is ever-increasing, while treatment options for such disorders are limited and insufficient. In this scarcity of available medication, it is a feasible strategy to search for potential drugs among natural compounds, such as those found in plants. One such plant source is the root of Chinese sage, Salvia miltiorrhiza Bunge (Labiatae), which contains several compounds reported to possess neuroprotective activities. The most important of these compounds are tanshinones, which have been reported to possess ameliorative activity against a myriad of mental diseases such as Alzheimer’s disease, cerebral ischemia/reperfusion injury, and glioma, along with promoting neuronal differentiation and manifesting antinociceptive and anticonvulsant outcomes. This review offers a critical evaluation of the utility of tanshinones to treat mental illnesses, and sheds light on the underlying mechanisms through which these naturally occurring compounds confer neuroprotection.

Keywords: Alzheimer’s disease; antioxidant; Chinese sage; ischemia/reperfusion; neurodegenerative diseases; tanshinones.

Introduction

The world-wide prevalence of neurocognitive disorders, such as dementia and mild cognitive impairment, is ever-increasing (Ahmed et al., 2015; Orhan et al., 2015). While all such disorders exhibit specified characteristics, they also manifest some shared common features, which are a consequence of neurodegeneration. One such shared feature is the progressive loss of neuronal cells, which in turn provokes deterioration of the central nervous system structure and function. One of the best-known and characterized neurocognitive disorders is a neurodegenerative pathological condition, Alzheimer’s disease (AD). It is characterized by a progressive decline in cognitive functions, with a prevalence of 35.6 million individuals, which represents 60%–70% of all neurodegenerative cases, and is expected to be higher in the coming years (Prince et al., 2013). Although it is a well-established fact that genetics, environmental aspects, and age are linked to neurodegenerative disorders (Orhan et al., 2015), more information related to the pathogenesis, mechanisms, and treatments in neurological diseases is still needed.

Natural products have been used in traditional medicine since the ancient times for the treatment of many diseases, and many of such products have become current drugs for the treatment of human diseases (Nabavi et al., 2013b, 2015a; Devi et al., 2015; Di Lorenzo et al., 2015; Russo et al., 2016). A plethora of scientific evidence has shown that natural products possess significant therapeutic roles in the treatment of human diseases with negligible adverse effects (Nabavi et al., 2012c, 2014, 2015b; Curti et al., 2014).