Improvement of Behavioural Scoring and Infarct Volume Sizes in Ischemic Stroke Rats Treated with Baicalein

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Abstract

Stroke is a cerebrovascular disease, contributing to major morbidity and mortality worldwide, with significant clinical and socioeconomic burdens [1]. In Malaysia, stroke is ranked as the third leading cause of death after ischemic heart disease and pneumonia with an alarming rising trend [2]. There are two major types of strokes, namely ischemic stroke (IS) and haemorrhagic stroke. IS caused by thromboembolic occlusion of cerebral artery is the main type of stroke in Malaysia, in which it is comprised up to two-third of total reported stroke cases, as compared to the haemorrhagic stroke [3]. Main pathological events of brain ischemia include a series of biological reactions such as oxidative stress, inflammatory cytokine release, and ischemic-reperfusion injury, leading to cell apoptosis and irreversible neurological damage [4]. Up to date, recombinant tissue plasminogen activator (rt-PA) is still the gold standard drug approved by Food and Drug Administration (FDA) for the clinical treatment of IS [5]. However, due to its narrow therapeutic window (<4.5h), high re-incidence rate and short half-life (<5 min) [5], the application of rt-PA is limited [6]. Therefore, many researchers are exploring other therapeutic approaches to tackle this disease.

In recent years, increasing evidences have discovered the potential of natural compounds extracted from plants as a promising alternative strategy against IS. Among the potential plant that possess blood-brain barrier properties, an important characteristics as neuroprotective agent for neurological disorder is Oroxylum indicum [6]. It has been reported that O. indicum has a dominant active compound, namely as baicalein that are responsible in this plant’s biological activities [7]. Therefore, in this study, we aimed to evaluate the potential of baicalein extracted from the leaves of Oroxylum indicum to treat the diseases. Briefly, 10 male Sprague Dawley rats were used in this study (n=5). 50 mg/kg b.wt of baicalein was orally administered via oral gavage before and after induction of ischemic stroke by endothelin-1 (ET-1), while control group was given normal saline. Assessments of behavioral scoring using modified neurological severity score (mNSS) and infarct volume by 2,3,5-triphenyltetrazolium chloride (TTC) staining were evaluated as the endpoint of this study.

Results demonstrated that the oral administration of baicalein improved the behavioral scoring of rats in motor test (forelimb flexion and forelimb twisting), contralateral sensory test (paw-whiskers), motor coordination and balance function and reflex test (pinna, corneal, startle and tail reflex) within 24 h -72 h, indicating that the baicalein-treated rats exhibited faster recovery rate as compared to non-treated rats.
Such improvements were observed up to two weeks. In addition, histological assessment using TTC staining also revealed reduction of infarct volume in baicalein-treated rats as compared to control rats. However, the percentage of infarct volume to whole brain was not significantly different in both groups (Figure 2).

![Figure 1: Behavioral scoring of A) motor test, B) contralateral sensory test, C) motor coordination and balance test and D) reflex test of experimental rats. Superscripts ** showed significant difference at (p<0.05) within the group and superscripts * showed significant difference at (p<0.05) between the groups.](image)

![Figure 2: Percentage of infarct volume to whole brain in experimental rats.](image)

The promising results displayed by baicalein might be contributed by its anti-inflammatory property. Several studies reported that baicalein, a type of flavonoid compound, are responsible in attenuation of lipopolysaccharide (LPS)-induced nitric oxide (NO) production in macrophage and inhibit NF-κB activation [7,8]. LPS is the potent macrophage activator, while NF-κB is a transcription factor that can cause inflammatory cytokines release in various cell types [9,10]. In summary, the present study demonstrates that...
oral administration of baicalein in ischemic stroke rats could be effectively addressed and improved behavioral scoring in treated rats as early as 24 h after baicalein treatment.

**Keywords**
Baicalein, Ischemic stroke, Oroxylum indicum

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**References**