Introduction

The capacity to blunder slightly is the real marvel of DNA.

Without this special attribute, we would still be anaerobic bacteria and there would be no music.

-Lewis Thomas-
Stroke has been defined by the World Health Organisation as "a focal (or, at times, global) neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death) and of presumed vascular origin". Today, the only specific treatment for stroke patients is thrombolysis with recombinant tissue plasminogen activator (tPA). However, this treatment can only be used in a small fraction of patients. Despite intensive research, there is no treatment paradigm that can reduce the cellular loss associated with an ischemic lesion, and all clinical trials of several neuroprotective drugs for the acute treatment of stroke have been unsuccessful. The research in stroke prevention is ongoing with the evaluation of new drugs, refinement of knowledge of current medications and the tailoring of treatments for appropriate patient groups. The interest in new aspects of recovery, including lesion-induced neural plasticity and regeneration has increased.

As of today, no treatment has been repair the cellular loss associated with an ischemic lesion. However, the discovery and dynamic regulation of neural stem/progenitor cells in the adult mammalian brain has open up exciting possibilities for future therapeutic interventions. Unfortunately, the results of this regenerative effort are so far limited compared to the amount of tissue loss. This could be due to the low survival of the recruited cells, but it could also be explained by insufficient activation or dysfunctional lineage selection. Whether the lineage selection of neural stem/progenitor cells is altered following a lesion in the brain, what signals are responsible for their activation or whether these cells can participate in post-lesion regeneration, astrogliosis or neuroprotection are yet to become clear. A greater understanding of these processes is necessary for finding ways to improve the endogenous regenerative capacity.

The use of plants for healing purposes predates recorded history and forms the origin of much of modern medicine. Turmeric, the yellow pigmented powder from the rhizomes of Curcuma longa L. (family Zingiberaceae) is used extensively in Ayurvedic medicine (Ammon and Wahl, 1991). The major chemical constituents of turmeric rhizome are volatile, and non-volatile compounds. The aroma of turmeric is due to its volatile oil (curcuma oil- a group of terpenoids), while the non-volatile compounds, a rich source of curcuminoid (curcumin) and its compounds account for its bright yellow colour.
Modern interest in turmeric began in the 1970’s when researchers found curcumin has anti-carcinogenic, and anti-HIV-1 integrase activities. However, curcuma oil (C.oil) has not received the attention of scientists and its potential uses in medicine have not been studied extensively. Some reports have mentioned the functionality and utilization of volatile turmeric oil, such as insect repellent (Roth et al., 1998), anti-fungous (Apisariyakul et al., 1995), anti-bacterial (Negi et al., 1999), and anti-carcinogenic (Aratanechemuge et al., 2002) properties.

The therapeutic strategies in stroke can take two directions: prevention of brain damage from stroke or in aiding its repair after a stroke. The ultimate criterion however, must rest upon the degree of neurological recovery. It is in these areas that the present thesis was designed to investigate the effects of curcumin and C.oil on the middle cerebral artery occlusion (MCAO)-induced ischemia in Sprague Dawley rats on the common execution and signaling and execution pathways of neuronal necrosis and of delayed mode of death. Most importantly it has been examined whether Curcumin and C.oil participated in post-lesion regeneration, astrogliosis or neuroprotection following an ischemic lesion in the brain.