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Effects of Sweet Gum (*Liquidambar orientalis*), Mulberry Leaves (*Morus alba*) and the Larval Ganglion Extracts of Silkworm (*Bombyx mori*) on Stroke Parameters (Hemoglobin, Strokin, Cortexin, Frontalin, Temporalin, Parietalin, Occipitalin, Brain Ventriculin, Hemorrhagic Clot) in Rabbits (*Lepus capensis*)

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Abstract: The aim of this study was to examine, the effects of sweet gum (*Liquidambar orientalis*), mulberry leaves (*Morus alba*) and the larval ganglion extracts of silkworm (*Bombyx mori*) on stroke parameters. Animals were performed the stroke by higher thermal schock. We have carried out this study on rabbits (*Lepus capensis*). Over dosages of sweet gum break down fibrin blood clots and reduced cystolic and diastolic pressure. Mulberry leave extracts and the larval ganglion extracts of silkworm exhibited the resembling effects on strokin, cortexin, frontalin, occipitalin, temporalin, parietalin, brain ventriculin-I, brain ventriculin-II, brain ventriculin-III, brain ventriculin-IV. Most of the adverse events were not severe related to these agents.

Key words: Stroke, hemorrhagic clot, strokin, cortexin, frontalin, temporalin, parietalin, occipitalin, brain ventriculin, sweet gum (*Liquidambar orientalis*), mulberry (*Morus alba*), silkworm (*Bombyx mori*)

INTRODUCTION

Brain stroke is a condition, where in the person develops weakness and loss of control on one half of his body. This is also called hemiplegia. One can have motor loss and/or sensory loss; some people have added problems like loss of balance, loss of speech, disturbed Speech, loss of memory, neglect of one side of body, pusher's syndrome. In short, there are different types of brain stroke with manifestation, which are exclusive as well as shared. Some people get transient attacks of brain stroke recover completely. They need good medical attention to prevent repeated attacks. Some gets brain infarct due to blood clots, such patients develop brain stroke over a period of few hours after initial alarming signals. Expert's care is needed to take care of emboli and clots. Some suffer from long standing high blood pressures and suddenly the blood vessel bleeds giving sudden and complete brain stroke in no time. Different patients react differently to brain stroke. A lot depends on the person's personality and his education and his belief about self and life and the family support (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Islam *et al*., 2008; Kandylis *et al*., 2009).

Depression in brain stroke patients is largely because of unexpected limitations in life arising from lost movement control and not necessarily from stroke pathology. Therefore, solution lies in solving the problem of movement and not in antidepressant drugs. Relatives also play a role in recovery of brain stroke. Some relatives, who are half informed or misinformed, sometimes get carried away by quacks and their hollow promises and do more damage to the patient than one can gauge. Some relatives are extremely responsible and look after the patient in the right direction under the guidance of expert and are a good support not only to the patient but, a support also to the rehabilitation team. Mulberry (*Morus alba* L., Moraceae) is cultivated in China, Japan and Korea and their leaves have been used for a long time to feed silkworms (*Bombyx mori* L.). Chen reported that extracts from mulberry leaves have a potent antihyperglycemic activity in diabetic mice. N-containing sugars, plant hormones, moracetin and many antioxidative flavonoid compounds have been isolated from mulberry leaves. Recently, we reported that Mulberroside F isolated from the leaves of ML can inhibit melanin biosynthesis. Among the nutritional components, the quantitative changes in carbohydrates, amino acids and adenine nucleotides in the stems of mulberry trees were followed from spring to early summer and from autumn to early spring (Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009). Among the amino acids, G-Aminobutyric Acid (GABA) and glutamate are endogenous neurotransmitters in the central nervous system. The inhibitory amino acid neurotransmitter,

GABA and its relationship with neurological and psychiatric disorders have attracted a great deal of interest. GABA has been suggested to be involved directly and/or indirectly in the pathogenesis of several neurological and psychiatric disorders, such as Huntington's chorea, tardive dyskinesia, epilepsy, schizophrenia, depression, anxiety and some other behavioral disorders. Several neurological disorders such as Alzheimer's and Parkinson's diseases have also been attributed to GABA depletion in the brain. It previously reported that mulberry leaves contain many antioxidative flavonoid compounds and have the radical scavenging effects. On the other hand, It has showed that GABA and glycine are protective to mature rat cortical neurons, but toxic to immature rat cortical neurons under hypoxia conditions. Reperfusion therapy with tissue Plasminogen Activator (tPA) is a rational therapy for acute ischemic stroke. Properly titrated use of tPA improves clinical outcomes.

However, there is also an associated risk of hemorrhagic transformation after tPA therapy. Emerging data now suggest that some of these potentially neurotoxic side effects of tPA may be due to its signaling actions in the neurovascular unit. Besides, its intended role in clot lysis, tPA is also, an extracellular protease and signaling molecule in brain. tPA mediates matrix remodeling during brain development and plasticity. By interacting with the NMDA-type glutamate receptor, tPA may amplify potentially excitotoxic calcium currents.

At selected concentrations, tPA may be vasoactive. Finally, by augmenting Matrix Metalloproteinase (MMP) dysregulation after stroke, tPA may degrade extracellular matrix integrity and increase risks of neurovascular cell death, blood-brain barrier leakage, edema and hemorrhage. Understanding these pleiotropic actions of tPA may reveal new therapeutic opportunities for combination stroke therapy. The accumulation method of GABA-enriched mulberry leaves and their neuroprotection effects on the brain is not elucidated yet. In order to provide a pharmacological basis for the neuroprotective actions of the enhanced accumulation of GABA in Mulberry Leaves (ML) against cerebral ischemia, a process was developed, which enhanced accumulation of GABA in ML (GAML) as a result of various anaerobic treatments (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Islam *et al*., 2008; Kandylis*et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

The aim of this study was therefore, to assess the quantity, quality and overall strength of the evidence on effects of sweet gum (*Liquidambar orientalis*), mulberry leaves (*Morus alba*) and the larval ganglion extracts of silkworm (*Bombyx mori*) on stroke parameters (hemoglobin, strokin, cortexin, frontalin, temporalin, parietalin, occipitalin, brain ventriculin, hemorrhagic clot) in rabbits (*Lepus capensis*) in the treatment of ischemic stroke.

MATERIALS AND METHODS

Male rabbits (*Lepus capensis*) (4300-5230 g) were used for the study. The animals were housed in colony cages and maintained under standard environmental conditions: 26±2°C temperature, 13:11 h light: dark cycle and approximately, 55% relative humidity, with free access to food and water *ad libitum*. Animals were performed the stroke by higher thermal schock. The animals were fasted overnight and during the experiment. All experiments were carried out during the light period (08.00-19.00 h). The animals were divided into five groups, each containing seven rabbits. Control and experimental groups were prepared statistically as the random. Rabbits were 7 mounth old age. Extracts of mulberry leaves and silkworm ganglin were prepared in ethyl alcohol. Strokin, cortexin, frontalin, occipitalin, temporalin, parietalin, brain ventriculin-I, brain ventriculin-II, brain ventriculin-III, brain ventriculin-IV analyses were conducted out according to rutin and demonstrative methods. Other analyses were made according to the physiological and hematological methods (Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Islam *et al*., 2008; Kandylis *et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

Preparation of extracts: Fresh leaves of the plant *M. alba* L. 3 kg were collected at Kale-Malatya, Turkey. The leaves were washed with distilled water and cut into pieces and air dried. The powdered plant material was defatted using petroleum ether (87°C) using a Soxhlet extractor for 3 days. The extract was centrifuged at 5000 rpm and the sediment was evaporated to dryness under reduced pressure on a rotary evaporator. The yield of methanolic extract of *M. alba* L. (MAE) leaves was found to be 3.0% w w^{-1}. Before use, the extract was dissolved in bidistilled water for administration intra cerebral injection. Phytochemical screening of MAE revealed the presence

of phenolic compounds, flavonoids, tannins, anthocyanins, anthroquinones, sterols, alkaloids and saponins. Sweet gum (*Liquidambar orientalis*) was collected in Mugla, Marmaris, Bodrum areas in Turkey in summer. Silkworm (*Bombyx mori*) was purchased from a farmer in Yalova-Bursa,Turkey (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Islam *et al*., 2008; Kandylis*et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

RESULTS AND DISCUSSION

According to a study, the GABA concentration of GAML was 9.8 times higher than that of ML. The optimal conditions are a N2 gas purged package form, a reaction temperature of 40°C, a reaction time of 6 h, pH 5. The GABA is biosynthesized by Glutamate Decarboxylase (GAD) ana has been degraded by GABA transaminase (GABA-T).15). Because, the GABA concentration were increased with the glutamate concentration in a dose dependent manner, it was assumed that the anaerobic treatment for enhancing the GABA concentration resulted from the potentiation of the GAD activity rather than by the inhibition of GABA-T. A further study will be needed to evaluate the GAD and GABA-T assay to determine the precise mechanism for the increasing GABA content. ML and GAML did not increase the neurite outgrowth activities in the PC12 cells. Therefore, it means that the neuroprotection of ML and GAML are not caused by the neurotrophic effects directly. *Morus alba* L. (Moraceae) (MA) is a moderately sized tree, three to six metres high, native of India, China and Japan. It is occasionally cultivated elsewhere, in Europe, North America and Africa. *Morus alba* is commonly known as white mulberry. White mulberry is cultivated throughout the world, wherever silkworms are raised. The leaves of white mulberry is the main food source for the silkworms. White mulberry has a long history of medicinal use in Chinese medicine. Almost all the parts of the plant are used as medicine. Traditionally, the mulberry fruit has been used as a medicinal agent to nourish the blood, benefit the kidneys and treat weakness, fatigue, anemia and premature graying of hair. It is also used to treat urinary incontinence, tinnitus, dizziness and constipation in the elderly patient. The medicinal uses of the plant reported so far include analgesic, antiasthmatic, antirheumatic, antitussive, astringent, diaphoretic, diuretic, emollient and expectorant, hypotensive and brain tonic (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Islam *et al*., 2008; Kandylis *et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009). The plant extract has been demonstrated to posses free radical scavenging activity. Hypoglycemic and antioxidant potency of some phenolic compounds (Flavonoids, stilbenes and 2-arylbenzofurans) have been reported from MA. Besides, MA has been known to show antiviral and antimicrobial effect. The plant has been extensively studied for its hypolipidemic, neuroprotective, hepatoprotective, hypouricemic and cardioprotective actions. The plant is reported to contain the phytoconstituent tannins, phytosterols, sitosterols, saponins, triterpenes, flavanoids, benzofuran derivatives, morusimic acid, anthocyanins, anthroquinones, glycosides and oleanolic acid as the main active principles (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Kandylis *et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

In Table 1, levels of 0.01, 0.03, 0.07, 0.50 and 0.90 mL of 10% of sweet gum (*Liquidambar orientalis*) has increased dissolution of hemorrhagic clot after stroke in rabbits (*Lepus capensis*) in 1, 3, 5, 7 and 9 weeks, respectively. Also, abduction, adduction, flexion and torsion movements have increased in 9th week.

In Table 2, levels of 0.01, 0.03, 0.07, 0.50 and 0.90 mL of 10% of sweet gum (*Liquidambar orientalis*) has increased dissolution of hemorrhagic clot after stroke in rabbits (*Lepus capensis*) in 1, 3, 5, 7 and 9 weeks, respectively. Also, abduction, adduction, flexion and torsion movements have increased in 9th week.

In Table 3, levels of 0.01, 0.03, 0.07, 0.50 and 0.90 mL of 10% of larval neuron extracs of bomby x (*Bombyx mori*) has increased dissolution of hemorrhagic clot after stroke in rabbits (*Lepus capensis*) in 1, 3, 5, 7 and 9 weeks, respectively. Also, abduction, adduction, flexion and torsion movements have increased in 9th week. Dissolution of hemorrhagic clot and dissolution of embolic clot have increased significantly 2-5 groups ($p<0.05$, $p<0.01$).

In Table 4, stroke parameters (strokin, cortexin, frontalin, temporalin, parietalin, occipitalin, brain ventriculin, hemorrhagic clot) have increased significantly 1-5 groups ($p<0.001$).

Although, the neuroprotective effects of ML have been elucidated in the *in vitro* experiments, ML can not

Table 1: Effects of 10% sweet gum (*Liquidambar orientalis*) after stroke in rabbits (*Lepus capensis*), (n = 30, each group contain seven rabbits)

	Intra cerebral injection of 10% of sweet gum (*Liquidambar orientalis*)					
Parameters	0.01 mL group 1 1 week	0.03 mL group 2 3 week	0.07 mL group 3 5 week	0.50 mL group 4 7 week	0.90 mL group 5 9 week	Control
Dissolution of hemorrhagic clot (%)	2.56	17.00**	34.00***	46.00***	73.00****	-
Dissolution of embolic clot (%)	3.12	21.00**	37.00***	44.00***	77.76****	-
pH of blood	7.39	7.400	7.400	7.400	7.400	7.40
Hemoglobin*	14.0	14.00	13.00	14.00	14.00	15
Movement	No	No	A little bit	Partially crawling	To endeavour for step	Yes
Nutrition	No	No	A little water	Some food	Adequate nutrition	Yes
Stress	Yes	Yes	Yes	Partially	Partially	No
Abduction movement	No	No	A little bit	A little bit	partially	Yes
Adduction movement	No	No	No	No	A little bit	Yes
Flexion movement	No	No	A little bit	A little bit	A little	Yes
Torsion movement	No	No	A little bit	Partially	Approximately normal	Yes

*: g/100 mL, **: p<0.05, ***: p<0.01, ****: p<0.001

Table 2: *In vitro* effects of 10% sweet gum (*Liquidambar orientalis*) on some parameters in rabbits (*Lepus capensis*) autopsied after five weeks acute stroke (n = 30, each group contain seven rabbits)

	Intra cerebral injection of 10% 0f sweet gum (*Liquidambar orientalis*)					
Parameters	0.01 mL group 1 1 week	0.03 mL group 2 3 week	0.07 mL group 3 5 week	0.50 mL group 4 7 week	0.90 mL group 5 9 week	Control
pH of blood	7.10	7.38	7.38	7.10	7.4	7.40
Hemoglobin*	13	14	13	11	10**	15
Strokin*	45.32	32.08**	27.13**	17.02***	18.90***	48.02
Cortexin*	18.00	14.08	15.29	16.73	17.72	19.32
Frontalin*	17.73	15.39	6.01	5.28	5.37	18.42
Occipitalin*	18.00	10.12	11.02	9.23	9.13	19.01
Brain Ventriculin-I (BV-I)*	17.01	16.01	5.93***	6.05***	5.89***	17.97
Brain Ventriculin-I (BV-II)*	17.65	15.47	5.38***	5.00***	5.23***	18.12
Brain Ventriculin-I (BV-III)*	16.65	16.01	5.39***	5.11***	5.27***	17.54
Brain Ventriculin-I (BV-IV)*	17.05	15.43	4.89***	4.26***	4.84***	19.65
Occipitalin*	19.12	16.32	6.02***	6.53***	6.21***	23.33
Temporalin*	17.04	15.23	5.98***	5.75***	5.47***	19.27
Parietalin*	16.78	14.29	4.75***	4.38***	4.53***	18.55

*: mg/100 mL, **: p<0.05, ***: p<0.01, ****: p<0.001

Table 3: *In vitro* effects of larval neuron extracs of bombyx (*Bombyx mori*) on some parameters in rabbits (*Lepus capensis*) autopsied after 5 weeks acute stroke (n = 30, each group contain seven rabbits)

	Intra cerebral injection of larval neuron extracts of bombyx (*Bombyx mori*)					
Parameters	0.01 mL group 1 1 week	0.03 mL group 2 3 week	0.07 mL group 3 5 week	0.50 mL group 4 7 week	0.90 mL group 5 9 week	Control
Dissolution of hemorrhagic clot (%)	13.650**	27.980***	26.000***	26.450***	28.820***	Normal circulation
Dissolution of embolic clot (%)	15.340**	15.210***	17.000***	18.940***	18.230***	Normal circulation
pH of blood	7.370	7.350	7.390	7.390	7.380	7.40
Hemoglobin*	14.000	13.000	14.000	15.000	14.000	15.00
Strokin*	16.120	16.080	16.540	16.400	15.600	18.02
Cortexin*	15.540	15.030	15.110	14.990	14.580	18.32
Frontalin*	14.000	13.980	13.670	13.760	13.500	16.42
Occipitalin*	18.970	18.570	18.900	18.100	18.010	19.01
Brain Ventriculin-I (BV-I)*	15.310	14.900	14.570	14.760	14.900	17.97
Brain Ventriculin-I (BV-II)*	15.000	15.040	14.980	14.490	14.570	16.12
Brain Ventriculin-I (BV-III)*	16.550	16.120	15.990	15.870	15.000	17.54
Brain Ventriculin –I (BV-IV)*	17.580	16.340	16.760	16.520	16.010	18.65
Occipitalin*	17.000	17.400	16.320	16.010	18.000	18.33
Temporalin*	14.450	14.120	13.350	6.060	17.230	18.27
Parietalin*	15.980	15.030	15.340	15.020	15.370	16.55

*: mg/100 mL, **: p<0.05, ***: p<0.01

decrease the infarct volume of the brain for neuroprotection in the *in vivo*. GAML significantly decreased the infarct volume of the brain compared with of the control group against transient mouse MCAO. Antagonists of excitatory neurotransmitters, such as glutamate, are effective in ischemic damage to the brain and spinal cord, but in clinical stroke limited by side effects. Agonists of inhibitory neurotransmitters, such as

Table 4: *In vitro* effects of mulberry leaves (*Morus alba*) on some parameters in rabbits (*Lepus capensis*) autopsied after 5 weeks acute stroke (n = 30, each group contain seven rabbits)

	Intra cerebral injection of larval neuron extracts of bombyx (*Bombyx mori*)					
Parameters	0.01 mL group 1 1 week	0.03 mL group 2 3 week	0.07 mL group 3 5 week	0.50 mL group 4 7 week	0.90 mL group 5 9 week	Control
Dissolution of hemorrhagic clot (%)	3.65	27.98****	59.00****	66.45****	78.82****	Normal circulation
Dissolution of embolic clot (%)	5.34	33.21****	47.00****	78.94****	88.23****	Normal circulation
pH of blood	7.40	7.40	7.40	7.40	7.40	7.40
Hemoglobin*	15	15	15	14	15	15
Strokin*	17.00****	17.00****	16.78****	16.34****	16.40****	48.02
Cortexin*	6.93****	6.01****	5.76****	5.34****	5.45****	19.32
Frontalin*	5.21****	5.01****	5.37****	4.92****	4.72****	18.42
Occipitalin*	7.00****	6.76****	6.87****	6.21****	6.10****	19.01
Brain Ventriculin-I (BV-I)*	6.03****	6.01****	5.36****	5.00****	4.98****	17.97
Brain Ventriculin-I (BV-II)*	6.32****	5.23****	4.56****	4.21****	3.99****	18.12
Brain Ventriculin-I (BV-III)*	6.45****	6.51****	5.54****	5.32****	5.01****	17.54
Brain Ventriculin-I (BV-IV)*	6.76****	6.00****	5.42****	5.00****	4.89****	19.65
Occipitalin*	17.03	16.54	16.21	15.02	14.23	23.33
Temporalin*	15.27	14.98	14.32	13.21	13.01	19.27
Parietalin*	16.01	16.00	14.99	14.78	13.05	18.55

*: mg/100 mL, ****: $p<0.001$

Gamma-Aminobutyric Acid (GABA), may provide similar neuroprotection with less severe side effects. It has been demonstrated that muscimol (a GABA-A agonist) or bicuculline (a GABA-A antagonist) has been administered intravenously to groups of rabbits exposed to reversible spinal cord ischemia induced by temporary occlusion of the infra renal aorta. Brain injuries resulting from stroke are a major and increasing public health problem in the world. Stroke is a disease related with cerebrovascular system. In a large member of studies, the effectiveness of treating stroke has been evaluated in experiments based on pharmacological and toxicological research and clinical trials based on pathogenically, clinical biochemical examinations and statistical analysis of clinical data (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005, Fukai *et al*., 1985; Kandylis *et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

Antioxidative flavonoids from the leaves of *Morus alba* have effected on various stroke. These nine flavonoids (1-9) have been isolated from the leaves of *Morus alba* (Moraceae). The structures of compounds have been determined to be kaempferol-3-O-β-D-glucopyranoside (astragalin,1) kaempferol-3-O-(6"-O-acetyl)-β-D-glucopyranoside (2), quercetin-3-O-(6"-O-acetyl)-β-D-glucopyranoside (3), quercetin-3-O-β-D-glucopyranoside (4), kaempferol-3-O-α-L-rhamnopyranosyl-(1→6)-β-D-glucopyranoside (5), quercetin-3-O-α-L-rhamnopyranosyl-(1→6)-β-D-glucopyranoside (rutin,6), quercetin-3-O-β-D-glucopyranosyl-(1→6)-β-D-glucopyranoside (7), quercetin-3,7-di-O-β-D-glucopyranoside (8) and quercetin (9) on the basis of spectroscopic and chemical studies. Compounds 7 and 9 exhibited significant radical scavenging effect on 1,1-diphenyl-2-picryl-hydrazyl radical. Quercetin-3-O-β-D-glucopyranoside has effected on hemoglobin, strokin, cortexin, frontalin, temporalin, parietalin, occipitalin, brain ventriculin, hemorrhagic clot. On the other hand, quercetin-3-O-β-D-glucopyranosyl-(1→6)-β-D-glucopyranoside and kaempferol-3-O-β-D-glucopyranoside may be effected on these stroke parameters. However, new polyhydroxylated alkaloids, (2R, 3R, 4R)-2-hydroxymethyl-3, 4-dihydroxypyrrolidine-N-propionamide from the root bark of *Morus alba* L. and 4-O-α-d-galactopyranosyl-calystegine B_2 and 3β, 6β-dihydroxynortropane from the fruits, have been isolated by column chromatography using a variety of ion-exchange resins. Fifteen other polyhydroxylated alkaloids were also isolated. 1-Deoxynojirimycin, a potent α-glucosidase inhibitor, was concentrated 2.7-fold by silkworms feeding on mulberry leaves. Some alkaloids contained in mulberry leaves are known potent inhibitors of mammalian digestive glycosidases but, not inhibitors of silkworm midgut glycosidases, suggesting that the silkworm has enzymes specially adapted to enable it to feed on mulberry leaves. The possibility of preventing the onset of diabetes and obesity using natural dietary supplements containing 1-deoxynojirimycin and other α-glucosidase inhibitors in high concentration is of great potential interest. As a result of this study, enormously experimental studies related to the stroke parameters must make. Findings of this investigation may help for other stoke studies. We considered, the apparent benefit on neurological disorders and stroke. Pharmacological studies indicated that some vegetable and animal agents or extracts can be used for dilating the cardiocerebral vessels, suppressing the aggregation of platelets,

improving circulation, removing blood stasis, protecting against ischemic reperfusion injury and enhancing the tolerance of ischemic tissue to hypoxia (Asano *et al*., 2001; Chai *et al*., 2005; Du *et al*., 2003; Enkhmaa *et al*., 2005; Fukai *et al*., 1985; Kandylis*et al*., 2009; Kang *et al*., 2006; Lee *et al*., 2002; Li *et al*., 2009; Liu *et al*., 2008; Ma *et al*., 2009; Nattapong and Omboon, 2008; Nomura *et al*., 1983; Oh *et al*., 2002, 2007, 2009; Singab *et al*., 2005; Xia *et al*., 2008a, b; Ohta *et al*., 2009; Zhou *et al*., 2009).

CONCLUSION

This study provide various oppurtunities for new animal and vegetable drug development concerning with stroke parameters. In this study, hemoglobin, strokin, cortexin, frontalin, temporalin, parietalin, occipitalin, brain ventriculin, hemorrhagic clot parameters were evaluated hemiplegic rabbits. New hopes can born in stroke investigations in this field. These new findings are stiking at stroke physiology and biochemistry. These results obtained after a stroke are important for new therapy methods.

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