ORIGINAL ARTICLE

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Tomato (*Lycopersicum Commune*) juice and physical exercise increase number of neurons and ERβ expression in post-ovariectomy rats brain

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ABSTRACT

Background: Estrogen deficiency condition can degrade the quality of life, decline in cognitive function will be more severe trough age. Phytoestrogen compounds can be found in pegaga leaf extract, tomatoes, and papaya is an easy and inexpensive way to increase estrogen levels in post menopause women through extra gonadal estrogen induction. Therefore, the aims of this study were to examine the effect of tomato juice, physical exercise, and combination of these treatments on promoting neurons and ERβ expression in somatosensory cortex that contribute to cognitive function of post-ovariectomy rats.

Method: Twenty-eight female healthy Wistar rats (Rattus novergicus), 8-10 weeks old, from Laboratory of Biochemistry, Faculty of Medicine Airlangga University include in this experiment. The animals were housed in the animal-care facility with ad libitum food and water. The temperatur was maintained at 18°C-24°C. The treatments were done 2 weeks after ovariectomy. Tomato were made in Laboratory of Pharmacognocy and Phytochemistry, Faculty of Pharmacy, Airlangga University, from inner part of the tomato fruits (mucous like substance) with freeze dry method (-40°C).

Results: The weight of white rat Rattus norvegicus post ovariectomy in this study was between 133-170 gram with a mean weight 154.32 ± 9.72 gram. Hematoxylin/eosin staining showed neuronal deficit in the control rats brain. In figure 1, the tomato group showed the largest of neurons number (145.43 ± 17.728), followed the combination group (140.57 ± 22.449), the exercise group (136.86 ± 23.104) and the smallest number in the control group (96.43± 28.965). Four weeks after treatments the number of neurons increased significant in the tomato group (p=0.001), exercise group (p=0.004) and combination group (p=0.002) from the control group. This study showed no significant different between tomato and exercise group (p=0.500), tomato and combination group (p=0.701) and between exercise and combination group (p=0.769).

Conclusions: In conclusion, our data demonstrated that post ovariectomy rats showed deficit numbers of neurons and decreased ERβ in the somatosensory cortex. Treatment with physical exercise, tomato juice, and combination of these treatments increased the number of neurons and ERβ expression in the somatosensory cortex.

Keywords: Neurons, ERβ expression, Post-Ovariectomy, Rats.

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INTRODUCTION

Women living almost about half of their lives with estrogen deficiency condition. One of the symptoms that can degrade the quality of life at the age of menopause is a decline in cognitive function and this symptom will be increased with age.[1,2] At least 10% of the population aged 65 years or more experience cognitive impairment and increased by about 50% at age 85 years. Epidemiological studies have shown that women have a higher incidence of dementia, particularly Alzheimer's disease than men.[3] The ageing-related decrease of cell plasticity that is normally maintained by the continuous addition of new neurons brought about by neurogenesis and contribute to senescence-dependent impairments of brain function. In aging, a dysregulation of the HPA system leads to elevated levels of circulating corticosteroid levels that will inhibit precursor cell proliferation in the brain. While neurotropic factors and growth factors are decline with age, transforming growth factor β1 (TGFβ1) might increase and in old mice inhibited the proliferation of early precursor cells.[2,4] Many studies reported that estrogen hormone replacement therapy reduces the risk of Alzheimer's and cognitive function in postmenopausal women and elderly.[5] In vivo studies reported the effects of estrogen on the areas in the brain such as cerebral cortex and hippocampus.[6] The hippocampus is involved in learning and memory processes, that hippocampal glutamatergic neuron express ER.[7] The neuroprotective effect of estrogen in physiologic doses is well establish, but the molecular and cellular mechanisms remain controversial.[8] Most studies show that the cerebral cortex is most strongly protected