Send Orders for Reprints to reprints@benthamscience.ae

292 *The Open Biomedical Engineering Journal,* 2015, *9,* 292-295

Open Access

The Research of the Effect of the Olive Juice on Anxiety and Depression Behavior

Jiguo Zhang*

Xi'an Jiaotong University, Xi'an, Shaanxi, P.R. China

Abstract: In order to evaluate the effect of olive juice on the anxiety and depression behavior, the paper uses olive juice concentrate as experimental material, and uses mice as experimental subjects. Mice are randomly divided into negative, positive, high, medium and low-dose group, administered orally for 7 days. And observe the impact on the mice elevated plus maze test, the opening acts test and forced swim test. The experimental results show that under conditions of the subacute administration, olive juice can induce anti-anxiety behavior of mice, but also has the potential to improve depression of mice.

Keywords: Anxiety, depression, olive juice.

1. INTRODUCTION

According to the World Health Organization, approximately 350 million people worldwide suffer from depression and other mood disorders. Affective disorder patients in China accounted for 6% of the population, the resulting direct and indirect economic losses amounted to 720 billion yuan annually [3,7]. Current mainstream academic view, affective disorder is a syndrome. The pathogenesis involves multiple physiological systems, especially neurotransmitters and oxidative stress injury and so on [2].

At present, the clinical use of antidepressants, all play a role for the neurotransmitter system, not only slow onset, and accompanied by serious drug - symptoms are not synchronized effect [4], thereare a large inter-individual differences in drug response. Use component having antioxidant action to intervene oxidative stress during affective disorder, is the idea of a screening affective disorder drug treatment.

Screening means animal anxiolytic and antidepressant drugs depends on a variety of classic behavioral experiments.Elevated plus maze test is widely used anxiolytic efficacy in animal behavior characteristics and evaluation anxiety drugs.The ratio of residence times in the open arms and the number of enter the open arms of mice reflects the strength of their anxiety in the maze. The opening test is a method of evaluating anxiety behavior. When animals are in unfamiliar environments, behavioral strategies can be broken down into to a safe area sports corners and open areas to the center of the movement [1]. The exercise time of central area negatively correlated with anxiety. Forced swim test is a classic antidepressant drug screening methods. Time of motionless to react the despair depressive behavior.

*Address correspondence to this author at the Xi'an Jiaotong University, Xi'an, Shaanxi, P.R. China; Tel: +358-6-3247476; Fax: +358-6-3247457; E-mail: hunter2011@foxmail.com

Olive belong Oleaceae, Olea, evergreen trees, is the world's leading oil and fruit with woody species. Pharmacology study found that contains a lot of olive polyphenols, especially oleanolic glycosides and hydroxytyrosol, at the level of animal and *in vitro* studies showed levels of antioxidant activity.

In order to assess whether the olive juice containg antioxidant active substances has the efficacy of improving affective disorder, paper uses mice as research object, through the classic anti-anxiety and depression behavioral experiments, to assess the potential of the olive juice to improve affective disorder as functional ingredients, provide a reference for the use of olive juice to improve mood disorders [9].

The rest of the paper is organized as follows. In Section 2, five kinds of classic test methods for depression and anxiety are described. In Section 3, the experimental materials, experimental procedures, and a method of analysis of experimental data are described. In Section 4, experiments are presented and the results are discussed. Finally, a conclusion is provided in Section 5.

2. CLASSIC EXPERIMENTS DESCRIBED

2.1. Tail Suspension Test

Tail suspension test detects the depression-like behavior in mice. After the mouse tail wrapped with transparent tape, the tape ends with a clip-on, hang on a hook at a distance of at least 50cm of ground. Cameras record activity in mice within 5 minutes. Statistical the two parameters of the incubation period in mice and the time during which mice does not move [8-10].

2.2. Open-field Test

Open-field test detects spontaneous activity and anxiety behavior of animals (McEwen, B. S. *et al.*, 2005). Experimental equipment is a white square wooden box (50cm × 50cm × 25cm) without a lid. Select a fixed right angle cor-

ner. Each experiment, mice were placed in his back right angles [11]. After the boxes into the mine, the operator immediately quit, let freedom mouse activity in the box five minutes. Usually the residence time in the middle area and anxiety-like behavior are negatively correlated.

2.3. Elevated Plus Maze

Elevated plus maze is composed of two opposing open arms (30 cm × 5 cm), two opposing closed arms (30 cm × 5 cm × 15 cm) and a connecting four arm central platform (5 cm × 5 cm), 50 cm from the ground (Claes, S, *et al.*, 2004). Open arms light luminance is 650 Le, and light luminance of closed arm if 350 Le. Use animals to the new environment to explore different characteristics, and fear hanging open arms, forming a state animal conflict, elevated plus maze reflects the animal anxiety. The time into the open arms and the number of residence time can be evaluated anxiety animals. The sum into the open arms and closed arms and the number of times in the central area of the probe to evaluate the animal motor activity and exploration capabilities. During the test, each mouse was placed in the center of the platform, the recording mice within 5 min into the open arms and closed arms and number of the residence time, entering the open arms and closed arms number of the sum, and the probe frequency in the central region. Enter any of the four legs of mice were arm in arm into the inner prevail. Foot exit from the arm into the activities deemed complete.

2.4. Forced Swimming Test

Forced swim major detects the depression-like behavior in mice and motor function (Jans, LA, *et al.*, 2007). In a high 20-25cm 20-25cm diameter cylindrical transparent container containing water with temperature around 25 ° C. Mice with his back to the wall of the container, gently let go after the front foot contacts the water. The first day the mice adapt to 10 minutes, that is not recorded to swim 10 minutes. The next record six minutes of swimming activity in mice in the container. When finished, taken out animal, with a dry towel, put back to squirrel cage. Statistical two parameters of the time when mouse does not move and the latency time.

2.5. Sugar Preference Experiments

Sugar preferences experimental mice were evaluated on the basis of the proportion of drink syrup and anhedonia of mouse. Mice in depression generally lose preference for sugar. After the mice were deprived of water for 24 hours while giving autoclaved water to make 1% sucrose and autoclaved sterile water. Mice 24 hours after drinking freely, timely weighed to calculate the ratio of the amount of sugar water to the total amount water.

3. EXPERIMENTAL PROCEDURE

3.1. Experimental Materials

Experiments use healthy adult male Sprague Dawley, their weights are 200-240g. After the mice acclimatizate(temperature 20-24, humidity of 55% -60%) for 10hours, the 20 rats were randomly divided into two groups, control group (fed tap water) and experimental group (fed olive) .

3.2. Experimental Methods

3.2.1. Open-field Test

Select a fixed right angle corner. Each experiment, mice were placed in his back right angles. After the boxes into the mine, the operator immediately quit, let freedom mouse activity in the box five minutes.

3.2.2. Elevated Plus Maze

During the test, each mouse was placed in the center of the platform, the recording mice within 5 min into the open arms and closed arms and number of the residence time, entering the open arms and closed arms number of the sum, and the probe frequency in the central region. Enter any of the four legs of mice were arm in arm into the inner prevail. Foot exit from the arm into the activities deemed complete.

3.2.3 Forced Swimming Test

The first time the mice adapt to 10 minutes, that is not recorded to swim 10 minutes. The next record six minutes of swimming activity in mice in the container. When finished, taken out animal, with a dry towel, put back to squirrel cage. Statistical two parameters of the time when mouse does not move and the latency time.

3.3. Data Statistics Methods

Variance is a measure the degree of deviation between random variables and its mathematical expectation (ie mean). In many practical problems, studing the degree of deviation between random variables and mean is of great significance.

$$D(\mathrm{X}) = \mathrm{E}(\mathrm{X}^2) - [\mathrm{E}(\mathrm{X})]^2 \quad (1)$$

Variance alse can has bellow form:

$$s^2 = \frac{1}{n}[(\mathrm{x}_1 - \mathrm{x})^2 + (\mathrm{x}_2 - \mathrm{x})^2 + ... + (\mathrm{x}_n - \mathrm{x})^2] \quad (2)$$

The analysis of variance can be used as an exploratory tool to explain observations. A dog show provides an example. A dog show is not a random sampling of the breed: it is typically limited to dogs that are male, adult, pure-bred, and exemplary. A histogram of dog weights from a show might plausibly be rather complex, like the yellow-orange distribution shown in the illustrations. Suppose we wanted to predict the weight of a dog based on a certain set of characteristics of each dog. Before we could do that, we would need to explain the distribution of weights by dividing the dog population into groups based on those characteristics. A successful grouping will split dogs such that (a) each group has a low variance of dog weights (meaning the group is relatively homogeneous) and (b) the mean of each group is distinct (if two groups have the same mean, then it isn't reasonable to conclude that the groups are, in fact, separate in any meaningful way).

In probability and statistics, the most commonly use a statistical distribution to measure the degree of statistical dispersion. it reflects the degree of dispersion among the individuals within group.

In probability and statistics, a probability distribution assigns a probability to each measurable subsetof the possible

outcomes of a random experiment, survey, or procedure of statistical inference. Examples are found in experiments whose sample space is non-numerical, where the distribution would be a categorical distribution; experiments whose sample space is encoded by discrete random variables, where the distribution can be specified by a probability mass function; and experiments with sample spaces encoded by continuous random variables, where the distribution can be specified by a probability density function. More complex experiments, such as those involving stochastic processes defined in continuous time, may demand the use of more general probability measures.

4. ANALYSIS OF EXPERIMENTAL RESULTS

First field test is conducted. Based on the total distance movement (Fig. **1**) and velocity (Fig. **2**) show that Olive juice fed mice and normal mice have the same self-activity. There are some differences, but the difference is small. The residence time in the central region of the mines (Fig. **3**) was not significantly different, indicating no significant difference between the two anxiety-like behavior.

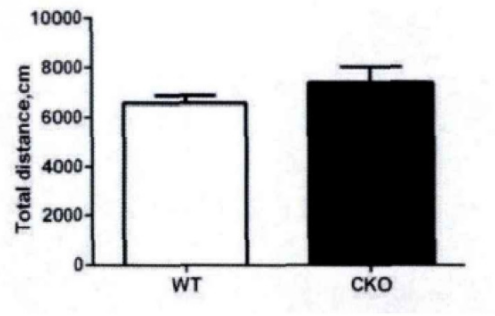

Fig. (1). The total distance of movement of the mice in the field test.

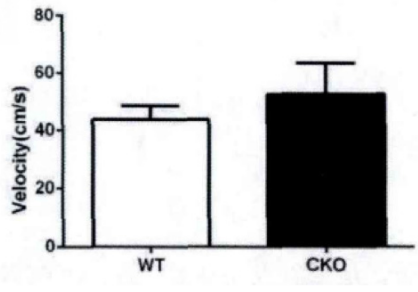

Fig. (2). The speed of movement of the mice in the field test.

In field test, the residence time in center area reactives the anxiety in mice, while the total movement distance reactives motor function in mice. Our experimental results show that the juice will not significantly increase locomotor activity distance in mice. This shows that the effect of Juice on anxiety behavior of mice is weak, and there is no significant central nervous stimulant.

High plus-maze is a classic model to measure anxiety behavior in mice. According to the mice in the open arms of the plus maze high residence time (Fig. **4**), evaluate the anxiety behavior. There are some differences between experimental mice and contrast mice of the residence time in the open arms and the number of times into the open arms (Fig. **5**). This shows that the olive juice has some anti-anxiety effect.

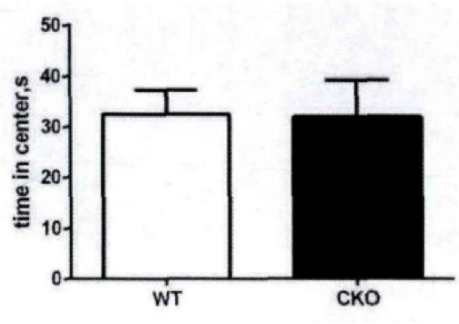

Fig. (3). The time of the mice stat in the center area in the field test.

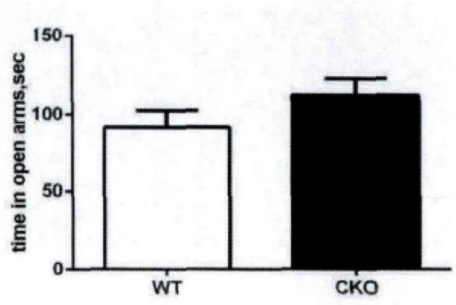

Fig. (4). The residence time in high plus-maze open arms.

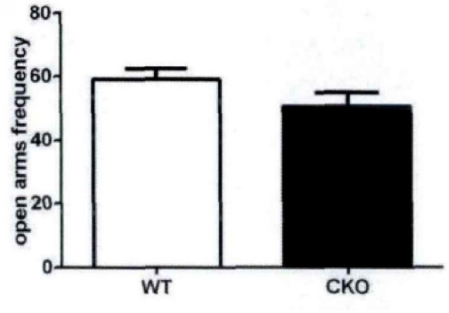

Fig. (5). The residence time in the open arms and the times into the open arms.

Forced swim test results are shown in Table **1**, the juice at three doses decreased the motionless time of mice, but There is not statistically significant. This state no moving is a desperate behavior. And antidepressants in the forced swim test can significantly reduce this state in a motionless.

Table 1. The unmoving time of forced swimming tests in mice.

Group	Low-dose administered group (3g/kg)	Middle-dose administered group (7g/kg)	High-dose administered group (12g/kg)
Unmoving time (s)	86	98	92

Experimental results show that, in the current dose, juice can not significantly reduce no moving behavior in mice, exhibit antidepressant effects.

CONCLUSION

The experimental results show that under conditions of subacute administration, olive juice can induce anti-anxiety behavior in mice, but also has the potential to improve depression in mice. Individual experimental results while the difference did not reach statistical significance levels, probably due to that the amount of fruit juice design is not very reasonable. The experimental results show that under conditions of the sub-acute administration, olive juice can induce anti-anxiety behavior of mice, but also has the potential to improve depression of mice.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

ACKNOWLEDGEMENTS

This work is supported by the Key Project of Guangxi Social Sciences, China (No.gxsk201424), the Education Science fund of the Education Department of Guangxi, China (No.2014JGA268), and Guangxi Office for Education Sciences Planning, China (No.2013C108).

REFERENCES

[1] Bleakman D, Alt A, Witkin J M. 2007. AMP A receptors in the therapeutic management of depression [J]. CNS Neurol Disord Drug Targets. 6(2):117-126.

[2] Chourbaji S,Vogt M A, Fumagalli F, *et al.* 2008. AMPA receptor subunit 1 (GIuR-A) knockout mice model the glutamate hypothesis of depression. [J]. FASEB J. 22(9):3129-3134.

[3] S.J. Claes, CRH, stress, and major depression: a psychobiological interplay. Vitam Horm, vol.69, pp. 117-50, 2004.

[4] F. Holsboer, *et al.* ACTH, "Cortisol, and corticosterone output after ovine corticotropin-rsleasing factor challenge during depression and after recovery," *Biol Psychiatry*, vol. 20, no.3, pp. 276-86, 1985.

[5] M. Ising, *et al.* "The combined dexamethasone/CRH test as a potential surrogate marker in depression," *Prog Neuropsychopharmacol Biol Psychiatry*, vol. 29, no.6, pp. 1085-93, 2005.

[6] LA. Jans, *et al.* "Serotonergic vulnerability and depression: assumptions, experimental evidence and implications," *Mol Psychiatry*, vol. 12, no.6, pp. 522-43, 2007.

[7] S. A. Johnson, N.M. Foumier, and L.E. Kalynchuk, "Effect of different doses of corticosterone on depression-like behavior and HPA axis responses to a novel stressor," *Behav Brain Res*, vol. 168, no.2, pp. 280-288, 2006.

[8] H. W. Kessels, and R. Malinow, "Synaptic AMP A receptor plasticity and behaviour," *Neuron*, vol. 61, no.3, pp. 340-350, 2009.

[9] S. Maeng, C. J. Zarate, J. Du, *et al.* "Cellular mechanisms underlying the antidepressant effects of ketamine; role of alpha-amino-3-hydroxy-5-methylisoxazole-4-propionic acid receptors," *Biol Psychiatry*, vol. 63, no.4, pp. 349-352, 2008.

[10] S. Meltzer-Mody, *et al.*, "Elevated corticotropin releasing hormone (CRH) during pregnancy and risk of postpartum depression (PPD)," *J. Clin Endocrinol Metab*, vol. 96, no.1, pp. 40-47, 2011.

[11] B. S. McEwen, "Glucocorticoids, depression, and mood disorders: structural remodeling in the brain," *Metabolism*, vol. 54, no.5, pp.20-23, 2005.

Received: May 26, 2015 Revised: July 14, 2015 Accepted: August 10, 2015