RedWhitepress https://series.gci.or.id

Global Conferences Series:
Social Sciences, Education and Humanities (GCSSSEH), Volume 5, 2020
Progress in Social Science, Humanities and Education Research Symposium
DOI: https://doi.org/10.32698/GCS-PSSHERS369

The Influence of Monosodium Glutamate in Stimulating the Mice (Musmusculus) Follicle Hormone of Female Japanese Strain

Maidawilis
Faculty of Sport Science, Universias Negeri Padang, Indonesia
E-mail: maidawiliws73@gmail.com

Abstract: Monosodium Glutamate (MSG) is one flavoring that many widely used by the communities. Besides the flavoring, it turns out MSG effects side in the hypothalamus which causes the ablation of examination seen a decrease in cell size, the density and volume of FSH, hyperplasia and diminution of size gonadotrope FSH gonad trope causes a decrease in the secretion follicle stimulating hormone (FSH) into the blood. With reduced levels of FSH in the blood that to the target organ also inadequate to support the development of the gonads that hypogonadism occurs. This research was conducted with the kind of experimental research design laboratories posttest only control group design that aims to determine the provision of MSG on levels hormones FSH mice (Mus muscular) females. Subjects numbered 30 mice, grouped into 5 groups: one control group and four treatment groups based on MSG difference P1 dose administration of 0.048 mg/ ml/ head/ day, P2 MSG dose of 0.072 mg/ ml/ head/ day, P3 MSG dose of 0.096 mg/ ml/ head/ day and p4 0.12 mg/ ml/ head/ day, administered daily per oral dissolved in 1 ml of distilled water for 20 days beginning in early proestrus phase. Variables examined were the levels of FSH . Then the results were analyzed by using ONE WAY ANOVA followed by comparison Multiple Test Type Bonferooni. Results showed that administration of MSG invitation dose of 0.072 mg/ ml/ head/ day, 0.096 mg/ ml/ head/ day and 0.12 mg/ ml/ head/ day to give effect a significant reduction of the FSH hormone levels ($p < 0.05$) , although not significant influence. The study concluded that administration of MSG to mice can reduce FSH levels.

Keywords: Monosodium glutamate, mice (musmusculus) follicle hormone

INTRODUCTION

The advance of information technology impact to the change of style community life, including changing patterns consumption of more food eating fast food type, food packaging, and reserved the lately more and more sold in the traditional market and self –service. The use of additional of food substances is commonly found. One of them is flavoring ingredient that often used as L-acid compound glutamate, namely Monosodium Glutamate salt (MSG), (Tranggono et al, 1989). Various MSG has been known trademark in society at large as Ajinomoto, MSG, Micin, Sasa, Miwon, and so on, (Donatus, 1990; Maun 1998). MSG is a seasoning the third most used in the world, after the salt and pepper. Average consumption of MSG in the world exceeds 67.5 million Kg/ year (Esminger, 1995). In 1995, Frank reported the existence of a "Chinese restaurant syndrome" which showed symptoms of illness, among others heartburn, a sense of tingling on the face impaled and the neck, chest tightness and some reaction sensitivity that may occur due to MSG among others headache, migraine, convulsions, vomiting, nausea, palpitations, shortness breath and spots on the skin. MSG causes a decrease which means the histamine content in central nervous system, (Fahim et al, 1999). MSG also causes brain damage (Olney et al, 1970). MSG causes obesity and disorders growth and development of the body on neonatal rats. In additional, some researchers say that MSG cause interference endocrinal through hypothalamic- pituitary mechanism (Airoldi, 1980; Donham, 1990).

Gonadal axis function can be turned on under certain conditions such as physical stressors, chemicals, and psychological. These stressors can cause imbalances the hypothalamus-pituitary-ovarian axis. The imbalance of the reproductive system generated can be disturbances or suppression of ovulation. Reproductive disorders can occur in the form of menstrual disorders which includes the delay menarche, phase luteal brief and inadequate, even secondary amenorrhea occurs. This can cause infertility reversible (Arsyad, 2007). Two gonadotropin hormones FSH (follicle- stimulating hormone) is secreted by anterior

pituitary, through stimulation Gonadotropin Releasing Hormone (GnRH) of the hypothalamus (Ganong, 2001). Hormone is also intensified gonadotropin preovulatory growth and secretion of estrogen and progesterone, which have a mechanism feedback on the hypothalamus (Turner, Bagnara, 1976). From the physiological work endocrinal, it is alleged that MSG cause damage to the system and reproductive organs.

Hormonal disorders can cause disruption in development process and the formation of germ cells (ovum) through the process of oogenesis. It occurs within the ovary through certain stages and controlled by hormonal, especially hormone Gonado Tropin Follicle Stimulating Hormone (FSH) . FSH functions to stimulate follicular development in the ovaries to ovulation, and LH also play a role in the development of the corpus luteum, while LTH serve to maintain and stimulate the corpus luteum to produce hormone progesterone (Ganong, 2001).

Normally GnRh is secreted in pulsation episodic. It is important for normal secretion of FSH and LH (Ganong, 2001). In the study, it can be shown that changes in the secretion of FSH and LH require spending by pulsatile GnRH with frequency amplitude in the critical limit. This matter has been proved by research on apes by 1 microgram of GnRH/ min for every hour (1 pulse/ h) produce GnRH concentration in the blood of the portal human ± 2 micrograms/ ml. hike GnRH pulse frequency to 2 and 5 pulse/ clock will stop secretion gonadotropin. Gonadotropin secretion will also be GnRH down when the dose is increased (Speroff, 1994).

The primary follicles are stimulated by the hormone FSH. When the follicle develops into the follicle Graff ripe, these follicle also produce the hormone estrogen stimulates the release of LH from the pituitary. Estrogen stimulates the exit function repair the walls of the uterus endometrium who finished peeling the time of menstruation, other than that estrogen inhibits the formation FSH and ordered pituitary LH stimulate the functioning produce Graaf follicles are ripe to hold ovulation, around the time of ovulation called the estrus phase (Shcarer, 2008). Generally MSG capable FSH hamper performance, so that the activity primordial follicles into primary follicles also join hampered. As a result, in mice MSG was given, the number of primary follicles tend down compared to the control although not significantly. It is because MSG can cause hormonal disturbances in mouse. Ion glutamate in the portal circulation will affects the hypothalamus in produces GnRH (Gonadotropin Releasing Hormone) which in turn will interfere in the anterior pituitary producing FSH and LH (Burkitt, 1995).

Hormonal disorders due to the influence MSG white rats causes the process follicular development was not running normal, so most folliclesbe atretic. Significant influence occurred at dose treatment of 140 mg/ 200 g BB because it is the highest dose of MSG, so that the risk of disruption hormonal most, whereas treatment the dose of 77 mg/ 200g BB, 98 mg/ 200g BW, and 119 mg/ 200g BW is not affect the number of secondary follicle compared with controls (Megawati, 2005). In addition, some researchers said that Monosodium Glutamate (MSG) can cause interference Endocrine through the mechanism of hyphotalamic pituitary, with consumption of MSG given can affect the mechanism Hyphotalamic- Pituitary- Axis ovaries. Luteinizing Hormone (LH), Folicle Stimulating Hormone (FSH), LH decreased resulting in disrupted ovulation, development of the corpus luteum declines occurred disruption of production of the hormone progesterone, FSH decreases can inhibit the development follicles in the ovaries and ovarian atresia resulting in disruption in production hormone estrogen (Donham et al., 1990).

According to the research that has performed by Nizamudin (1993) reported that the effect of MSG orally on spermatogenesis and fertility of rats white male adult, with doses of 2400, 2800, and 9600 mg/ kg/ day for 49 days, diameter reduction effects semniferus tubules and cause disruption of spermatogenesis in accordance with MSG doses given magnitude.

A study of children aged mice 5 days the mother was given orally MSG during gestation at a dose of 2400 mg/ kg agency, 4800 mg/ kg body weight, and 9600 mg/ kg body weight, apparently at a dose of 4800 mg/ kg body weight occurs minor damage and heavy on the hypothalamic neuronal cells from cell edema and edema accompanied piknotik cell nucleus. Whereas at a dose of 9600 mg/ kg severe body damage neuron cell hypothalamus in the form of cell edema and piknotik core (Sekawan, 1995).

Another study conducted in children male and female mice newborn by subcutaneous injection of day 2 until day 11, with a dose gradually increased, from 2.2 to 4.2 mg/kg body weight. Apparently after adult, when the male mice mated the female mice were given MSG, then number of pregnancies and the number of children decreases significantly in female mice that given MSG. in the female mice and mice males were given MSG, a reduction severe endocrine glands, which glands pituitary, thyroid, ovary, and testis. After adult, the female mice were given MSG delays and vaginal canalization had a longer estrous cycle than the control. As adults, the mice males were given MSG obtained- sign signs of decreased fertility, for example, weight reduction in testis, pituitary, and underscended testis (Trentini, Botticelli 1990)

Journal of Nutritional Sciences 2000 reported glutamic acid levels in human blood begins to rise after MSG consumption of 30 mg/kg body weight/ day, which means it starts to outstrip ability metabolism. If still within the limts of control, increased level of this will drop back to normal levels or like the original levels in

3 hours, mean average per day is limited additions maximum 2.5-3.5 g MSG (weight 50-70 kg), and should not be in high doses at the same time. While, one teaspoon mean average contains 4-6 grams of MSG. also turns MSG easier to effect when presented in the form of foods. (Walker, 2000).

So far there has been no research clearly report whether granting MSG can affect the level of FSH . So researchers interested in studying the effect of MSG continuously and constantly during estrous cycle with using experimental animals. As for animals try used were mice (Mus musculus). It because this animal is easy to get, the price is relatively cheap, maintenance is not too difficult, costs low maintenance and mice can also be used to represent mammals including human. Based on the above, this study is to determine the effect of monosodium glutamate to the FSH hormone levels hormone levels in female mice (Mus musculus).

METHOD

This type of research is experimental design posttest only design group (Zainuddin, 2000).

RESULTS

The result of the study has done on the influence the provision of MSG to the FSH hormone and environment. Before undergone a statistics about the influence of the provision of MSG to the hormone FSH and environment first undergone a normality with Kolmogorov- Smirnov. Normality test hormone FSH levels and environment mice (Mus musculus) the female in the control group to the treatment group.

Table 1. Normality test hormone FSH levels and environment mice (Mus musculus) the female in the control group to the treatment group

Group	The average score of FSH
	FSH
Control	0.745
P1	0.934
P2	0.995
P3	0.899
P4	0.601

Based on the normality test above, it turns out that value p is greater than 0.05, so that it can be assumed that data is normally distributed (table 1). Thus, the next can be carried out parametik.

Table 2. FSH levels of mice *(mus musculus*) to control and treatment groups.

TREATMENT	REPEAT					SD	
	1	2	3	4	5		
CONT	0.442	0.538	0.432	0.462	0.468	0.468	0.041
P1	0.426	0.442	0.408	0.446	0.408	0.426	0.018
P2	0.367	0.387	0.419	0.403	0.465	0.408	0.037
P3	0.392	0.395	0.420	0.450	0.376	0.406	0.028
P4	0.398	0.378	0.402	0.408	0.039	0.396	0.011

From table 2, it can be seen that the average of FSH level in the control group was 0.468 miu/ ml, while FSH level in the treatment group decline in accordance with the size of the MSG given. Statistical test One Way Anova ($p<0.05$) shows control group to the treatment group. hence, statistical tests followed by multiple comparisons post hoc test type of bonferroni and the results could look at in table 3.

Table 3. The results of statistical test multiple comparisons levels FSH control and treatment groups.

Control	The provision Of MSG mg	P
Control	[2400]	0.351
	[3600]	0.044
	[4800]	0.036
	[6000]	0.011

From table 3, it can be seen that the difference between the control group and treatment group show meaningful differences ($p< 0.05$) begins in the provision of MSG 2400 mg. it also on the provision of MSG 3600 mg, 4800 mg, and 6000 mg give the difference meaningful.

Statistical tests one Way Anova ($p<0.05$) shows differences in meaningful between the control group and the treatment group. Hence statistical tests followed by multiple comparisons (post hoc test) type.

Group show meaningful differences ($p<0.05$) begins in the provision of MSG 2400 mg. it also on the provision of MSG 3600 mg, 4800 mg, and 6000 mg give the meaningful difference of bonferroni and the results can be seen on the table 4.

Table 4. The results of statistical test multiple comparisons the environment control and treatment groups.

Control	MSG mg	P
Control	[2400]	1.000
	[3600]	0.173
	[4800]	0.133
	[6000]	0.111

From table 4, it can be seen that the difference between the control group and the treatment group do not show meaningful differences ($p>0.05$) but occurs a tendency the decline in.

DISCUSSION

FSH

The survey results revealed FSH levels in mice decreased in accordance with the increasing amount of MSG given. After analyzing the data with One Way Anova statistical test shows the differences in the level of FSH ($p<0.05$) between the control and the treatment group. then followed by a statistical test Multiple Comparison kind Bonferroni and in the know that between the control and the treatment group had shown a significant difference from MSG 2400 mg. this shows that the MSG administration at a dose of 2400 mg is started to give effect to the levels of FSH.

Likewise for granting MSG 3600 mg, 4800 mg, and 6000 mg alleged that the administration of MSG low alone was cause changes in hypothalamic pulsatile GnRH which exceeded the critical limit, resulting in GnRH production decline significantly which resulted in down-regulation of the anterior pituitary resulting lowering the secretion of FSH (Sperrof, 1994). Giving MSG affect hormonal systems in the hypothalamus in produces Corticotropin Releasing Hormone (CRH). Increased CRH in hypothalamus also inhibits the secretion of GnRH. Consequently, it reduces the stimulation to the anterior pituitary so that it can lowering the secretion of FSH (Sherwood, 2001). Setting hormonal function female reproductive occur in a pathway called Axis Hypothalamus Hipofisi Ovary. It is important for the secretion of FSH .

It is proved by research Nizamudin (1993) with MSG administration orally against spermatogenesis and fertility of rats adult male, with a dose of 2400, 4800, and 9600 mg/ kg/ day for 49 days, diameter reduction effects semniferus tubules and cause disruption of spermatogenesis in accordance with the magnitude of a given dose of MSG. a study of children aged mice 5 days the mother was give orally MSG during gestation at a dose of 2400 mg/ kg agency, 4800 mg/ kg body weight, and 9600 mg/ kg body weight, apparently at a dose of 4800 mg/ kg body weight occurs minor damage and heavy on the hypothalamic neuronal cells from cell edema and edema accompanied piknotik cell nucleus.

Whereas at a dose of 9600 mg/ kg severe damage to the body of the neuron cell hypothalamus in the form of cell edema and piknotik core (Gang, 1995). Hormonal disorders due to the influence of MSG white rats causes the process follicular development was not running normal, so most follicles be atretik. Significant influence occurred at dose treatment of 140 mg/ 200 g BB (Megawati, 2005).The title is set 17 point Times Bold, flush left, unjustified. The first letter of the title should be capitalized with the rest in lower case. It should not be indented. Leave 28 mm of space above the title and 10 mm after the title.

CONCLUSION

The study concluded that administration of MSG to mice can reduce FSH hormone levels. It is recommended that further research be done on hormone levels estrogen and progesterone hormone levels due to the provision of MSG.

REFERENCES

Administration, U. S. F. D. 1995 FDA and Monosodium Glutamate (MSG), FDA Backgrounder

Airoldi L M, Bonfanti P, Ghezzi M, Saimona and S Garratini, 1980. Effect of Pral Monosodium Glutamat on glutamic acid levels in the nucleus arcuatus of the hypothalamus and on serum osmolality of adult and infant mice. Toxicology Letter 7 (2): 107-111

Burki, K, 1986. Experimental Embriology of the Mouse, Monographs in Developmental Biology. Munchen, Paris, London, New York, New Delhi, Singapore, Turkey, Sidney: 19: 4-23

Burkitt HG, JW Heath, and B Young, 1995. Histologi Fungsional. Edisi 3. Penerjemah: J. Tambojang. Jakarta: EGC

Camihort G, Dumm C G, Luna G, Fersese C, 2004. Relationship between Pituitary and Adpdiposa Tissue after Hypothalamic Denervation in the female rats.

Campbell, Kecce, 2004. Biologi. Universitas Airlangga Press, Surabaya

Danbolt NC, 2001. Glutame Up Take Prog Nevobiod: 65 (1) 1- 105

De Mello MA. Et al, 2001. Glucosa Tolerance and Insulin Action in Monosodium Glutamat Obest Exercises Trainet Rats Physio Chem Phys men NMB: 33 (1) 63-71

Dian Megawati, Sutarno, Shanti Listyawati, 2005. Siklus Estrus dan Struktur Histologis Ovarium Tikus Putih (*Ratus norvegicus L.*) Setelah Pemberian Monosodium Glutamat (MSG) Secara Oral Jurusan Biologi FMIPA Universitas Sebelas Maret (UNS), Surakarta.

Donatus I A, 1990. Toksikologi Pangan. Edisi I. Yogyakarta: PAU Pangan dan Gizi, UGM

Donham RS, KM Ogivile, TM. Kerner, and MH. Steson. 1990. Daily Rhythms of Luteinizing Hormone and Follicle Hormone Persist in Female Hamsters Sterilized by Neonatal Administration of Monosodium Glutamate Biology of Reproduction 43: 392-396

Enttwistle KW Ridd Cay, 1995. Asai Hormon dengan Elisa, Graduate School of Tropical Veterinari Science James Cook University of North Queensland PP: 557-464

Esminger, AH., ME. Esminger, JE. Konlande, and JRK. Robson. 1995. The Concise Encyclopedia of Foods and Nutrition. New York: CRC Press

Fahim E, AM Rahman and MM. Fathi. 1999. Effect of Monosodium Glutamate and Sodium Benzoate on Histame Content and Their Potential Interaction with Anthitasminic in Different CNS Areas of Albino Rat. Egyptian Ger. Society of Zoology Journal 29 (A): 1-16

Frank C, 1995. Toksikologi Dasar., Asas, Organ masalah Keamanan MSG. Yayasan Lembaga Konsumsi Indonesia 1986, 1-8

Giovambatista AO, Suescun M, CDL nessrala, R Franca. 2003. Modulator Effect of Leptin on Leydig Celly Function of Normal and Hyperleptinemic Rats. Reproductive neuroendocrinology, 78, 270-279

Gold M, 1995. Monosodium Glutamate

Hermannusen M, Gracia A., Sunder M, Voigt M., Salazar V, 2006. Obesity, Voracity and Shot Stature the Impact of Glutamate on the Regulation of Appetite. European Journal of Clinical Nutrition.

Laurence DR and Bacharach, 1984. Evaluation of Drug Activities Pharmacometrics

Lewis D. Stegink., L, J Filer, J. G. L. B. 1973. Monosodium Glutamate metabolism in the Neonatal Pig: Effect of Load oPlasma, Brain, Muscle and Spinal Fluid Free Amino Acid Level. Journal of Nutrition

Lindemann B., Ogiwara Y and Ninomiya Y. 2002. The Discovery Umami. Chemical Senses. Universitaas des Saarlandes, Medical Faculty, Physiology

MN Munro. 1979. Factor in the Regulation of Glutamate Metabolism. Raven Perss

Nizamuddin, 1993. Pengaruh pemberian Monosodium Glutamat Peroral Terhadap Spermatogenesis dan Kesuburan Tikus Putih Jantan Dewasa Stain MLR. Tesis Magister Program Studi Biomedik, Program Pasca Sarjana Universitas Indonesia.

Olney JW. 1970. MSG and Aspartate Cause Brain Damage Following a Single Low Leveldose. Nature: 277

Park C H. et. Al; 2000. Glutamat and Aspartate Impair Memory Retention and Damage Hyothalamic Neuron Adult Nice Toxical Lett 2000 May 19115 (2) 117-125

Pizz W. J., Barnhart JE, Fanslow DJ. 1990. Monosodium Glutamate Administration to the new Born Reduces Reproductive Ability in Female and Male Mice. Science: 196,

Pulido, S. G. A. O and Bigiani, A. 2005. Glutamate Receptors in Peripheral Tissue, Excitatory Transmission Outside the CNS, Springer US

Rabe Thomas, 2002. Buku Saku Ilmu Kandungan. Jakarta: Hipokrates, 2002

Rosanti Muchsin. 2009. Pengaruh Pemberian Monosodium Glutamate Terhadap Histologi Endometrium Mencit (Mus musculus), Tesis Magister program Studi Biomedik, Program Pasca Sarjana Universitas Sumatera Utara

Rugh Roberts. 1986. The Mouse, Its Reproduction and Development. Minneapolis. Burgess Publishing Co, 1-430

Shearer J K, 2008. Reproductive Anatomy and Physiology of Dairy Cattle. University of Florida. Florida

Sheerwood, L. 2004. The Reproductive System in Human Physiology Cell to System (5th Edition)

Singgih, S. 2005. Menggunakan SPSS untuk Statistik parametric. PT Elex Media Komputindo. Jakarta

Speroff L, Glass RH, Kase NG, 1994. Clinical Gynecologyc Endocrinology and Infertility, 5th ed. Williams and Wilkins

Suntoro H. 1983. Metode Pewarnaan (Histologi & Histokimia). Jakarta: Penerbit Bhrartara Karya Aksara.
Syachman MH. Sistim Reproduksi Betina. Dalam: Reproduksi dan Embriologi, Seri Biologi Kedokteran, Fakutas kedokteran, Universitas Indonesia 1994: 25-44
Tamyis A, I. 2008. Siklus Estrus. FMIPA, Universitas Brawijaya Malang
Tranggono. 1989. Bahan Tambahan Pangan (Food Activities). Yogyakarta: PAU Pangan Gizi UGM
Trentini, Botticelli A. 1990. Effect of Monosodium Glutamate on the Endocrine Glands, and Reproductive Function of the Rat, Fert. Steril, 25,: 478-483
Turner CD, Bagnara JT, 1976. Endokrinologi Umum. Edisi Keenam. Penerjemah: Harsojo. Surabaya: Airlangga University Press
Uke Yohani Sekawan, 1995. Efek Toksik Monosodium Glutamate (MSG) pada Binatang Percobaan Fakultas Kedokteran Universitas Kristen Indonesia
Vitt, U A., E A, McGee, M. Hayashi, and Hsueh, A JW, 2000. In Vivo Treatment with GDF-9 Stimulates Primordial Follicle Progression and Cell Marker CYP17 in Ovaries of Immature Rats. Endocrinology Journal 141: 3814-3820
Walker R. and Lupien, J.R. 2000. The Safety Evaluation of Monosodium Glutamate. J Nutr. 130: 1049S-1052S, 2000
Wiknjosastro H, 1997. Fisiologi Haid. Dalam: Ilmu Kebidanan Edisi 3. Yayasan Bina Pustaka Sarwono Prawirohardjo. Jakarta. Pp: 45-54
Yatim, W. 1994. Reproduksi dan Embriologi untuk Mahasiswa Biologi dan Kedokteran, Tarsito, Bandung
Yuf Shi W, Ma R, Yu L. 1997. Effects of Material Oral Administration in Monosodium Glutamate at a Late Stage of Fragnancy on Developing Fetal Brains, Brains Res 1997, Feb 7, 747 (2) 195-206
Zainuddin M, 2000. Metodologi Penelitian. Universitas Airlangga Press. Surabaya