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ADMINISTRATION OF TEMPEH ETHANOL EXTRACT ON PRENATAL UNTIL WEANING PERIOD INHIBIT THE OVARY FOLLICLES DEVELOPING OF LITTLE WISTAR RATS Ni Nyoman Budiani1*, Ni Ketut Somoyani2. Gusti Ayu Marhaeni3, Gusti Kompiang Sriasih4 Luh Putu Sri Erawati5 1-5 Midwifery Department, Health Polytechnic, Indonesia Ministry of Health Denpasar Bali *Corresponding Author email ABSTRACT
Background and objective: soybean tempeh contains isoflavones that are able to bind to estrogen receptors, so they have estrogenic properties.

This study aims to prove that the administration of tempeh soybean extract during periods of perception can inhibit the formation of ovarian follicles. Method: posttest only control group design, using female rats aged 12-13 weeks with BB 150 g, a research site in Udayana University's integrated laboratory. Result: the results showed that there were significant differences in the mean number of follicles in the three groups, namely primordial, primary, secondary was p <0.01; atretic follicles was p <0.05.

Conclusion: the administration of ethanol extract of tempeh during the perimenopause periode can inhibit the formation of primordial follicles, primary follicles, and secondary follicles. High doses can increase the average number of atretic follicles.
Keywords: ethanol extract tempeh, perimenopause period, ovarian follicles
INTRODUCTION Infertility is a failure of couples gets pregnant after sexual intercourse routinely without contraception for 12 months. Riset Kesehatan Dasar (Riskesdas) Indonesia in 2013 found 43.2% married couples do not use contraception because they want children1. World Health Organization (WHO) estimates that 10-15% of couples in the world experience infertile2.

The cause of infertility due to ovulation disorders of 27%, and 25% due to spermatozoa

disorders3. Ovulatory disorders can occur because of the lack of proper follicles to be recruited and selected so that the follicle is ready for ovulation is also less likely to be absent. Problems with follicular development may occur during the period of perception, ie before, during, and after conception.

This period as a critical period is sensitive to exposure or events that interfere with the physiology of cells, tissues or organs4. The primordial germ cells in the fetus, arrive in the gonads and undergo sexual differentiation at 4-6 weeks gestation. Ovum differentiation requires the activity of the Y-group sex genes (SRY) to promote ovarian development by suppressing Sox9.

The germ cells in the ovaries experience mitosis rapidly so that the amount of oogonia multiplies. Oogonia is converted into a primary oocyte followed by meiosis as well as the development of its wrapping cells to form a primordial follicle and then develop into primary follicles to preovulatory follicles2,5. The recruitment of oocytes into primordial follicles is triggered by germ cells apoptosis, which begins at 13.5

post-coitus days in rate, due to decreased levels of estrogen and progesterone in pregnancy6,7. In addition to estrogen and progesterone hormone levels, genistein administration of 50 mg/kg BW/day for five days in 1 day-old rats also inhibits oocyte nest break and recruitment of primordial follicles8.

Oocytes that fail to grow degenerate and become follicular atresia, so the number of ovarian follicles continues to decrease to 2 million follicles at birth2. A large number of stimulated follicles grows and subsequently develops atresia, causing fewer primordial follicle reserves9. The process of apoptosis is controlled by various cell signals, such as hormones, growth factors, nitric oxide and cytokine10.

Other factors such as nutrient intake and free radicals. Pregnancy increases oxidative stress due to high metabolic activity, characterized by increased placental lipid peroxide and decreased expression of antioxidant enzymes11. Soybean tempeh is one of the foods that have been consumed for generations.

Soybean tempe contains protein, carbohydrates, fats, vitamins, minerals, and fiber12. In addition, it contains isoflavones consisting of daidzein, genistein, and glycitein13. Isoflavones have a chemical structure similar to estradiol that is able to bind to estrogen receptors, thus having estrogenic properties.

Isoflavone compounds are generally complex or conjugate compounds with sugar compounds through glucoside bonds. Genistein and daidzein are hydrolyzed by the

enzyme ß-glucosidase bacteria of the intestinal lumen into aglycons. The hydroxyl group possessing isoflavones is antioxidant14. Genistein and Daidzein can be transferred to the fetal body. The compound is also found in the stomach of infants after suckling on its mother who gets soy isoflavone15.
The results of studies on the effects of ethanol extract of tempeh during the period of periconception of little rats folikulogenesis not exist until today, so it needs to do further research.

This study aims to prove that, giving ethanol extract of tempeh able to influence the formation of primordial follicles, primary follicles and atresia follicles. MATERIALS AND METHOD
Animal
Female Wistar rats aged 12-13 weeks, healthy, selected as many as 18 tails with an average body weight of 150 grams. Wistar male rats aged 16-18 weeks selected 9 tails with an average weight of 190 g. The mice were obtained from the UNUD Integrated Biomedical Laboratory.

Material enclosure is a plastic box, measuring 40 cm x 15 cm x 10 cm. Each cage is equipped with a feeding and drinking place that is cleaned and replenished daily. The condition of the cage is kept clean, dry, good air circulation, stable room temperature, and calm atmosphere. Acclimatization is done for one week, the rats are given adjust to the light-dark cycle, covering 12 hours of light: 12 h dark.

Rats were given refill drinking water in ad libitum, and standard feed 12-20 g per day. If anyone is sick, the mouse is removed from the study sample, then treated.
Chemical material The soybean tempeh made by researchers from the local soybean varieties of Wilis, fermented for 48 hours. The tempe was extracted using 96% Ethanol and then the Freezy dryer was done. Every 100 g tempeh yields 4 grams of viscous extract, containing 1.04 mg / g of Genistein tested using thin layer chromatography (KLT) -Spektrofotodensitometri. The extract also contains Phenol 70.25 mg per 100 g GAE (Galic Acid Equivalent), antioxidant 152.31 mg / L GAEAC (Galic Acid Equivalent antioxidant capacity). Each 100 g of wet weight, containing 1.53 g water content, 0.22 g of ash, 1.94 g protein, 80.43 g fat, and 15.89 g of carbohydrate.

Research design Female rats were randomized after acclimation, divided into 3 groups, ie control (C) given aquadest 0.3 mL; treatment 1 (T1) was given extract of tempeh 0,1 g/kg BW/day; treatment 2 (T2) was given tempeh extract 5 g/kg BW/day. Each group numbered 6 tails. Treatment is administered orally via sonde, daily from 9:00 to 10:00 AM. Determination of dosage refers to the study of Lofamia et al (2014)16.

Treatment duration is about 56 days, covering 14 days before mating, about 21 days during pregnancy until the pup is born, and 21 days during breastfeeding. Dam rats mated, in one cage placed 1 male versus 2 females. The dam rat was found pregnant after a vaginal plug (+) was found. Pregnant rats are returned to their respective enclosures until weaning. Male rats are kept in one stable with their dam and pups siblings.

The rats were separated from their dams by age 21, randomly selected each of 2 females and males little rats per dam. The females were examined for this study, while the males were used for other studies. Selected little rast, euthanasia with cervical dislocation method. Surgery to take the ovaries of female little rats, followed by histopathological examination.

Gonadal tissue preparation The ovaries taken from the little female rats were fixed in a 10% formalin solution. The fixed tissue is processed, with the Meyer hematoxylin-eosin (HE) staining. Preparation done according to standard in a laboratory of pathobiology Faculty of Veterinary Medicine of Udayana University.

Sample histological observation Observations Primordial follicles, primary follicles, and follicular atresia were performed using the Olympus BX 51 brand microscope, the number of cells counted at 5 fields of view. The observations were conducted in the pathobiology laboratory of the Faculty of Veterinary Medicine of Udayana University.

Ethics
This research, before being implemented has been studied by the research ethics committe of Udayana University Medical Faculty / Sanglah Bali General Hospital. Statistical analysis Statistical analysis includes descriptive analysis. Comparative analysis using Independent t-test, ANOVA, after all data has the normal distribution. Data analysis using computer assistance, using 95% confidence level ($p < 0.05$).

RESULTS
General observations
A total of 18 rats were observed, but drop out 3 tail, that is each group of 1 tail. In group K, the mother rages and wounds her child; T1, sick mother; T2, the mother refused to breastfeed. The number of female children observed per parent is 2 little rats (10 little rats each group).

Comparison of the number of Primordial Follicles, Primary Follicles, Secondary Follicles, and Atretic Follicles / Figure 1 Mean of Primordial Follicles, Primary Follicles, Secondary Follicles, Atretic Follicles Figure 1 shows that the average number of primordial follicles, primary follicles and secondary follicles was lower in the treatment group (T1 and T2) versus control (C), while the number of follicular atresia lower in group C than treatment.

To know the differences between the three groups and the differences between groups, One Way Anova analysis was performed. The results of the analysis are presented in table 1 below. Table 1 Difference Count of Primordial Follicles, Primary Follicles, Secondary Follicles, and Atretic Follicles in Three Groups (C, T1, T2) Follicles _F _p* _ _Primordial Follicles _20.034 _0,000 _ _Primary Follicles _12.881 _0,000 _ _Secondary Follicles _9.466 _0,001 _ _Atretic Follicles _4,03 _0,029 _ _p* significant p<0,05 Average the three groups appear significantly different at primordial follicles (p <0.01), primary follicle (p <0.01), secondary follicles (p <0.05), and follicle atresia (p <0.05).

To find out the intergroup comparison, the test is followed by Post Hoc Multiple Comparison: LSD test. Table 2 Average Comparison of Number of Primordial Follicles, Primary Follicles,
Secondary Follicles, and Atretic Follicles Follicles _Between Group _P _ _Primordial _C-T1 _0,000** _ _ _C-T2 _0,000** _ _ _T1-T2 _0,000** _ _Primary _C-T1 _0,002** _ _ _C-T2 _0,000** _ _ _T1-T2 _0,171 _ _Secondary _C-T1 _0,023* _ _ _C-T2 _0,000** _ _ _T1-T2 _0,064 _ _Atretic _C-T1 _0,632 _ _ _C-T2 _0,013* _ _ _T1-T2 _0,038* _ _C=control group; T1 = treatment 1 group given ethanol extract of tempeh 0,1 g / kgBB / day; T2 = treatment 2 group, given ethanol extract tempeh 5 g / kg BB / day. * p value <0.05 which means there is a significant difference mean the number of follicles between the two groups. ** p value <0.01 which means there is a significant difference mean the number of follicles between the two groups.

Table 2 shows that the comparison of the number of primordial follicles, primary follicles, and secondary follicles between groups of C with T1 and group C with T2 is significantly different. The comparison of primordial follicular and follicular atresia between T1 and T2 groups was significantly different, while the mean of primary and secondary follicles did not differ. Comparison of mean of follicular atresia between group C with T2 and T1 with T2 was significantly different, whereas C with T1 was not different.

/ / / DISCUSSION
The formation of primordial follicles in the ovaries occurs only once in a woman's lifetime, so the loss of the follicle at the beginning of the lifespan greatly affects the

follicle reserve in the woman's reproductive life. Administration of low dose (0.1 g/kg BW/day) and high doses (5 g/Kg BW/day) tempeh ethanol extract since preconception to weaned causes formation of primordial follicles, primary follicles, and secondary follicles to be lower than the control group. This indicates the existence of inhibition to the formation of these three follicles.

In this study, there appears to be a inhibit of recruitment of primordial follicles which causes the number of follicles to be less than the number of primordial follicles of control group of little rats. In this study, tempeh ethanol extract given containing isoflavones (genistein 1.04 mg/g extract) and flavonoids may cause estrogen levels remain high until late pregnancy and postpartum, so as to inhibit the breaking of the oocyte nest.

In addition, the antioxidant properties of isoflavones may also be capable of inhibiting germ cell apoptosis. Both of these events (inhibit of oocyte nest breakdown and apoptosis) lead to the recruitment of primordial follicles to be inhibited as well, resulting in the number of primordial follicles becoming slight.

The results of this study are in line with the opinion, that the effect of genistein exposure on ovarian development of little rats, is unfavorable. At birth, rats have large oocyte nests, and during the first week of life, these oocyte nests dissociate into individual oocytes surrounded by granulosa cells. This process of ovarian differentiation requires decreased estrogen and progesterone postpartum.

Neonatal treatment with estrogens such as 17ß-estradiol and genistein interferes with this process6,7,17. Giving genistein injection 50 mg/kg BW/day for five days in 1 day-old rats inhibited the breakdown of the oocyte nest and the recruitment of primordial follicles8. Administration of genistein subcutaneous injections of 50 mg/kg BW/day for three days in 18-21 day-old rats caused the number of primordial follicles and fewer primary follicles than the control group18.

Primary follicles are a further development of primordial follicles characterized by the change of pregranulosa cells into granulosa surrounding the oocyte. Under the influence of growth factors and other factors, primary follicles develop into secondary follicles, characterized by oocytes surrounded by several layers of granulosa cells19. Once the primordial follicle is formed, the oocyte begins to meiosis.

Oocytes develop through meiosis I to the diplotene stage of prophase I 20,21.

The number of follicles of atresia was highest in the high-dose treatment group (T2). The number of follicular atresia in the group was significantly different with the low-dose treatment group and the control group. The results of this study support the finding that the administration of subcutaneous genistein increases the number of follicular atresia in large follicles and small follicles18. Giving 100 mg of soy isoflavone/kg BW/day increases the number of cells in the antral follicle having atresia in mice.

Increased incidence of atresia may be associated with increased apoptosis in the follicle due to low levels of FSH. Isoflavone administration may increase serum estradiol levels. This may provide negative feedback to the pituitary so that FSH levels become low and inhibit the expression of FSH receptors 22,23,24.

This phenomenon occurs because of increased levels of protein factor apoptosis caspase3, FAS, BAX, combined decreased levels of protein factor antiapoptosis BcL2 25,26. This study is consistent with the findings of Budiani et al., that the administration of Genistein during the periconception period results in inhibition of leydig cell, sertoli and spermatogonia cells formation in male little rats27 CONCLUTION This Study conclude that the formation of primordial, primary, and secondary follicles is inhibited in Wistar rats who received exposure to tempeh ethanol extract (high and low doses) since the preconception period. However, follicular formation of atresia is triggered by high doses.

CONFLICT OF INTEREST All author declare that there is no any conflict of interest within this research and publication including the financial agency. ACKNOWLEDGMENT Acknowledgments are given to Directur of Health Politechnic, Indonesia Ministry of Health Denpasar Bali, the Chairman of the Biomedical Laboratory of the Faculty of Medicine and the Head of Biopathology Laboratory of the Faculty of Veterinary Medicine of Udayana University.

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