Potential of Uwi (*Dioscorea alata L.*) as Antiosteoporosis in Histopathological Appearance of Rat Bone (*Rattus novergicus*)

Ismedsyah[1], Lavinur[2], Melva Simatupang[3]
[1,2,3]Poltekkes Kemenkes Medan, Indonesia
Email: ismedsyah@gmail.com

Abstract

Estrogen deficiency can be overcome by hormone replacement therapy, but it causes various unwanted effects in the long term. Phytoestrogens meet the criteria for having estrogen-like activity. Sweet potato root (*Dioscorea alata L.*) as a phytoestrogen was used in this study to anticipate bone loss (osteoporosis) in postmenopausal women. This study aims to determine the potential of uwi in bone density in rats by looking at the decrease in the number of osteoclasts. Laboratory experimental research method with a research design using RAL (Rak Complete) with five treatments and six replications. The results showed that the average number of osteoclasts from the negative control group was 4.67; the positive control of 2.83; by offering uwi extract at a dose of 600 milligrams/200 grams. Rat BB 2.16; presented Uwi extract dose of 800 milligrams/200 grams of rat B.B. as much as 2.83; presented Uwi extract at a dose of 1000 milligrams/200 grams Rat BB 1.0; and 2.5 . false group. This study concludes that Uwi is likely to maintain bone density in rats with osteoporosis by decreasing the number of osteoclasts.

Keywords: *Anti-Osteoporosis, Ovariectomy, Uwi, Rattus Norvegicus, Na Alendronate.*

A. INTRODUCTION

The health of postmenopausal women really needs to be a concern. In a postmenopausal woman, there will be a cessation of the production of the hormone estrogen. One of the functions of the hormone estrogen is to help the process of bone formation osteoblasts. As a result of the cessation of the production of the hormone estrogen in a postmenopausal woman, osteoporosis may occur. The World Health Organization (WHO) includes osteoporosis in the list of 10 major degenerative diseases worldwide. It is noted that there are approximately 200 million patients worldwide who have osteoporosis.

The latest source data from the Indonesian Ministry of Health's Pusdatin (2015) shows that osteoporosis causes the highest incidence of fractures in women aged 95-99 years with a total of 1680 cases and the lowest at 40-44 years with a total of 8 points. Meanwhile, the highest incidence of fractures was in men aged 90-94 years with 718 cases, and the lowest was at 40-44 years with 10 points.

The results of research by Gunawan et al. (2006) at the Osteoporosis Center, R.S. Media Jakarta, concluded that the prevalence of osteoporosis in women tends to increase with age. The increased prevalence of osteoporosis is caused by menopause and also due to decreased production of the hormone estrogen.

The state of estrogen deficiency or menopause in a woman, can generally be treated with hormone replacement therapy. Hormone replacement therapy can be done by giving synthetic estrogen hormones. However, hormone replacement therapy in the long term turns out to have various unexpected side effects, such as breast pain, vaginal bleeding, and triggering breast cancer. Multiple studies have been conducted to find other alternatives as a substitute for hormone replacement therapy. The option chosen must meet the criteria of being natural, easy to obtain, and effective. Phytoestrogens meet the natural criteria, are easy to obtain and are a substrate from plants with high activity Estrogen-like (Glover & Assinder, 2006).

According to Jefferson et al. (2002), phytoestrogens are naturally occurring decomposers found in plants that have many similarities to estradiol, the most potent natural form of estrogen. Phytoestrogens have a better safety effect than synthetic estrogens or hormonal replacement therapy (HRT) (Achdiat, 2003). Purple yam tuber (*Dioscorea Alata L.*) has five estrogenic compounds based on the activity of 5 ligand-dependent transcription compounds (Sri Tasminatun, 2014). A study was conducted to increase bone calcium levels in ovariectomized rats. The results obtained were 85% ethanol extract of purple yam tuber (Dioscorea alata L.) with a dose variation of 116; 232; and 463 mg/kg BB/day for 30 days cannot increase bone calcium levels as an anti-osteoporosis (Tasminatun, 2014).

In this study, we will conduct an experimental research to look at the antiosteoporosis potential of 85% uwi ethanol extract through histopathological images of rat bones. The study was carried out using several test animals, namely female white rats ovariectomized, to obtain postmenopausal conditions. The administration of 85% ethanol extract of the wheat germ was carried out with different doses of 600 mg/200 g B.B., 800 mg/200 g, and 1000 mg/200 g BB BB rats, to get the optimal amount.

B. METHOD

1. Types of experimental laboratory research by design

The study used RAL (Completely Randomized Design) with five treatments and six replications. The control group (+) in ovariectomized female rats without extract treatment, and the control group (-) is normal female rats. In contrast, the treatment group is the treatment group ovariectomized female rats with Uwi plant extract (Dioscorea alata) with three different doses, namely P1 600 mg /kg BB, P2 800 mg/kg BB, and P3 1000 mg/kg BB.

2. Population and Sample

The test animals used were white rats (Rattus norvegicus). Ovariectomized female sex, 50 days old with an average B.B. of 200-350 grams and normal white rats (Rattus norvegicus). Ovariectomized rats were obtained from the Biology laboratory, Faculty of Mathematics and Natural Sciences, University of North Sumatra (FMIPA-USU). The simplicia that will be used is Uwi dry powder (Dioscorea alata), obtained and determined from the Plant Taxonomy Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, University of North Sumatra (FMIPA-USU) Medan. IPA University of North Sumatra (FMIPA USU) Number 0630/KEPH-FMIPA/2021

C. RESULTS AND DISCUSSION

The results showed that the mean number of osteoclasts from the negative control group was 4.67; positive control of 2.83; by giving P1 Uwi extract dose of 600 mg/200 g B.B. rats of 2.16; administration of P2 Uwi extract dose of 800 mg/200 g B.B. rats 2.83; administration of P3 Uwi extract at a dose of 1000 mg/200 g B.B. rats of 1.0; and the sham S group of 2.5.

Table 1. The Mean Number of Osteoclasts

Group	Cell Mean Osteoklas	St. Deviasion
S	2.600	.2309
K(-)	3.650	.1915
K(+)	4.250	.9713
P1	2.000	.6928
P2	2.550	.3786
P3	700	.3830

Information :
S : *sham*
K(-) : Giving CMC 0,5%
K(+) : Administration of Sodium Alendronate 0.18 mg P1 : Administration of Uwi Extract Dosage 600 mg
P2 : Giving Uwi Extract Dosage 800 mg P3 : Giving Uwi Extract Dosage 1000 mg

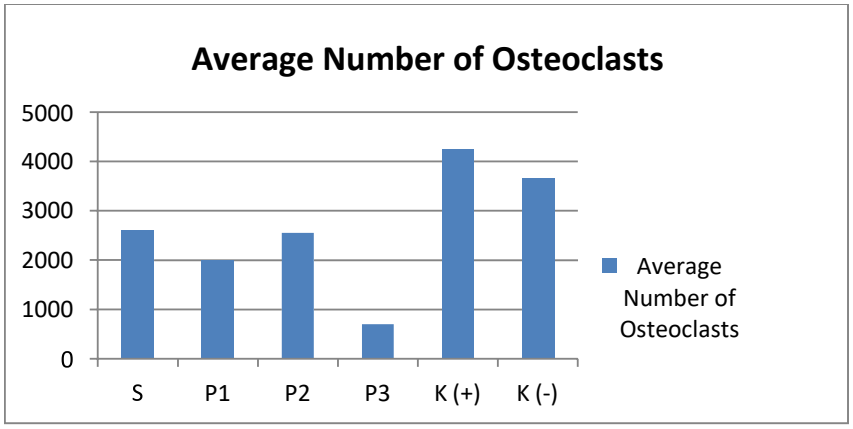

Figure 1. Average Number of Osteoclasts

The normality and homogeneity test results showed that the data were normally distributed and homogeneous ($p > 0.05$). Furthermore, the One Way Anova test was carried out, showing the results that there was a practical effect on the number of osteoclasts because the value was significant ($p < 0.05$).

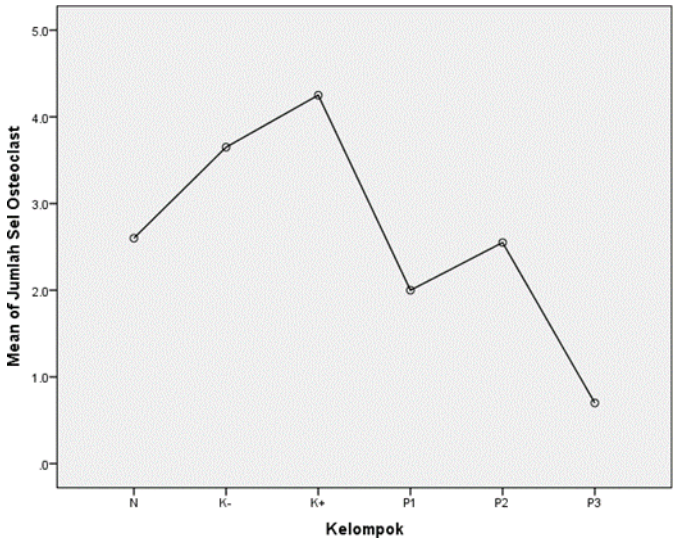

Figure 2. Result of One Way Anova Test

The LSD test results showed that there was a significant difference between the control group (+) and the 600 mg, 800 mg, and 1000 mg uwi extract groups because the value was significant ($p > 0.139$).

This study was to see a decrease in the number of osteoclasts caused by the potency of the extract of Uwi (Dioscorea alata L.) in ovariectomized white rats (Rattus novergicus). The average number of osteoclasts in the negative control group showed the highest number of osteoclasts compared to the positive control and other groups. The state of the highest number of osteoclasts follows the statement that ovariectomy can stop producing estrogen, decreasing estrogen. Decreased estrogen resulted in decreased intestinal calcium absorption and increased renal excretion of calcium. In bone, estrogen works to reduce the formation of osteoclasts and the activity of osteoclasts in bone resorption.

Uwi extract with 3 doses of 600 mg/kg BB, 800 mg/kg BB and 1000 mg/kg BB can reduce the number of osteoclasts in ovariectomized rats. Uwi extract has bioactive compounds that are beneficial to health, such as dioscin, diosgenin, and water-soluble polysaccharides (PLA), Prasetya (2016). Diosgenin is a steroidal sapogenin belonging to the triterpene group. It is essential in the pharmaceutical industry due to its function as an ingredient for producing corticosteroids, sex hormones, and oral contraceptives, Ortuno A.(2000). The decrease in the number of osteoclasts in this study may be due to a synergistic effect between the bioactive compounds in Uwi extract.

The group that was given Uwi extract at a dose of 1000 mg/kg BB significantly differed from the Sham group. This significant difference means that Uwi extract at a dose of 1000 mg/kg BB can reduce the number of osteoclasts and restore the number of osteoclasts to normal.

The positive control group (Na. Alendronate) was not significantly different from the group given Uwi extract at a dose of 800 milligrams/kg B.B. This significant difference means that Uwi extract at a dose of 800 milligrams/kilogram B.B. can be used as an alternative therapy for osteoporosis.

From the results of this study, it can be said that Uwi extract can reduce the number of osteoclast cells in ovariectomized white rats and has the potential as an alternative therapy for osteoporosis with an effective dose of 800 milligrams/kg B.B.

D. CONCLUSION

The study concludes that Uwi has the potential to maintain bone density in rats with osteoporosis because there is a decrease in the number of osteoclasts.

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