

# Analysis of the Use of Antioxidant (Vitamin C and E) on the Calculation of Blood Eosinophil on the White Missing White Walking Swiss Webster Character Exposed to Peat Smoke

Siska Delvia, SST., M. Bmd<sup>1</sup>; Muhammad Hasan Azhari, S.Kep., NS., M.Bmd<sup>2</sup>; Ns. Fitriani Agustina, S. Kep., M. Sc<sup>3</sup>; Handry Darussalam, M. Sc<sup>4</sup>

<sup>\*1</sup>Lecturer of the Department of Midwifery, STIKES Al-Ma'arif Baturaja

<sup>\*2</sup>Lecturer of the Department of Nursing, Akper Kesdam II/ Sriwijaya Palembang

<sup>\*3</sup>Lecturer of the Department of Nursing, Akper Al-Ma'arif Baturaja

<sup>\*4</sup>Lecturer of the Poltekkes Kemenkes East Kalimantan

Email: handry\_darussalam @ poltekkes-kaltim.ac.id

**Abstract— Background:** The peatlands fire produce particles and gasses component such as sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen oxide (Nox) and ozone (O<sub>3</sub>) that caused health problems. The expose of the smoke will activate CD4+ and mast cell on respiratory system. The CD4+ will differentiated into Th2, while in the differentiated proses, it will produce IL-4 and IL-5. Th2 that merge with IL-5 could activate and increase the eosinophil production. Eosinophil is an inflammation cell that have a main role in chronic inflammation proses of respiratory system. One effort to prevent the effects of smoke is by consuming antioxidants. This study aims to determine the analysis of antioxidant consumption to count the number of blood eosinophils in white male Swiss Webster strains exposed to peat smoke. This research is laboratory experimental research and the design used is Post Test Only Control Group Design. The research was carried out at the FK Unsri animal house for 30 days in July 2019. The samples were 33 male white Swiss Webster mice divided into 2 treatment groups and 1 control group. Data were analyzed by the Kruskal-Wallis and Mann-Whitney tests which were processed using SPSS version 22 for windows. Research results prove that exposure to peat smoke increases eosinophil levels. Consumption of antioxidants can reduce the count of blood eosinophils in white male Swiss Webster strains exposed to peat smoke ( $p$  Value = 0.037 <  $\alpha$  0.05).

**Keywords—** Antioxidant, peat smoke, Swiss Eosinophil.

## I. INTRODUCTION

Globally peatlands store around 329 - 525 gigatons (Gt) of carbon and around 14% (70 Gt) of them are found in the tropics (Liu et al., 2020). This large carbon stock also causes high amounts of carbon released into the atmosphere when peatlands burn finally triggered the acceleration of global warming. Until September 2015, in Indonesia the number of forest and land fires reached 8726 while in South Sumatra alone reached 476 ha (López-costas et al., 2020).

In the world wide peatlands cover an area of 400 million ha. Meanwhile in Southeast Asia it covers 60% with an area of around 25 million ha. While Indonesia, which has the 4th largest area of peatlands with 21 million hectares of peatlands, is the country with the largest area of tropical peatlands in the world. While in Sumatra alone the area of peat is around 7.2 million ha with 1.484 million ha among them in South Sumatra (Purnomo et al., 2020).

Anticipation of the formation of free radicals in the body can be done by regulating diet and eating additional food (supplements) which can be used as a source of antioxidants to reduce the formation of free radicals (Grzybowski & Glińska-lewczuk, 2020). Free radicals are mediators of tissue damage, and antioxidant vitamins (A, C and E) are very effective in

preventing tissue and cell damage from free radicals (Tan, 2013). Antioxidants can also be obtained from the intake of foods that contain lots of vitamin C, vitamin E and beta-carotene and phenolic compounds (Heli, Jyri, Turo, & Kaisu, 2019 and Stahl W Sies H, 2013).

There are no data on the use of antioxidants to reduce the effects of peatland burning on health. This research was conducted on experimental animals because this research is a negative experiment which is not possible to be applied to humans (induction) (Yusup, Khakim, Aminuddin, & Yustian, 2020).

So it is necessary to do research on the use of antioxidants to count the number of blood eosinophils in white male Swiss Webster mice exposed to peat smoke.

## II. METHOD

This research is a laboratory experimental study and the design used is the Post Test Only Control Group Design by comparing the results of observations in the control group and the treatment after being given an action. This research was held at Animal House FK UNSRI Palembang in June to July 2019.

The population in this study were white mouse strain of male Swiss Webster aged 3 months with a weight of 20-35 grams obtained from the Laboratory of the Faculty of

Veterinary Medicine, Bogor Institute of Agriculture. adult male mouse tails.

*How to Treat Animals Try*

1. Peat Preparation. Peat is taken from peatlands in the Kayu Agung area of Ogan Komering Ilir District (OKI) because OKI Regency has the most extensive peatlands that are most vulnerable and at risk of burning.
2. Preparation of the Animal Experiment Room and Peatland Exposure.
3. Determination of ISPU Levels (Air Pollution Standard Index)
4. Try Animal Care  
Also during animal studies, try to be fed and drinking regularly, cleanliness and while maintaining the comfort of the cage. The medical examination of mice was carried out to monitor the health of mice, if there were sick people were immediately removed from the group.

5. The Way of Research

After the preparation of experimental animals is carried out, the research is carried out in the following order:

- a. In the first week, mice were separated into 3 cages each and named the control group (P0) without treatment, the treatment group (P1) was exposure to peat smoke without antioxidants, the treatment group (P2) was exposure to peat smoke given consumption antioxidant, treatment group.
- b. During the course of animal research, animals were given food and drink regularly.
- c. For 30 days after the acclimatization of mice the peat smoke with ISPU 300-399 level was exposed for 1 hour.
- d. 2 hours before the peat smoke exposure the groups of mice that have been determined are given antioxidants through nasogastric. Vitamin C dose of mice with an average body weight of 20 g converted was =  $0.0026 \text{ mg} \times 1000 \text{ mg} = 2.6 \text{ mg} / \text{kg}$  body weight. Then the dose for one mouse is  $1000/20 \times 2.6 \text{ mg} = 130 \text{ mg}$  (Laurence, 2008) and dissolved into 0.3 ml of sterile aquadest. Doses of mice with an average body weight of 20 g converted were =  $0.0026 \text{ mg} \times 268 \text{ mg} = 0.7 \text{ mg} / \text{kgBW}$ . Furthermore, the dose for one mouse is  $1000/20 \times 0.7 \text{ mg} = 35 \text{ mg}$  (Laurence, 2008) which is then dissolved in 0.1 ml of edible oil.

*Research variable*

The research variables consist of:

1. Independent variables: peat smoke and antioxidants
2. Dependent variable: Amount of blood Eosinophils
3. Controlled Variables: white male Swiss Webster mice, age, weight, environment (temperature, humidity, light), mice health.

After all data is collected, an analysis of research data is carried out. This process uses a computerized system of SPSS version 22 for Windows with a significance level of  $p < 0.05$ .

III. RESULTS

TABLE I. Value of Difference between Groups

Group	Control	P1	P2
Control		0.000	0.037
P1	0.000		0.000
P2	0.037	0.000	

Source: Primary Data 2019

IV. DISCUSSION

*The difference in the count of blood eosinophils in groups not exposed to smoke and groups exposed to peat smoke*

In this study it was found that there was a significant difference between the count of blood eosinophils in the groups exposed to peat smoke and those not exposed to peat smoke ( $p \text{ Value} = 0,000 < \alpha 0.05$ ). According to researchers burning peat smoke continuously will produce an inflammatory response, one of which can be seen from an increase in the amount of eosinophils in the blood (Chahaya S, 2015).

*The Difference in the Count of Blood Eosinophils in the Antioxidant Consumption Protection Group*

In this study it was found that there was a significant difference between the amount of blood eosinophils in the group exposed to unprotected peat smoke and the groups exposed to peat smoke and protected with antioxidant consumption ( $p \text{ Value} = 0.037 < \alpha 0.05$ ).

The consumption of antioxidants during peat smoke exposure in this study found that the average value of 76.43 was lower than the average value of the group that did not consume antioxidants.

Researchers consider the use of antioxidants to prevent inflammation in the body resulting from continued exposure to peat smoke. These results are consistent with the opinion of Tan (2013) and López-costas et al (2020) which states the anticipation of the formation of free radicals in the body can be done by regulating diet and eating additional food (supplements) that can be used as a source of antioxidants to reduce the formation of free radicals (South Sumatra Province Environmental Agency, 2015).

Antioxidants can stop free radical chain reactions. Initially, vitamin E will capture free radicals, but vitamin E then changes to vitamin E radicals that require the help of vitamin C. Vitamin C together with vitamin E can inhibit oxidation reactions by binding to vitamin E radicals that form in the process of terminating free radical reactions by vitamin E becomes free vitamin E, so it functions again as an antioxidant. With these different mechanisms of action, if these two vitamins are used it can inhibit free radical activity (Sendra et al, 2014).

V. CONCLUSION

The burning of peat smoke can increase the count of blood Eosinophils due to air pollution produced will activate CD4 + and mast cells in the respiratory tract, then CD4 + will differentiate into Th2 which will then produce IL-5 and subsequently can activate and increase blood eosinophil production.

Antioxidants, in this case vitamins C and E, are suitable for use during peat fires because they can stop the free radical chain reactions that can be produced from gases that burn peat. Initially, vitamin E will capture free radicals, but vitamin E then changes to vitamin E radicals so that it requires the help of vitamin C. Vitamin C together with vitamin E can inhibit oxidation reactions by binding to vitamin E radicals that form in the process of terminating free radical reactions by vitamin E becomes free vitamin E, so it functions again as an antioxidant so that it can prevent the adverse effects of peat fires.

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