THE INFLUENCE OF GIVING TEMPE FLOUR TOWARD THE AMOUNT AND MORPHOLOGY OF WHITE MALE RAT (*Rattus norvegicus*) ERYTHROCYTES WISTAR STRAIN WAS AFFECTED BY CIGARETTE SMOKE

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Abstract: Cigarette smoke was one of free radicals source for the body. Free radical contain in cigarette smoke were hydroxide radicals (•OH). Hydroxide radicals would cause erythrocytes damage. Antioxidants were substances that can prevent free radicals. Now, natural antioxidants source has developed, one of that is tempe, because of it contained antioxidants substances such as carotene, Vitamin E, isoflavon, and factor II antioxidants. This resource was for knowing the influence of giving tempe flour toward the amount and morphology of white male rat (*Rattus norvegicus*) erythrocytes wistar strain was affected by cigarette smoke. A pure experiment which was used *the post test only-control group design* method. Sample of the resource was white male rat wistar strain aged of 3-4 month as much 30 rats by the weight around 180-220 gram. The samples divided into 3 groups that were control group (K1), treatment group 1 (K2), and treatment group 2 (K3), each group consists of 10 rats. Control group was not given a special treatment, it only got a standard feed, treatment group 1 got special treatment and it was affected by cigarette smoke, furthermore, treatment group 2 got standard feed, it was affected by cigarette smoke and tempe. Analysis of data used *one way anova* experiment. The test showed the significance *P-value* = 0,036 that was <α (0,05). The result showed that there was the influence of giving tempe flour toward the amount and morphology of white male rat (*Rattus norvegicus*) erythrocytes wistar strain was affected by cigarette smoke.

Keywords: cigarette smoke, free radicals, erythrocytes, antioxidants, tempe

INTRODUCTION

Today, smoking habit is not a taboo for Indonesians anymore. An estimated number of smokers in the world of 1.3 billion people and deaths caused by tobacco reach 4.9 million people per year[1]. According to Global Adults Tobacco Survey (GATS) in 2011, Indonesia has the highest number of active smokers with a prevalence of 67% of men and 2.7% in women. Cigarette smoke is one source of free radicals for the body[2,3,4]. One of them is a hydroxyl radical (OH). Hydroxyl radicals are one of the most reactive types of oxygen radicals[4,5,6]. In the body, hydroxyl radicals can damage the cell-forming macromolecules such as DNA, lipid membranes, and proteins. This will spur cell damage[7,8,]. One of the damaged cells is the erythrocytes primarily on the membrane which will cause the membrane lysis so that the cell will die[2,8,9]. This results in decreased levels of erythrocytes and changes in erythrocyte form. Antioxidants are substances that can counteract free radicals, especially hydroxyl radicals that can block the deterioration of erythrocytes prematurely[9,10]. Natural source of antioxidants are now widely developed, one of which is soybean and its processed is tempe[11,12]. Tempe contains antioxidants such as carotene, vitamin E and isoflavones, antioxidant factor II is high enough. Isoflavones itself serves to stop the process of free radical formation[11,12,13]. Based on the description, the researcher is interested to examine "The Influence of Giving Tempe Flour Toward the Amount and Morphology of White Rat Erythrocytes (*Rattus Norvegicus*) Wistar Strain was Affected by Cigarette Smoke".

RESEARCH METHODS

This research is a pure experimental analytical research using randomized post test only control group design[14]. The samples in this study were white rat (*Rattus norvegicus*) adult male wistar strain weighing 180-220 gram. A total of 30 rats were randomly divided into 3 groups per group of 10 rats treated for 30 days. Group (K1): given standard feed, Group (K2): given standard feed, exposed to filter cigarette smoke 4 cigarettes / day twice daily in morning at 9.00 WIB and afternoon at 15.00 WIB without the intake of tempe flour, Group (K3): given standard feed, exposed to filter cigarette smoke 4 cigarettes / day twice daily in the morning at 9.00 WIB and afternoon at 15.00 WIB and given tempe flour intake as much as 1 ml 30 minutes after exposure to cigarette smoke[10]. Data analysis was done by using analytical analysis with ANOVA test[15].

RESULTS AND DISCUSSION

The results of the mean ($\overline{X}$) of erythrocytes in K1, K2 and K3 groups are presented in the table below:

Tabel 1. Average Grouped Erythrocyte Descriptions

Treatment	N	Mean	Std. Deviation	Std. Error
K1	10	4.5620	.56672	.17921
K2	10	4.3920	.39276	.12420
K3	10	5.0120	.58721	.18569
Total	30	4.6553	.57039	.10414

Source: Data procced on 2017

Analytical analysis with the One Way Anova Variance Analysis test is shown as below:

Tabel 2. Analysis of One Way Variance (One Way Anova)

Research Variable	F	P	Information
Eritrosit (U/L)	3,754	0,036	There are differences

Source: Data procced on 2017

Morphology of White Rat Erythrocytes can be seen on figure 1, figure 2, and figure 3.
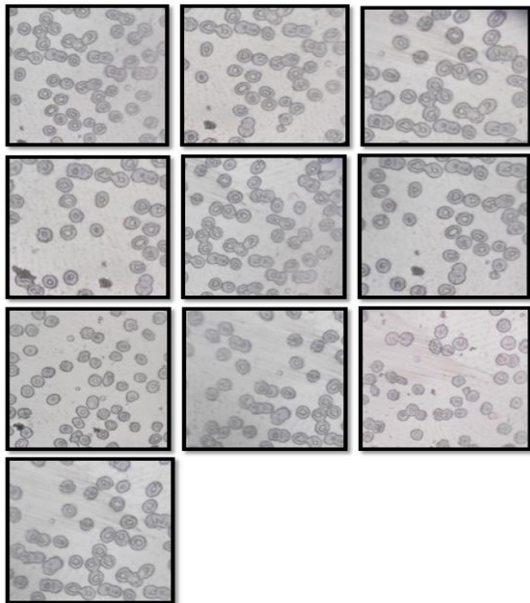
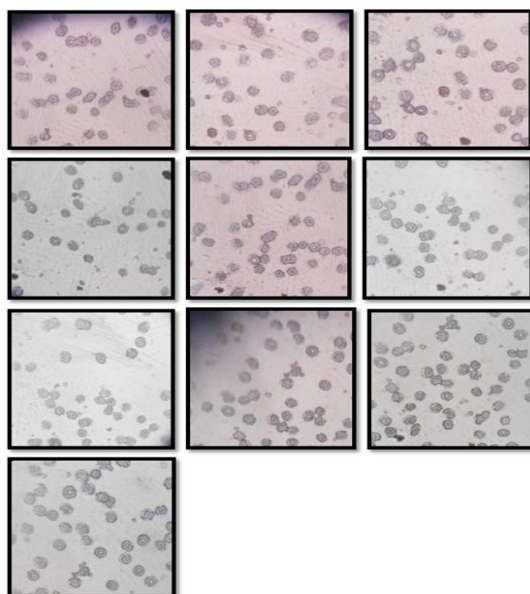

Figure 1. Erythrocytes morphology (K1) group

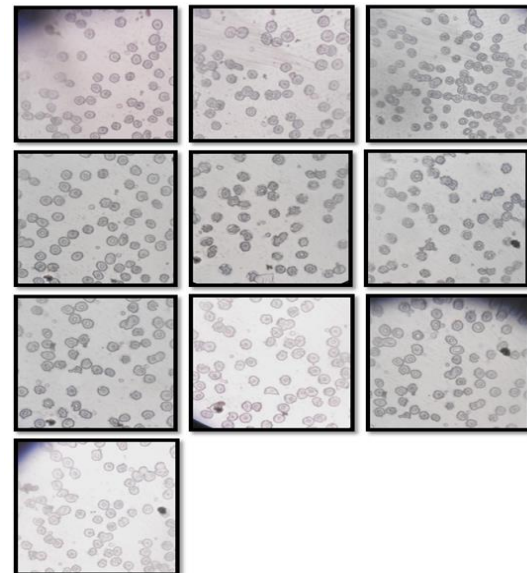Figure 2. Erythrocytes morphology (K2) group

Figure 3. Erythrocytes morphology (K3) group

Based on table 1. above can be seen that the average of the highest eritrosite value in the group that is equal to 5,012 million / mm3 and the lowest value of erythrocytes exist in group K2 that is equal to 4,392 million / mm3. Table 1 shows an increase in erythrocytes after given Tempe. The result of analytic test with One Way Anova test in table 2 shows the significance of p-value = 0,036 that is $<\alpha$ (0.05) hence there is influence of Tempe flour to the amount and morphology of white rats (*Rattus norvegicus*) wistar strain which is exposed to cigarette smoke. From the whole pictures above (Picture 1, 2, 3) can be seen the difference of erythrocyte morphology in each group. In Groups (K1) (Picture 1) the erythrocyte morphology appears to be very good, bikonkaf-shaped discs, the cell membrane is smooth, and the number of cells between one field of view and the other is more or less equivalent, seen under the cell's microscope still very active . In Group (K2) (Picture 2) the

erythrocyte morphology appears irregular ie there are bulges on the surface of the cell, so it appears uneven and the cell membrane looks jagged (star-shaped) and the number of cells in one field looks decreased compared to the group control, seen under the microscope of less active mobile cells. In Group (K3) (Picture 3), the erythrocyte morphology appears to be a bikonkaf disc-shaped (K1) group, its cell membrane is smooth, and the number of cells between one field of view and the other is more or less equal, seen under a sufficient cell microscope move actively.
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CONCLUSIONS

The result of the study shows that the giving of Tempe Flour is influenced Toward the Amount and Morphology of White Rat Erythrocytes (*Rattus norvegicus*) Wistar Strain that exposed by Cigarette Smoke.

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