

THE EFFECT OF 2 CUP DAILY COFFEE CONSUMPTION ON THE IL-10 LEVELS OF OBESE AND NON OBESE MALE WISTAR RATS

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ABSTRACT

Coffee is one of the most consumed drinks in the world. Many people of the world who make coffee as one of the favorite daily drinks supporting daily work activities. Coffee contains many components that are very beneficial for health, including caffeine and polyphenols. The results of previous studies indicate that coffee is beneficial for health and affects IL-10 levels for body conditions with obesity or without obesity. IL-10 is one of the anti-inflammatory which is very important for daily immune response. This study is an experimental study using male rats. The results of this study prove that coffee consumption 2 times a day can reduce clinically IL-10 levels in the obese and non-obese groups. The coffee content affects a decrease in IL-10 levels in both groups of obese and non-obese rats that consume coffee.

Keywords: Tin dioxide; Coffee; Consumption; IL-10; Obese

INTRODUCTION

IL-10 or called as human Cytokine Synthesis Inhibitory Factor [CSIF] is an anti-inflammatory which is an important body defense factor in dealing with acute attacks of infection [1]. IL-10 is an important key component of the cytokine system which suppresses the expression of proinflammatory cytokines during the healing phase of infection and reduces damage due to inflammatory cytokines [2]. IL-10 experiences an initial increase in production during persistent viral infections [3]. The broad spectrum of IL-10's is the true cellular target of all leukocyte cells. The blockade of IL-10 causes immunopathology [4]. Caffeine increased IL-10 levels in 2 of the 3 trials [5]. High levels of caffeine correlate with decreased levels of IL-10. At therapeutic levels, caffeine is able to prevent the persistent activation of

inflammatory cascades and vice versa if it does not match therapeutic levels. So decreasing IL-10 levels is one of the most important things about counter-balance cytokines, which are associated with higher caffeine levels [6]. IL-10 is considered as an anti-inflammatory which is able to strongly inhibit the production of pro-inflammatory cytokines [7].

METHODS

This research was conducted for 14 days in male wistar rats at the Biology MIPA Laboratory in Unnes/Semarang University, Central Java, Indonesia. The study consisted of 4 groups of male rats.

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The selection of male mice is based on community conditions that there are more male coffee drinkers than female coffee drinkers. Group 1 is the non-obese group who received coffee drinking treatment, group 2 was the non-obese group who did not receive coffee treatment. Group 3 is the obesity group that gets the treatment of drinking coffee, group 4 is the obesity group that does not get the treatment of drinking coffee.

RESULTS

Figure 1 shows the difference in body weight between obese and non-obese rats on the first day of the study, the 7th day of the study and the 14th day of the study. Day 0 of the study was the day the study began where no coffee was given. The 7th day of the study was the first 7 days of consuming coffee and the 14th days of the study were 14 days of consumption of coffee carried out in obese and non-obese rats. Coffee consumption showed the potential to stabilize body weight in non-obese rats, whereas in obese rats, coffee consumption did not show the potential for weight loss. It is possible the study was only carried out for 14 days, so the potential for weight loss in obesity was not demonstrated in obese rats, but the potential for weight stabilization has been demonstrated in the non-obese rat group. This means, coffee consumption 2 times daily can stabilize body weight in non-obese rats. The potential to stabilize body weight can be interpreted that coffee consumption has a good effect on body health. So, it can be said that coffee consumption in obese patients will not increase excessive body weight especially in non-obese rats or normal weight mice, as shown in Figure 1.

In above, table shows that the average of the IL-10 obese group before being treated was higher than

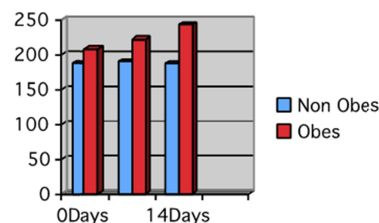


Figure 1: Weight Characteristic of Male Wistar Rats.

the IL-10 non-obese group. This is consistent with previous studies that obesity has higher IL-10 levels than non-obese [8]. Before giving coffee, the table shows that there were clinical differences but there were no significant differences between the treatment and control groups in the obese group, as well as in the non-obese group (Table 1).

Group	n	IL-10 0	
		Mean	SD
Obese	12	15,97	11,422
Non obese	12	15,18	11,799

Table 1: The Difference of Mean Test IL-10 pre (IL-10 0).

IL-10 is an anti-inflammatory cytokine which has a strong potential to inhibit the production of proinflammatory cytokines, where proinflammatory cytokines are mostly found in obesity. In fact, IL-10 is an immunostimulatory from CD4 +, CD8 + T cells and NK cells which results in an increase in IFN- γ production [7], so it is normal for the obese group to have more proinflammatory secretions than the non-obese group [increased in proinflammatory secretion obesity comes from adipose tissue accumulation]. Therefore, the obese group will get more self-defense attacks from anti-inflammatory cytokines, so there is more increase in IL-10 levels in obesity than the non-obese group just before the treatment / administration of coffee (Table 2).

Group		n	IL-10 0		t/z	P
			Mean	SD		
Obese	Treatment	6	5,83	3,962	-0,482	0,699
Control		6	10,14	7,460		
Non Obese	Treatment	6	4,40	4,860	-1,441	0,150
Control		6	10,78	6,939		

Table 2: The Difference of Mean Test IL-10 pre (IL-10 0).

Table 3 shows that all groups of mice had decreased levels of IL-10 after consuming coffee for 14 days. That is, the coffee content can improve

In table 3 of the 14th day after all groups of mice consumed coffee, it appears that obese mice that received treatment, still had higher IL-10 levels than non-obese mice that received treatment, but there was a decrease in IL-10 levels in both treatment groups, both obese and non-obese groups. This shows that coffee consumption can reduce IL-10 levels in both the obese and non-obese groups.

Table 4 above shows, after consuming coffee, all obese male wistar rats had higher IL-10 levels than the non-obese group, although there was a decrease

reduce IL-10 levels in all groups of mice both obese and non-obese groups.

According to previous studies, the non-obese group had lower IL-10 levels than the obese group [8].

in IL-10 levels after consuming coffee in both groups of obese and non-obese groups. This means that the coffee content can reduce / improve IL-10 levels.

After consuming coffee, it showed that there were clinical differences between the obese and non-obese groups, where the obese group showed higher IL-10 levels than the non-obese group. In the group that received treatment had IL-10 levels lower than the group that did not get the treatment or control group, both in the obese

Group		n	IL-10 1		t/Z	p
			Mean	SD		
Obese	Treatment	6	5,09	3,289	-0,801	0,423
Control		6	7,13	4,553		
Non obese	Treatment	6	3,61	2,446	-1,780	0,105
Control		6	7,18	4,272		

Table 3: The Difference of Mean Test IL-10 post (IL-10 1).

Group	n	IL-10 1	
		Mean	SD
Obese	12	12,22	7,84
Non obese	12	10,80	6,72

Table 4: The Difference Mean of Test IL-10 post (IL-10 1).

and non-obese groups. Whereas the obese group that received treatment had higher IL-10 levels than the non-obese group, although there was a decrease in IL-10 levels.

Grafik 2 shows total IL-10 levels between obese and non-obese groups on day 0 (before consuming coffee) and day 14 (after consuming coffee for 14 days), where total IL-10 levels in the non-obese group were lower than the obese group, both on day 0 and day 14 after 14 days consuming coffee.

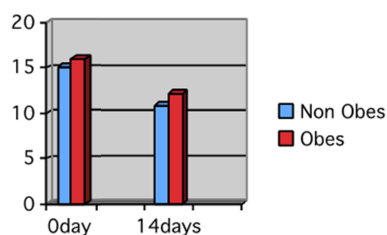


Figure 2: Total IL-10 levels between obese and non-obese groups.

DISCUSSION

The results of this study are consistent with studies conducted in women with metabolic syndrome who have higher IL-10 levels than obese women, whereas women with obese have higher IL-10 levels than non-obese women [8]. Similarly, studies conducted on obese adolescent girls have higher IL-10 levels than non-obese adolescent girls [9] as well as studies on people with central obesity have higher IL-10 levels. [10].

On the contrary, some studies show the opposite results, but it is still in accordance with this study where the control group in table 3, namely the obese control group had lower IL-10 levels than the non-obese control group. Previous supporting studies have shown that overweight adolescents have lower serum IL-10 levels, higher alpha TNF and higher NO / Nitric Oxide than normal weight adolescents [11]. Likewise, obese individuals with obstructive sleep apnea show lower IL-10 levels [12]. Low levels of IL-10 are also found in wistar

rats with obesity, metabolic syndrome and type II diabetes [13].

In male wistar mice with obesity there appears to be an increase in proinflammatory cytokines such as IL-10, IL-6 and TNF- α in adipose tissue after energy-draining exercise, causing an inflammatory condition in this tissue. IL-10 inhibits nuclear factor kappa beta [14,15]. This inflammatory condition occurs with intermediaries TLR-4 and NF-kBp65 [16]. Acutely exhausting exercise will stimulate the pro-inflammatory response in adipose tissue thereby increasing TNF alpha and IL-6, and IL-10 [17] while physical endurance training will stimulate the anti-inflammatory response in adipose tissue thereby increasing IL-10 levels [18]. IL-10 is secreted by adipose tissue [18-20]. White adipose tissue is a source of IL-10.

Healthy individuals have lower IL-10 levels than obese individuals [21]. The results of this research study show IL-10 levels of obese wistar are higher than non-obese wistar, in accordance with previous studies. In this study unhealthy mice were represented by obese male wistars who had higher IL-10 than non-obese male wistars. In the discussion of this study, what is meant by healthy mice is non-obese mice or mice with normal weight because obesity is one of the metabolic syndromes. Likewise, what is meant by a statement of healthy individuals is an individual without obesity/normal body weight.

The results of other studies previously showed that coffee provides protection against acute responses to liver damage stimulated by lipopolysaccharides by reducing/reducing TNF- α production [22]. The results of the study showed similar results to this study in that there was a decrease in TNF- α production accompanied by a slight decrease in IL-10 in the coffee-consuming group.

Whereas in the group that did not consume coffee experienced a decrease in levels of IL-10 more [remember! Blockade of IL 10 causes immunopathology, so a large decrease in IL 10 is a bad thing. A decrease in IL-10 levels occurred in the control group because it did not consume whereas coffee consumption did not decrease the levels of IL-10 more, the difference between the treatment and control groups was significant ($p < 0.05$), similar to previous studies that showed protective effects of coffee. Previously showed that caffeine can protect acute liver injury induced by LPS / D-GalN, through an intermediate in the form of reduced TNF- α production and / or increased production of IL-10. The intention is that the consumption of caffeine-containing coffee will protect damaged cells by increasing IL levels -10 [22].

IL-10 is an antiinflammatory, so that in damaged cells an increase in IL-10 levels [22], due to the anti-inflammatory properties of IL-10.

Previous studies supporting this study showed that coffee consumption in obese adipose cells [where adipose cells in obesity had widening adipose cell diameter beyond normal adipose cell size] would reduce IL-10 levels because in obese mice having higher IL-10 levels higher than non-obese mice. So after giving coffee consumption, the diameter of the adipose cells will shrink due to the improved adipose cells and eventually the IL-10 level will decrease.

All of these effects are due to coffee consumption, which in previous studies also proved that coffee consumption decreased uric acid levels clinically in hyperuricemia sufferers [23] and clinically lost weight in obese people [24].

A study showed IL-10 levels in obese children were lower than control IL-10 levels [25]. The study supports this study that mice with obesity show a decrease in levels of IL-10 more than non-

obese mice due to the adipose cell diameter of the previous obese rat greater than the diameter of the adipose cell of non-obese mice. So, the secretion of IL-10 is also reduced much in obese adipose cells than non-obese adipose cells which were previously of smaller diameter and secrete IL-10 less. Weight loss is associated with a reduction in the diameter of the adipose cells and a decrease in IL-10 levels.

Previous studies stated that adipose cells are a regular source of IL-10. Thus, IL-10 is secreted by adipose cells [26,27]. This study is in accordance with the study that IL-10 is secreted by adipose cells so the diameter of adipose cells in obese male wistar rats enlarge, the IL-10 produced is more and vice versa.

Limitations of the study: This study was conducted only on male wistar rats because it is based on data in the community as well as previous study data that coffee consumption in men is greater than women [28]. This study was conducted 14 days because previous studies showed that coffee consumption for 7 days had a beneficial effect for people with hyperuricemia, but research needs to be done with a longer time to provide more meaningful research results [29]. Several previous studies have shown support for the results of research studies that IL-10 levels of obese people are higher than non-obese, but some studies also support that IL-10 levels of obese people are also lower than non-obese sufferers. This is likely due to the time the study was conducted for only 14 days.

In addition, many factors determine the working of coffee in the body and this affects the results of this study [30].

Coffee components that affect the results of this study include caffeic acid which inhibits the NF κ B pathway [31,32], where NF κ B is the key to the molecular system for the induction of pathology

from inflammation in the brain that bridges overnutrition and makes intracellular stress and regulated neural energy and also glucose and cardiovascular homeostasis collectively lead to metabolic syndrome [33] and obesity related to metabolic syndrome [34]. IL-10 has relationship with NF κ B [35].

CONCLUSION

The obese group / male wistar rats with obesity had higher IL-10 levels before and after 2 cups of coffee consumption daily than the non-obese male wistar mouse group, but decreased IL-10 levels in both groups after consuming coffee. This proves that 2 cups of coffee consumption daily can reduce levels of IL-10 in the obese and non-obese groups.

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CONFLICT OF INTEREST

No conflict of interest

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