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**Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** THE EFFECT OF EXPOSURE TO Toxoplasma gondii PROFILIN ON LEPTIN Universitas Brawija LEVEL IN Rattus Norvegicus WISTAR STRAIN RATS GIVEN NORMAL AND Universitas Brawijaya **Universitas Brawijay** Universit Universit **Universitas BI Universitas Brawija Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** 

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FINAL PROJECT

HYPERCALORIC DIET

By: PARVEEN ANANDHAN

NIM 145070108121020

Has been examined on

Day: Friday Date: 2<sup>nd</sup> March 2018

and passed by:

Examiner I

dr. Samsul Arifin, M.Biomed

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Universi Key words: Toxoplasma gondii (T.gondii), Leptin level

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Obesitas adalah akumulasi lemak tubuh yang abnormal dan memiliki banyak etiologi termasuk infeksi. Berdasarkan penelitian sebelumnya, ada kemungkinan ersi hubungan antara infeksi Toxoplasma gondii (T. gondii) dan obesitas. T.gondiisitas Brawijay diklasifikasikan sebagai penyakit zoonosis dan memiliki protein seperti profilinsitas Brawijava yang dikenali oleh receptor seperti-tol (TLR-11) dan merangsang sitokin pro-inflamasi yang menyebabkan radang sel inang dan mungkin terkait dengan stass Universi tingkat leptin. Penelitian ini dilakukan untuk mengetahui pengaruh paparan profilinsi tas Brawijaya Toxoplasma gondii pada kadar leptin pada tikus Rattus Norvegicus Wistar Strain yang diberikan diet normal dan diet hipercalorik. Percobaan ini dilakukan di Laboratorium Farmakologi dan Parasitologi Universitas Kedokteran Universitas Brawijaya untuk pemeliharaan tikus, intervensi dan pengukuran tingkat leptin.sitas Brawi Untuk kelompok kontrol positif, konsentrasi profil T.gondii yang diuji adalah 15µg/ml, 30µg/ml, dan 45µg/ml pada dua kelompok tikus, mengkonsumsi makanan normal dan diet hipercalorik. Hasilnya dianalisis dengan menggunakan Universi ANOVA satu arah dan menunjukkan perbedaan yang signifikan antara profilinsi tas Toxoplasma gondii dan tingkat leptin (p = 0,001 < $\alpha$ ), (alfa = 0,05). Korelasi Pearson menunjukkan bahwa ada arah positif dan korelasi yang cukup kuat Universifantara tingkat T.gondii profilin dan leptin pada tikus Wistar dengan diet normal (RSITAS BrawIJaya Universi = 0,557) tanpa pengaruh yang signifikan (p = 0,087> α); sedangkan arah negatifsitas Br dan korelasi kuat antara T.gondii profilin dan tingkat leptin pada tikus Wistar memberikan diet hiperkalik (R = -0.616), dengan efek yang signifikan (p = 0.014Universit<α). Penelitian ini menunjukkan bahwa paparan profilin Toxoplasma gondiisitas meningkatkan kadar leptin pada tikus yang diberi diet normal namun penurunan sitas pada tikus diberi diet hipercalorik.

Kata kunci: Toxoplasma gondii (T.gondii), tingkat leptin

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rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Braujater Iniversitas Brawijaya INTRODUCTION Background 1.1 niversitas Brawijaya Universitas Brawijaya Universitas B Obesity is an abnormal accumulation of body fat which is usually 20% orsitas Brawijaya more over an individual's ideal body weight. It is often associated with increased Brawijaya Universit risk of illness, disability, and death. The World Health Organization (WHO) termssit as Brawijaya obesity as a worldwide epidemic as it is becoming increasingly prevalent. Universit According to WHO, worldwide obesity has more than doubled since 1980. In 2014, it as Bra over 600 million, 13% of adults aged 18 years and over, were obese. Most of the Universi world's population live in countries where obesity kills more people thansitas underweight. 41 million children under the age of 5 were obese in 2014 (WHO Universit2016). Obesity has multiple etiologies; while genetic and behavioral components of Universitobesity have been the focus of intense study, an infection as an etiological factorsitas Brawijava could be an overlooked possibility and has received little attention. The term used Universi for obesity of an infectious origin is 'infectobesity' (Pasarica, 2007). Universitas Based on previous study that had been conducted, the possible association Universi between Toxoplasma gondii (T. gondii) infection and obesity had been estimated in a sample of 999 psychiatrically healthy adults. Individuals with psychiatric **Anversitas Brawijaya** Universitas Universi conditions were excluded because of the association between positive serology tositas Brawijava Universit *T. gondii* and various forms of serious mental illness that is strongly associated ersites Bravilaya Universit with obesity. In the sample, individuals with positive T. gondii serology had twices that the odds of being obese compared to seronegative individuals. Latent T. gondii Universitas Brawijaya Universitas Brawijaya Universit Universi infection is common worldwide, so potential public health interventions related to Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya Universit this parasite could have a high impact on associated health concerns (Reeves et sites Brawijaya rsitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas it<mark>al</mark>s2013)wijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya ersitas B T.gondii was first discovered by Nicole and Manceaux (1908) on a rodent at North Africa, which is *Ctenodactylus gondi*. That is how the name of *T.gondii* was derived from. In the same year, Splendore found the organism on a guinea pig at Sao Paolo Brazil. Now, this parasit is found worldwide. *T.gondii* is classified as ersi zoonotic disease. It is an intestinal coccidium that parasitizes the cat family assitas definitive hosts and has a wide range of intermediate hosts. *T.gondii* infection is Universit common in many warm-blooded animals, including humans. In most cases, thesitas Br infection will be asymptomatic, but devastating disease could occur (Mandell et al, Universi 2006). T.gondii has a profilin-like protein that is recognized by toll-like receptor (TLR-11) of the natural immune system which leads to inflammation of the host cell. Although profilin does not function in cell growth, it will stimulate gliding motility to invade the host cell and cause virulence. Therefore, profilin is an important element of the two aspects of T.gondii infection (Kucera et al, 2010). Versitas Bra A few studies had shown the association of T.gondii profilin on lipid Universit metabolism. According to the Asean Pacific Journal of Tropical Disease (Iskandarsitas et al, 2016), a study had been carried out to know the levels of T.gondii profilin

et al, 2016), a study had been carried out to know the levels of *T.gondii* profilin and adiponectin in obese patients complicated with or without metabolic syndrome as compared to non-obese patients. The results showed that the *T.gondii* profilin level in obese subjects complicated with metabolic syndrome was significantly higher compared to the non-obese subjects. The occurrence of infection by *T.gondii* would increase the expression of profilin, including fat cells. (Iskandar, 2016). This shows that *T.gondii* profilin is strongly correlated with lipid metabolism but the pathogenesis is yet to be understood well. Although *T.gondii* universitas Brawijaya Universit profilin had been associated with the level of adiponectin and cytokines, there is stars Brawljay rsitas Brawijaya no study that relates T.gondii with the level of leptin. Sitas Brawijava **Universitas Brawijaya** Universitias B Leptin, the "satiety hormone" was discovered in 1994. It is a hormone made sites by adipose cells that helps to regulate energy balance by inhibiting hunger. The Universi actions of the hormone ghrelin, also known as the "hunger hormone" opposessitas leptin. Both hormones act on receptors in the arcuate nucleus of the versi hypothalamus to regulate appetite to achieve energy homeostasis. Although the sit as Br regulation of fat stores is considered to be the primary function of leptin, it also Universit plays a role in other physiological processes, as evidenced by its multiple sites of sitas Braw synthesis other than fat cells, and the multiple cell types beside hypothalamic cells ersi that have leptin receptors. In obesity, a decreased sensitivity to leptin occurs, sitas resulting in an inability to detect satiety despite high energy stores (Brennan and UniversitMantzoros, 2006). Although few experimental researches had been carried out such as using rat to identify the association between T.gondii and body weight (Reeves et al, sites) 2013), yet there is no clear understanding on how the leptin level is affected and Universit which part of the T.gondii that is involved on the changes of lipid metabolism.sitas Therefore, a research must be done to know the effect of exposure to Toxoplasma gondii profilin on leptin levels in Rattus Norvegicus Wistar Strain rats. Universit1.2 B Problem Statement ersitas Brawijava Universitas Brawijava Universitin Rattus Norvegicus Wistar Strain rats given normal diet and hypercaloric diet? ersit 1.3 <sup>B</sup> Objective of the Research rawijaya Universitas Brawijaya Universit1.3.1 General Objective Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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rawijaya Universitas Brawijaya REVIEW OF RELATED LITERATURE rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Bravilava rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universit2.1.1 Definition "obesity" refers to body weight that is greater than what is Universitas Brawilava Universit considered healthy for a certain height. It is a complex disorder where a personsitas Brawijaya has accumulated excessive amount of body fat that it might have a negative effect AWIN Universition their health (Ofei, 2005). Universit 2.1.2 Etiology Obesity usually results from a combination of causes and contributingsitas Brawijaya Universi factors, including genetics. Genes may affect the amount of body fat stored, and sitas Brawijaya rawijaya Universit where that fat is distributed. Genetics may also play a role in how efficiently the sitas rawijaya Universit body converts food into energy and how the body burns calories during exercise. Sitas Brawijaya Obesity tends to run in families. If one or both of your parents are obese, your risk rawijaya Universit of being obese is increased. Apart from the genetic factor, family members tend tositas Brawijaya share similar eating and activity habits (Perusse et al, 2000). Universitas BOther factor includes inactivity. With a sedentary lifestyle, you can take insitas Brawijaya more calories every day than you burn through exercise and routine daily activities. Universit Having medical problems, such as arthritis, can lead to decreased activity, which sit as Brawijaya ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya contributes to weight gain (Schauer, 2011). Universitas Brawijaya Universitas Brawijaya Universitas B Besides, having an unhealthy diet could lead to obesity too. A diet that stas Brawijaya high in calories, lacking in fruits and vegetables, full of fast food, and laden with Universitas Brawilava Universit high-calorie beverages contributes to weight gain (Heber, 2010).vijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Iniversitas Brawijaya / Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya such as Brawijaya Universitas B For some people, obesity can be traced to a medical cause, Prader-Willi syndrome, Cushing's syndrome and other conditions. Medical Universit problems, such as arthritis can lead to decrease in activity, which may result insitas Brawijaya ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya weight gain (MayoClinic, 2014). Brawijaya Universitas Brawijaya rawijaya Universitias B Some medications may lead to weight gain if diet and activities are notsitias Brawijaya compensated. These medications include some antidepressants, anti-seizure Universimedications, diabetes medications, anti-psychotic medications, steroids and betasitas blockers (Ofei, 2005). Universitas B Age is one of the factors leading to obesity. Obesity occurs at any age, even sitas Brawijaya in young children. But as aging, hormonal changes and a less active lifestyle ersi increase your risk of obesity. The amount of muscle in body tends to decrease with age. This lower muscle mass leads to a decrease in metabolism. These Universi changes also reduce calorie needs, and can make it harder to keep off excesssi weight (Flier, 2012). Moreover, not getting enough sleep or getting too much sleep can causesitas Universita changes in hormones that increase your appetite. Craving for foods will futher Universi increase calories and carbohydrates intake, which can contribute to weight gainsit Universit (Bray, 2015). Universitas B Of the several etiological factors, infection, an unusual causative factor, has recently started receiving greater attention. In the last two decades, 10 adipogenic Universi pathogens were reported, including human and non-human viruses, scrapiesitas Brawijava agents, bacteria, and gut microflora. Some of these pathogens are associated ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Br Universit with human obesity, but their causative role in human obesity has not been sites established (Dhurandhar, 2007). Based on the Journal of Nutrition (Dhurandhar, Universi 2001), six pathogens are reported to cause obesity in animals. Canine distemper-Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijava** Universitas Brawijaya Universitas Brawijaya

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rawijaya Universitas Brawijaya Universit virus was the first virus reported to cause obesity in mice, followed by the Brawliay Universitas Brawijaya Universitas Brawijaya Universi Rous-associated virus-7, an avian retrovirus, which has been shown to cause Universit stunting, obesity and hyperlipidemia in chickens. Next, the obesity-promoting it as ersitas Brawijava Universitas Brawijava Universitas Brawijava Universitas Brawijava effect of Borna disease virus was demonstrated in rats. Scrapie agents were ersitas Brawijava rawijaya Universi reported to induce obesity in mice and hamsters. The final two reports were of sitas Brawijaya SMAM-1, an avian adenovirus, and Ad-36, a human adenovirus that caused Universit obesity in animals. Additionally, an association with human obesity is the uniquesitas Brawijaya of SMAM-1 and Ad-36. Although the exact mechanism of feature Universit pathogen-induced obesity is unclear, infection attributable to certain organisms it as Brawijaya Universit should be included in the long list of potential etiological factors for obesity. In Universi addition, the involvement of some pathogens in etiology of obesity suggests thesitas possibility of a similar role for additional pathogens (Heber, 2010).

# Universit2.1.3 Complications

Obesity may cause further health issues and may lead to serious conditions. SITAS The complications of obesity are increase in triglycerides and decrease in Universi high-density lipoprotein (HDL) cholesterol; type 2 diabetes; high blood pressure; sitas Brawijaya metabolic syndrome; heart disease; stroke; cancer; breathing disorders, including Universi sleep apnea; gallbladder disease; gynecological problems, such as infertility and sitas Brawijaya irregular periods; erectile dysfunction and sexual health issues and osteoarthritis Universit (Rettner, 2015). Universities **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 2.1.4 Diagnosis of Obesity ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit21.4.1avBody Mass Index (BMI) rawijaya Universitas Brawijaya Universitas Body Mass Index (BMI), is used as a screening tool for overweight or itas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi obesity. BMI is a statistical measurement derived from height and weight. A Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijava** Universitas Brawijaya Universitas Brawijaya rawijava

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Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universit person's weight in kilograms will be divided by the square of height in meters. The Universitas Brawijaya Universitas Brawijaya criteria for BMI is shown in Table 2.1 and 2.2, (WHO,2016), Universit Table 2.1 BMI worldwide itas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya va UniveNutritional Status **BMI**versitas Brawija **Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universitas BrawijavaBelow 18.5 sitas Brawija Univers Underweightava **Universitas Brawijaya** Universitas Brawijaya18.5 n 24.9 sitas Univer Normal weight ya as Brawijay<sub>25.0</sub> 29.9 Univer<mark>sitas Brawijaya</mark> S Overweight ava Universitas Brawijaya as Brawi Obese class I 30.0 - 34.9 Universitas Brawijaya Obese class II 35.0 - 39.9 <del>er</del>sitas Brawijaya Above 40.0 Obese class III Universit (WHO, 2016) (WHO, 2016) Brawijaya

#### Universit Table 2.2 : BMI according to Asian criteria

| Jniversi                  | SCAP USE    |                    | <u> </u>                  |
|---------------------------|-------------|--------------------|---------------------------|
| Jniversi                  | BMI         | Nutritional Status | niversitas Brawijaya      |
| Jniversi                  | Below 18.5  | Underweight        | niversitas Brawijaya      |
| Jniversit                 | 18.5 - 22.9 | Normal weight      | hiversitas Brawijaya      |
| Jniversit                 | 23.0 - 24.9 | Overweight         | niversitas Brawijaya      |
| Jniversit <mark>a</mark>  | 25.0 - 29.9 | Pre-obese          | Universitas Brawijaya     |
| Jniversit <mark>as</mark> | Above 30.0  | Obese              | Universitas Brawijaya     |
| Jniversitas               |             | (W                 | HO, 2016) sitas Brawijaya |

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2.1.4.2 Waist Circumference

Universitas B Health care professionals also may take waist measurement. This helps tositas Brawijaya screen for the possible health risks related to overweight and obesity in adults. If Universit there is an abdominal obesity and most of the fat is around waist rather than at sitas Brawijaya hips, the risk for coronary heart disease and type 2 diabetes will increase. The risk Brawijay Universit goes up with a waist size that's greater than 35 inches for women or greater than sitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 40 inches for men (WHO, 2014). Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universita 2.1.5 Treatment and Management wijaya Universitas Brawijaya ersitas Brawijaya . Universitas Brawijaya Universitas Brawijaya . Universitas Brawijaya Universitias B The goal of obesity treatment is to achieve and stay at a healthy range of ersi weight. The initial treatment goal is usually a modest weight loss 3 to 5 percent of sit as ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas your total weight. However, the more weight you lose, the greater the benefits. The first treatment is dietary changes. The key to weight loss is reducing how the second sec ersidrinking habits to see how many calories are normally consume and where it cansitas Br be cut back. The typical amount of calories that should be consumed in a day is Universit1,200 to 1,500 calories for women and 1,500 to 1,800 for men (Sacks et al, 2009). Sitas Bra In addition, the concept of energy density can help you satisfy your hunger Universi with fewer calories. All foods have a certain number of calories within a givensitas amount (volume). Some foods such as desserts, candies, fats and processed versit foods are high in energy density. This means that a small volume of that food has it as a large number of calories. In contrast, other foods, such as fruits and vegetables, Universi have lower energy density. These foods provide a larger portion size with a fewersitas Brawijay number of calories. By eating larger portions of foods that have fewer calories, the Universi feel of hunger is reduced which contributes to overall satisfaction (Heber et al, Universitas br ersitas B To make overall diet healthier, eat more plant-based foods, such as fruits, vegetables and whole-grain carbohydrates; also emphasize lean sources of Universi protein such as beans, lentils and soy. Try to include fish twice a week. Limit salts tas Bra and added sugar. Stick with low-fat dairy products. Eat small amounts of fats, and ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Universimake sure they come from heart-healthy sources, such as olive, canola and nut oils. Certain diet should be restricted such as drinking sugar-sweetened Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijava** beverages because it is a sure way to consume more calories than intended beauties Brawlay Universitas Brawijaya Universitas Brawijaya (Hamdy, 2016). **Universitas Brawijaya** Universitas B Meal replacement is included in dietary changes too. It suggest that one or sitas Universitas Brawijava Universitas Brawijava Universitas Brawijava Universitas two meals is replaced with products such as low-calorie shakes or meal bars and Universitas Universil eat healthy snacks and a healthy, balanced third meal that's low in fat and calories. It as In the short term, this type of diet can help in losing weight (Purnell, 2011). Universitas B Apart from diet changes, and increased physical activity or exercise is ansitas essential part of obesity treatment. Most people who are able to maintain their Universitive ight loss for more than a year get regular exercise, even simply walking. Peoplesitas Brawi who are overweight or obese need to get at least 150 minutes of exercise a week ersi with moderate-intensity physical activity to prevent further weight gain or tositas maintain the loss of a modest amount of weight. To achieve more-significant Universitweight loss, 300 minutes of exercise has to be done in a week. Graduallysitas increasing the amount of exercise can improve endurance and fitness (Hamdy, Universit2016). Other treatment includes behaviour modification, sometimes called Universi behaviour therapy, which include counselling. Therapy or interventions with sitas B trained mental health or other professionals can help you address emotional and Mjava Universit behavioural issues related to eating. This therapy will teach healthy ways to cope with anxiety, understanding eating triggers, and cope with food cravings. Therapy Universi can take place on both an individual and group basis (Barlow, 2007).va Universitas Brawijava Universitas B Universitas <sup>B</sup> Doctor may recommend weight-loss medication if other methods of weight Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Universi loss haven't worked and if one of the following criteria is met. Body mass index (BMI) is 30 or greater and also have medical complications of obesity, such as Universitas Brawijaya Universitas Brawijaya erci diabetes, high blood pressure or sleep apnea. Before selecting a medication, Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universit doctor will consider health history, as well as possible side effects. Some it as Brawijaya Universitas Brawijaya Universitas Brawijaya weight-loss medications can't be used by women who are pregnant, or people Universit who take certain medications or have chronic health conditions. Commonly it as Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya prescribed weight-loss medications include orlistat (Xenical), lorcaserin (Belviq), rawijaya Universi phentermine and topiramate (Qsymia), buproprion and naltrexone (Contrave), and sitas Brawijaya liraglutide (Saxenda) (Jensen et al, 2014). Universitas Brawijaya **Universitas Brawijava** Universit2.2 BrToxoplasma gondii AS BR Universit 2.2.1 Classification Universitas Brawijaya Toxoplasma gondii is an unicellular eukaryotes, called protista. It is ansitas Brawijaya apicomplexa, cells with cluster of organelles known as apical complex; a coccidea, Brawijaya Universi gamonts small and intracellular, form small resistant spores called oocysts. Thesitas Brawijava gametes (Eimeriida) develop independently without syzygy; known as coccidian parasites (Allen, 2000). 2.2.2 Family: Toxoplasmatidae This family belongs to the tissue cyst-forming coccidia: heteroxenous Universi (two-host) parasites cycling between predator and prey hosts (transmission tositas Brawijaya predator via carnivorism of tissue cysts, and to prey via faecal-oral transmission of Universit spores). Parasites undergo sexual reproduction termed gamogony (microgametes sites fertilize macrogametes) in the gut of the predator (definitive host) resulting in the Universitas Brawijava Universi formation of small spores (oocysts). The oocysts undergo endogenous sporogonysitas Brawijava (forming sporocysts and sporozoites) and are shed in host faeces. When ingested Universitas Brawijaya Universitas Brawijaya University prey (intermediate hosts), the parasites multiply by asexual merogony tas Brawijava ersit (schizogony) and then form cysts within host tissues (especially striated muscles Universitas Brawijaya rawijava

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit and brain). The cysts may remain dormant in the tissues for months or years until sites Brawijaya eaten by a predator (Manceaux, 1908). jaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit2.2.3 Morphology Iniversitas Brawijaya Universitas Brawijaya Universitas Browi developmental stages are formed; schizonts, tissue cysts, gamonts Universitas Brawijaya Universitand oocysts. Schizonts appear as small basophilic intracellular bodies which sitas Brawliav divide rapidly to form small collections of tachyzoites (measuring 4-5 x 1-2µm). Universit Tissue cysts (measuring 10-100µm in diameter) are surrounded by a thin primary Universit cyst wall (<0.5m thick) and contain hundreds of basophilic bradyzoites (measuring Universitas erst 3-4 by 1-2µm). Gamonts exhibit sexual differentiation, with microgamonts tras Brawliava apparent as multinucleate basophilic stages ultimately shedding small small biflagellated microgametes; and macrogamonts evident as uninucleate eosinophilic cells with a single ovoid nucleus. Oocysts are small ovoid stages (10-13 x 9-11m) and contain two round sporocysts, each containing four elongate Universit sporozoites (Ajzenberg, 2011). Universita Universitas 2.2.4 Host Range Universitas B Infections have been detected worldwide in a diverse range of vertebratesitas hosts; carnivores, herbivores, insectivores, rodents, pigs, primates (including humans) and occasionally birds. Sexual development and oocyst formation onlysitas occurs, however, in feline hosts. Only one parasite species is considered valid ersitas Brawijaya Universidue to the lack of intermediate host specificity. Various strains, however, aresitas Brawijava recognized on the basis of their variable infectivity, growth, virulence and gene Universit expression. T. gondii propagates primarily by clonal, asexual or uniparental clonal sites reproduction, and various strains have been allocated to three clonal lineages Universi (Types I, II and III) on the basis of analyses of multiple independent single-copy Universitas Brawijaya Universitas Brawijaya

rawijaya Universitas Brawijaya Universit loci as well as microsatellite markers. Type I strains are most often associated it as Brawliave ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya with disease in immunocompetent adults and in congenital infections, type II Universit strains with immunocompromised individuals, and type III strains with patients it as with ocular toxoplasmosis. The prevalence of infections varies according to host Universi populations and geographic location but seroprevalence estimates range from sitas Brawijaya 5-75% in many countries (Flegr, 2014). Universitas Brawijaya – Universitas Brawijaya Universit2.2.5 Site of Infection Universitas Bin cats, parasites undergo asexual and sexual multiplication in intestinal sitas Brawijaya Universitepithelial cells culminating in the formation of oocysts 3-5 days after infection. Insitas Brawijava Universital other vertebrate hosts, parasites undergo asexual multiplication in a wide Universi range of extra-intestinal locations (cells of the lymphatic and circulatory systems, sitas nervous tissue, skeletal musculature, etc.). During the acute phase of infection, SI the parasites divide rapidly forming small groups of 8-32 tachyzoites which lyse Universithe host cells. As infections become chronic, the parasites divide more slowly sitas forming large accumulations of bradyzoites particularly within the brain, heart and Universi skeletal muscle. These tissue cysts are surrounded by a thin cyst wall and theysitas Brawijaya persist for months or even years after infection. Cyst formation coincides with the Universidevelopment of host immunity (not sterile immunity but rather a state of sitas Brawijaya premunition) (Webster et al, 2013). Universit2.2.6 Pathogenesis iversitas Brawijaya Universitas Brawijaya Universitas B Many host species exhibit an age-related resistance to disease therefore Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit most infections in adults and weaned individuals are asymptomatic. In susceptible sitas Brawijava hosts, symptomatic infections may be acute, subacute or chronic. Acute infections Universitas Brawijaya Universitas Brawijaya Universi by proliferating tachyzoites cause flu-like symptoms, including lymphadenitis, Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijava

Universitas Brawijaya fever, headache, muscle pain and anaemia. Symptoms generally subside with the rsitas Brawijaya Universitas Brawijaya Universitas Brawijaya development of immunity, but may sometimes persist producing subacute disease, <sup>Crst</sup> characterized by extensive lesions in the lung, liver, heart, brain or eyes. Postnatal infections often involve lymphadenitis, myocarditis, central nervous system Universit involvement and retinochoroiditis. Chronic infections by encysted bradyzoites as B usually cause few clinical signs, although degenerating cysts have been ersi associated with hypersensitive inflammatory reactions, resulting in, for example, sitas encephalitis, myocarditis and/or chorioretinitis. The tissue cysts lay quiescent Universit (dormant) in the tissues for some time, occupying little space and apparentlysitas Br causing few functional deficits, although there is contradictory evidence that infections may be associated with some learning disabilities, slower reflexes and sites altered behaviour in intermediate hosts. Latent cyst infections may be reactivated Universi in immunocompromised patients (those undergoing immunosuppressive therapysitas or with acquired immunodeficiencies) resulting in cell lysis, expanding focal Universitlesions, rapid dissemination, encephalopathy and meningoencephalitis (Arantessit et al. 2009). Universitas B Infections may also be transmitted transplacentally. If the mother contracts infection during pregnancy, parasites may cross the placenta and infect the foetus causing spontaneous abortion, stillbirth or congenital abnormalities, such as hydrocephalus, brain calcification, chorioretinitis and mental retardation. ers Nonetheless, if the mother/dam is infected prior to pregnancy, her immunity issitas Bra transferred to her foetus which is consequently protected. Infections in cats by ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit Universit enteric sexual developmental stages are generally subclinical, transient and leaves the cat with a solid protective immunity against subsequent oocyst production Universi (Weiss and Kim, 2011). Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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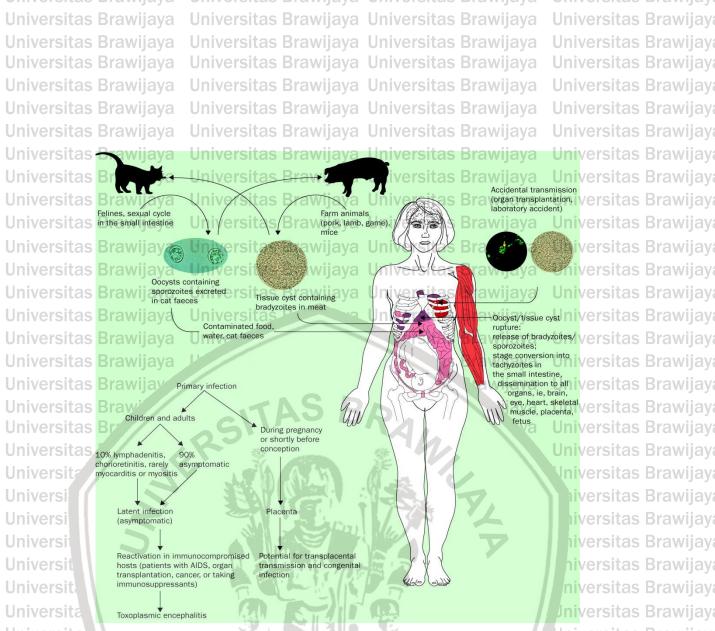


Figure 2.1 Pathogenesis of Toxoplasma gondii (Montoya, 2004).

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#### Universitas 2.2.7 Mode of Transmission

Universitas Binfections are transmitted horizontally between hosts by the ingestion of sitas Brawijava oocysts excreted by cats, and vertically between mother and offspring by **Universitas Brawijava Universitas Brawi** Universi transplacental or even transmammary transmission of proliferative tachyzoites sitas Brawijava Infections may also be transferred between intermediate hosts through the food Universitas Brawijaya Universitchain via carnivorism, the ingestion of fresh or undercooked meat containingsitas Brawijava viable cysts. Bradyzoites released during digestive processes are resistant to Universi enzymatic digestion and revert back to tachyzoite stages which infect the host, sitas Brawijava multiply, spread and lead to new cyst formation. Infections are more prevalent in Universitas Brawijaya Universithuman populations which have traditional cultural practices involving the tas Brawijaya Universitas Brawijaya

rawijaya Universitas Brawijaya consumption of raw or partially cooked meat. Oocysts excreted by cats take 1-5 ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya days to sporulate before they become infective and they are resistant to external Universit environmental conditions and may remain viable in contaminated soil and watersitas Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** for some time (Flegr et al, 2014). Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit2.2.8 Differential Diagnosis Universitas B Parasites may be detected in autopsy or biopsy material by histology, Universitimmunolabelling or in vivo culture following inoculation into laboratory rodents.sit Zoites in smears stain well with Giemsa and other Romanowsky stains while cysts erst in sections have silver-positive walls and the bradyzoites are strongly PAS and Bradyzoites are strongly PAS (periodic acid-Schiff) positive. Monoclonal and polyclonal antibody labels have also been used to detect parasites in tissue sections, and molecular studies using polymerase chain reaction (PCR) amplification techniques have detected parasite DNA in host tissues. Most infections, however, are diagnosed serologically and a ersi range of immunoassays (fluorescence, agglutination and enzyme-based) are commercially available. Recent/acute infection is indicated by a 4-16 fold increase Universit in specific antibody titre over a two-week period, or by the detection of specific IgMSITAS antibody titres (Santos et al, 2011). 2.2.9 Treatment and Control Chemotherapy is successful when pyrimethamine and sulphonamides are Universi given together as they act synergistically. The toxic side-effects of bone marrowsitas depression can be relieved by the administration of folinic acid. Clindamycin and Universi spiramycin have also been reported to be effective. The risk of transmission can be reduced by maintaining high standards of hygiene (particularly where cats are Universitas Brawijaya Universitas Brawijaya Universi involved), by thoroughly cooking or deep-freezing meat prior to consumption and Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya currently sitas Brawijaya universitive washing potentially contaminated foodstuffs. Molecular vaccines are being developed for high risk patient groups, and a live vaccine using easitas Brawijaya rawijaya Universit low-virulent non-persistent strain has been marketed to protect sheep against las Brawijaya ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya toxoplasmosis (Hokelek, 2016). Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi 2.3 B Toxoplasma gondii Profilin Universitas B Apicomplexan parasites stimulate actin-dependent gliding movements that play an important role to invade the host cell. Profilin is a vital contributor in actinsitas polymerization. T.gondii has a profilin-like protein that is recognized by toll-like Brawijay Universitas Brawijaya receptor (TLR-11) of the natural immune system which leads to inflammation of sitas Brawijaya the host cell. The damage to the host cell is known to be associated with a gene encoding profilin in T.gondii parasites. Although profilin does not function in cellsitas Brawijaya growth, it will stimulate gliding motility to invade the host cell and cause virulence. Besides, the parasites without profilin are unable to induce TLR-11 for the production of interleukin (IL)-12 (cytokine defense of the host cell) both in vivo and SILAS in vitro. Therefore, profilin is an important element of the two aspects of T.gondii Universit infection. Profilin functions in motility when the microbial host cell recognizes the sitas Brawijaya ligand of the natural immune system (Uliana et al, 2011). NK cell University esicle Dra as Parasite Iniversitas Brawijaya ava Unit Universitas Braw intracellular killing Universitas Bray IFNY Universitas Brawijava s BNeutrophilava Universi Universitas Bramacrophagea Brah Brawijaya CD8<sup>+</sup> T cell Universitas Photocora Universitas Brawijaya Universitas Brawijaya Invasion of Toxoplasma gondii profilin (Yarovinsky, 2014). iversitas Brawijaya Universitas BFigure 2.2 Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya Universite 2.4 B Relationship between *Toxoplasma gondii* Profilin and Obesity **Universitas Brawijaya** rersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas BA few studies had shown the association of T.gondii profilin on lipid Universit metabolism. According to the Asean Pacific Journal of Tropical Disease (Iskandar Itas Bra ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas et al, 2016), a study had been carried out to know the levels of T.gondii profilin Universitand Badiponectin in obese patients complicated with or without metabolicsitas Bra syndrome as compared to non-obese patients. The results showed that the ersit T.gondii profilin level in obese subjects complicated with metabolic syndrome wassitas Bra significantly higher compared to the non-obese subjects, but there was no Universit significant difference in the level of T.gondii profilin between the obese subjects sitas Braw complicated with metabolic syndrome and those without metabolic syndrome. This could be due to the excessive fat deposits on the obese subjects. The it as B occurrence of infection by *T.gondii* would increase the expression of profilin, ersi Universit including fat cells. The bond between profilin-like protein and TLR-11 would sit as Brawi further increase the expression of pro-inflammatory cytokines which will Universiteventually lead to the increase of inflammation in adipocytes and causingsitas Brawijava adiposopathy and obesity. This shows that *T.gondii* profilin is strongly correlated erst with lipid metabolism but the pathogenesis is yet to be understood well. Althoughs ras Br T.gondii profilin had been associated with the level of adiponectin and cytokines, Universithere is no study that relates T.gondii with the level of leptin (Kucera et al, 2010). Universit2.5 B Leptinya Universite ...... Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 2.5.1 Definition Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya ersitas BA hormone produced mainly by adipocytes (fat cells) that is involved in thesitas Brawijaya Universitas Brawijava Universitas Brawijava regulation of body fat. Leptin interacts with areas of the brain that control hunger Universitiand behavior and signals that the body has had enough to eat. A small number of sit as Brawijay Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijava Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universit people have genetic mutations in the leptin gene, leading to a greater demand for sites Brawijay ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit food, resulting in obesity (MedicineNet, 2016). Iniversitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit2.5.2 Mechanisms and Actions of Leptina Universitas Brawijava Universitas Bravijava Leptin acts as a hormone that modulates the size of the adipose tissues in Universitas Bravijava rawijaya Universi the body. It regulates food intake and body weight. Based on Figure 2.5, leptinsitas Brawijava Universitalso acts on specific receptors in the hypothalamus to inhibit appetite through both Universitals Brawijaya Universi counteractive and stimulatory mechanisms (Margeric et al, 2002). jaya Universitas Brawijaya Universitas B Leptin counteracts the effects of a feeding stimulant released in the gut Universitas Brawijaya Universitas Braunopeptide Y as well as the effects of a cannabinoid neurotransmittersitas Brawijaya called adandamide which stimulates appetite. Leptin also promotes the synthesis Brawijay hiversitas Brawijaya Universi of an appetite suppressant called a-melanocyte-stimulating hormon (Gao et al, sitas Brawijava Universi 2007). rawijaya When fat mass decreases, the level of plasma leptin falls so that appetite is rawijaya Universitistimulated until the fat mass is recovered. There is also a decrease in bodysitas Brawijaya temperature and energy expenditure is suppressed. By contrast, when fat mass Universitincreases, so do leptin levels and appetite is suppressed until weight loss occurs.sitas Brawijaya

In this way leptin regulates energy intake and fat stores so that weight is Universitimaintained within a relatively narrow range (Mandal, 2014).

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rawijaya Universitas Brawijaya Univer**ACTION** iOE LEPTINas Brawijava rawijaya Universitas Brawijava, Universitas Brawijaya Universitas Brawijava Universitas Brawij Decreased energy expenditure avinhibit niv rs Hypothalamusava rawijaya increased activation Universitas Brawijaya Universitas Brawijaya Universitas Brawijay rawijaya Fat depots (AD tissue) Brawijaya Universitas **Universitas Braw** Increased fat deposition Universitas Brawiiava Universitas Brawijaya Increased plasma Va Increased leptin synthesis leptin conc. java Universitas Braw

Figure 2.3 Action of Leptin (Saini, 2013).

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### 2.5.3 Leptin Resistance

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People who are obese have a lot of body fat in their fat cells. Because fatsitas Brawijaya cells produce leptin in proportion to their size, obese people also have very high Universi levels of leptin. Given the way leptin is supposed to work, people shouldn't besitas Brawijaya eating and their brain should know that they have plenty of energy stored. UniversitHowever, the problem is that the leptin signal isn't working. There's a whole ton ofsitas Brawijava leptin floating around, but the brain doesn't "see" that it is there. This condition is Universitknown as leptin resistance. It is now believed to be the main biological sitas Brawijava abnormality in human obesity. When the brain doesn't receive the leptin signal, it Universiterroneously thinks that the body is starving, even though it has more than enoughsitas Brawijava energy stored (Brennan and Mantzoros, 2006). ersitas Braw Universitas B This makes the brain change our physiology and behavior in order to regainsitas Brawijava the fat that the brain thinks we're missing. The brain thinks that we must eat so Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi that we don't starve to death. The brain also thinks that we need to conserve it as Brawijava universite energy, so it makes us feel lazier and makes us burn fewer calories at rest. For Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi the great majority of people, trying to exert cognitive inhibition (willpower) over the sitas Brawijava leptin-driven starvation signal is next to impossible (Myers et al, 2010). **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

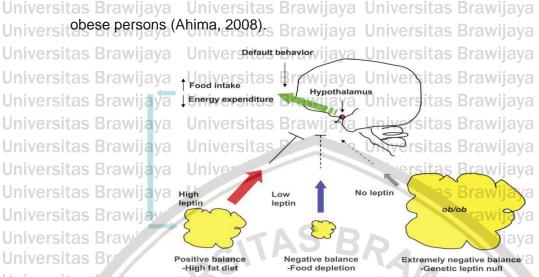
Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit2.6 B The Role of Leptin in Obesityvijava Universitas Brawijava Iniversitas Brawijaya Leptin is a neurotransmitter expressed in the brain. This neurotransmitter Brawijaya Universi signals to the brain mainly in the hypothalamus that when a person stops to eat forsitas Brawijava maintaining hisbody mass index. It has been observed that lab mice have a ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Universi polymorphism in the leptin gene. Mutations in this gene prevent to manufacture the functional leptin protein. Due to less leptin expression, mice become morbidly obese. Another strain has a mutation or polymorphism in the gene encoding for the Leptin Receptor (LEPR). In this case, signal of the leptin is not received by the ersi brain or the hypothalamus. So due to signal disruption or mutations in the lepting receptor, mice become obese (Wasim, 2015). Based on Mantzoros, 1999, the dramatic effects of leptin administration to ob/ob mice (obese mouse, a mutant mouse that eats excessively and becomes profoundly obese; also an animal model of type II diabetes) which are leptin ersil deficient because of mutations of the leptin gene, raised expectations that human obesity might also be a leptin-deficient state that could be treated with exogenous Universit leptin administration. Although the first persons with extreme, early-onset obesitysitas due to an inactivating mutation of the leptin gene have been identified and ersi clinically characterized (Montague et al, 1997), several population studies haves tas Brawi failed to demonstrate such mutations (Maffel et al, 1996; Morl et al, 1996; Williams Universitiet al, 1995). Thus, leptin-deficient persons probably represent only a minority of ILAS obese humans. In contrast, most obese humans have increased leptin levels Considine et al, 1996), indicating that obesity is a leptin-resistant state in most as B Universitas Brawijava Universitas Brawijava obese persons. However, because one sequence polymorphism and linkage of Universit obesity to regions flanking the leptin gene have been reported in association with sites Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universite extreme obesity, the leptin gene may prove to be important only in extremely it as Brawijay Universitas Brawijaya Universitas Brawijava Universitas Brawijaya Universitas Brawijava Universitas Brawijaya Universitas Brawijava нів Universitas Brawija Universita

Figure 2.4 Universit **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya**  Universitas Brawijaya Universitas Brawijaya

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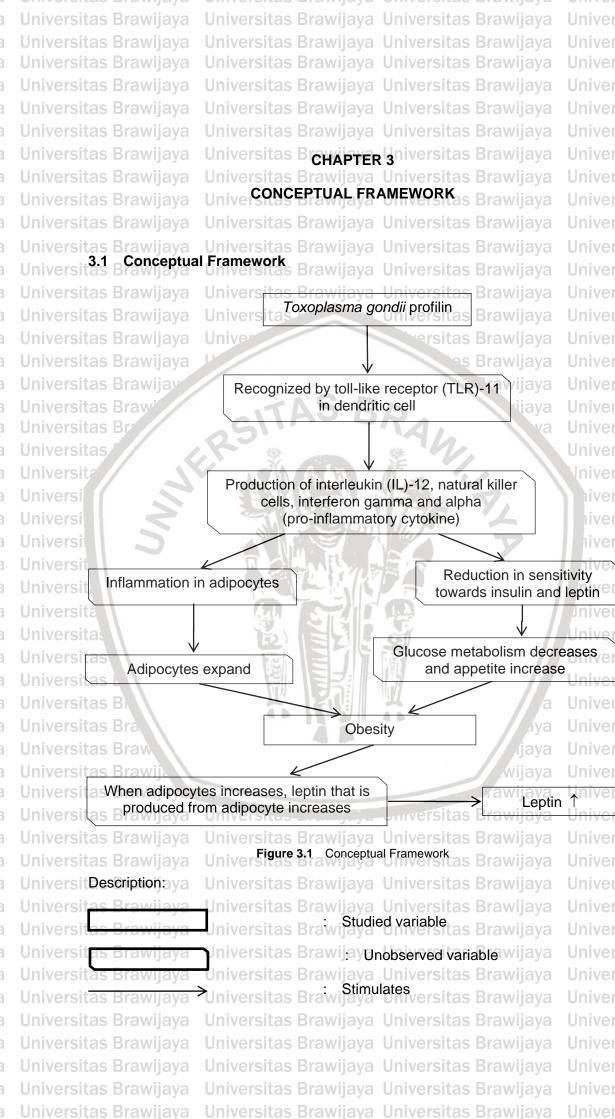
Relationship of leptin and adipocytes (Gao and Horvath, 2007).

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Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B Profilin of toxoplasma gondii will be inserted into rat and the profilin will Universitas Brawijaya Universitas Brawijaya Universit stimulate gliding motility to invade the host cell through actin polymerisation and Universit cause virulence. The profilin will be recognized by toll-like receptor (TLR-11) of the ersitas Brawijava Universitas Brawijava Universitas Brawijava Universitas natural immune system and leads to the production of interleukin (IL)-12, natural Universi killer cells, interferon gamma and alpha (cytokine defense of the host cell). Thesitas Brawijaya production and elevation of pro-inflammatory cytokines causes inflammation in versitadipocytes. Apart from causing inflammation, the pro-inflammatory cytokines wills tas Brawijaya reduce the sensitivity towards leptin and insulin therefore causing increase in Universitappetite and decrease in glucose metabolism. This will eventually lead to obesity. Sitas Brawij Inflammation precede the development of obesity by the expansion of the Universi adipocytes. In other hand, there could be a possibility that if the inflammationsitas takes place in the brain (specifically the hypothalamus), it might causes leptin Universi resistance. Leptin is a hormone that regulates appetite and metabolism. It doessitas Bi this through its effect on the hypothalamus. When the hypothalamus becomes Universi resistant to leptin, fat metabolism are impaired and weight will be gained. Leptin issitas Brawijava produced mainly by adipocytes (fat cells) that is involved in the regulation of body Universitet B Universitas B If the rat is obese, it indicates that the amount adipocytes is increased and Universitherefore the amount of leptin will be increased too. Universit3.2 B Hypothesis of the Research The effect of exposure to *Toxoplasma gondii* profilin is increase in the level Universit of leptin in Rattus norvegicus Wistar strain rats given normal diet and hypercalorics tas Brawijaya Universitas Brawijaya rawijava

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Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya srawijaya 🛛 **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas Bravijaya Universitas Brawijaya Universitas Brawijaya Universit RESEARCH METHODS sitas Brawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya Universitas B This study is an experimental study, in vivo on experimental animals of sitas Brawijaya Wistar rats (*Rattus norvegicus*) by using the *post test control group* design. With Universitas Brawijaya Universitas P rawijaya Universithis design, it will allow the researcher to measure the effect of intervention in thesitas Brawijaya experimental group by comparing the experimental group and control group. Ahr, Universitas Brawijaya rawijaya Universitas B Universit42 Sample and population **Universitas Brawijaya** rawijaya Universit 4.2.1 Population of the Research niversitas Brawijaya Population of the research is male, white Rattus Norvegicus Wistar strainsitas Brawijaya rawijaya Universi rats that are obtained from Pharmacology Laboratory of Medical Faculty, Sitas Brawijaya srawijaya 🛛 hiversitas Brawijaya rawijaya UniversitBrawijaya University. srawijaya 🛛 rawijaya Universit4.2.2 Sample Selection Universitas 4.2.2.1 rawijaya Inclusion criteria Universit1.sMale rats. **Universitas Brawijaya** rawijaya rawijaya Universitas Weight of the rats are approximately 50-100 gram. **Universitas Brawijaya** rawijaya Universit3. Age of 3-5 months. **Universitas Brawijaya** 4. Rats that are healthy, active and without disability. rawijaya Universitas Brawijaya rawijaya ersitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Gender of subjects used in experiment will be male that are healthy instead rawijaya rawijaya Universit of female because female rats have reproductive cycles and hormone fluctuationssit as Brawijaya that would confound the results of experiment. They have estrogen hormone that **Universitas Brawiiava** rawijaya rawijaya Universitinfluences the metabolism of lipid dan cholesterol, while male rats don't havesit as Brawijaya tas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya hormonal changes (Marcotte, 2014). tas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawiiava** rawijaya **Universitas B** rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya

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Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya rawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas B Rats are chosen as sample because they are classified as benign animal, sitas Brawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya Universiteasy to be housed and maintained. Scientists and researchers rely on rats for sites Brawijaya rawijaya Universit several reasons as below (Melina, 2010): va Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya a. Small in size. rawijaya Universitas Brawijaya Universitas Brawijaya Universitb. Shigh sensitivity towards interventions ava Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Province Universitas Brawijaya c. More standardized compared to other experimental animals. Universitas Brawijaya rawijaya Universitas Brawijaya Universitd.sCan be bred to guarantee the authenticity and uniformity of strain.ya Universitas Brawijay e. Rats cannot vomit because they do not have vomiting centre. Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas B This research divides the sample into seven groups which are : /a Universitas Brawijaya Table 4.1 Groups of the Research Universitas Brawijaya

| Universi               | Group | Toxoplasma gondii profilin | Hypercaloric dietiversitas Brawijay |
|------------------------|-------|----------------------------|-------------------------------------|
| Universi               | К     | Shi Selan I                | <b>Eniver</b> sitas Brawijay        |
| Universi               | D1    | 15µg/ml                    |                                     |
| Universit<br>Universit | D2    | 30µg/ml                    | hiversitas Brawijay                 |
| Universita             | D3    | 45µg/ml                    | - Universitas Brawijay              |
| Universita             | D4    | 15µg/ml                    | + Universitas Brawijay              |
| Universitas            | D5    | 30µg/ml                    | + Universitas Brawijay              |
| Universitas I          | D6    | 45µg/ml                    | + Universitas Brawijay              |
| Universitas E          | ЗА    |                            | a Universitas Brawijay              |
| Universitas E          | Bra   |                            | ava Universitas Brawijav            |

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## Universita 4.2.3 Number of Samples **Universitas Braw**

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Universitas Brawijaya Universitas B The amount of replication that is used for each group using the formula: versitas Brawijava Universitas Brawija) (t-1) (r-1) ≥ 15 (Hanafiah, 2005), Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas=Bnumber/of gloupsersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit15 Bravonstant valueersitas Brawijaya Universitas Brawijaya Universitas Brawijaya In this research, the number of groups are 7 (t = 7), therefore the number of Universitas Brawijaya Universitreplication would be iversitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas  $B_{(7,1)} \ge 15$  iversitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitaa Beawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya Universitas B So, the number of replication needed for each group will be a minimum of 4sitas Brawijaya tas Brawijaya Universitas Brawijaya with an addition of 1 for each group. The total number of sample that is used for Brawijaya rawijaya **Universitas Brawijaya** Universithis research will be 35 rats for 7 groups of intervention and control since 5 ratssitas Brawijaya BRAW **Universitas Brawijaya** are needed for each group. **Universitas B** rawijaya Universitas Brawijaya Variables of the Research Universit4.3 rawijaya Universitas Brawijaya Universit 4.3.1 Manipulative Variable (Independent) Iniversitas Brawijaya Universi rawijaya The manipulative or independent variable in this research is the exposure of sitas Brawijaya rawijaya Universi Toxoplasma gondii profilin with three different dosage on Rattus Norvegicus Brawijaya rawijaya niversitas Brawijaya rawijaya UniversitWistar strain rats. rawijaya rawijaya Universit 4.3.2 Responding Variable (Dependent) rawijaya The responding or dependent variable in this research is the level of leptin in rawijaya Universitas Brawijaya Universit Rattus Norvegicus Wistar strain rats. **Universitas Brawijaya** Universitas Brawijaya rawijaya Universit4.3.3 External Variable Universitas Brawij Universitas Gender of rats : Male **Universitas Brawijaya** Universitas Brawijaya rawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 3. Weight: 50-100 gram Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universit4. Environmental factor in the laboratory where the rats were housed and thesitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Ieptin levels were measured. Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit4.4 B Location and Time of the Research Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas B This research was executed in Pharmacology Laboratory of Medical Faculty Itas Brawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit Brawijaya University for experiments and maintenance of the rats while tas Brawijaya rawijaya rawijaya Universit Parasitology Laboratory of Medical Faculty Brawijaya University for leptin levelsitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya measurement. The duration of the research was from February to July 2017. Universitas Brawijaya rawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit 4.5 B Materials and Equipment / Instrument of the Research wijava rawijaya Universita.5.1 Equipments Universitas Brawijaya rawijaya Universitas Brawijaya ce on BRAMIJ VIJ Universit4.5.1.1 Equipments for the Maintenance of Wistar Rats vawijaya Universitas Brawijaya Universita) Rat cage along with the chaff. **Universitas Brawijaya** rawijaya Universitb) Cage cover made of woven wire. **Universitas Brawijaya** rawijaya Universitc) Water bottles and feeding spot. Iniversitas Brawijaya rawijaya rawijaya 4.5.1.2 Equipment for the Intervention on Wistar Rats rawijaya Universita) Syringe 1 cc for intraperitoneal injection of Toxoplasma gondii profilin. srawijaya 🛛 rawijaya Universit4.5.1.3 Equipments for Serum Intake from Wistar Rats Universita) Syringe 5cc to take blood sample of rats. rawijaya Universitb)SMedical gloves. **Universitas Brawijaya** Universit's Test tubes. **Universitas Brawijaya** rawijaya Universitd)SVacutainer **Universitas Braw Universitas Brawijaya** Universite) Eppendorf **Universitas Brawijaya** rawijaya **Universitas Brawijaya** rawijaya Universit<sub>f</sub>)scentrifuge/a Universitas Brawijaya Universitas Brawijaya 4.5.1.4 Equipment for the Measurement of Leptin Level rawijaya rawijaya Universita) ELISA (Enzyme-Linked Immunosorbent Assay) Kitsitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya b) Incubator rawijaya Universitas Brawijaya Universitas Brawijaya Universită Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitc)sMicropipette Universitas Brawijaya d) Yellow tip Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya srawijaya

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universites Eppendorf/a **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitf) Microplate reader with 450 ± 10nm wavelength filter as Brawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universit4.5.2 Materials rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijava, Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas B Experimental animal used for this research is Rattus Norvegicus Wistarsitas Brawijava rawijaya Universit strain rats that are male and healthy with the age of 3-5 months and weigh 50-100 sitas Brawijaya Universit<sup>gram</sup>rawijay **Universitas Braw** TAS BD Universitas Brawijaya Universit4.5.2.2 Materials for the Maintenance of Wistar Rats rawijaya a) Rat diet according to standards of Pharmacology Laboratory of Medical Faculty Brawijaya University. rawijaya Universi b) Rat drinks according to standards of Pharmacology Laboratory of Medical rawijaya Faculty Brawijaya University. c) Specific to particular groups : Hypercaloric diet according to standards of Universit Universita rawijaya Universita, Pharmacology Laboratory of Medical Faculty Brawijaya University. rawijaya rawijaya Universit4.5.2.3 Material for Intervention on Wistar Rats a) *Toxoplasma gondii* profilin Universitb) Ketamine 50mg/ml **Universitas Brawijaya Universitas Brawijaya** Universit4.5.2.4 Whaterials for the Measurement of Leptin Level Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitb)s B Diluent N Concentrate as Brawijaya Universitas Brawijaya rawijaya Universitas Brawijava, Universitas Brawijaya Universitas Brawijaya c) Wash Buffer Concentrate rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitd)s B Biotinylated Mouse Leptin Antibody ya Universitas Brawijaya Universitas Brawijaya Universitas Brawijava Universitas Brawijaya Universitas Brawijaya e) Chromogen Substrate Universitas Brawijaya Universitas Brawijava Universitas Brawijaya rawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya

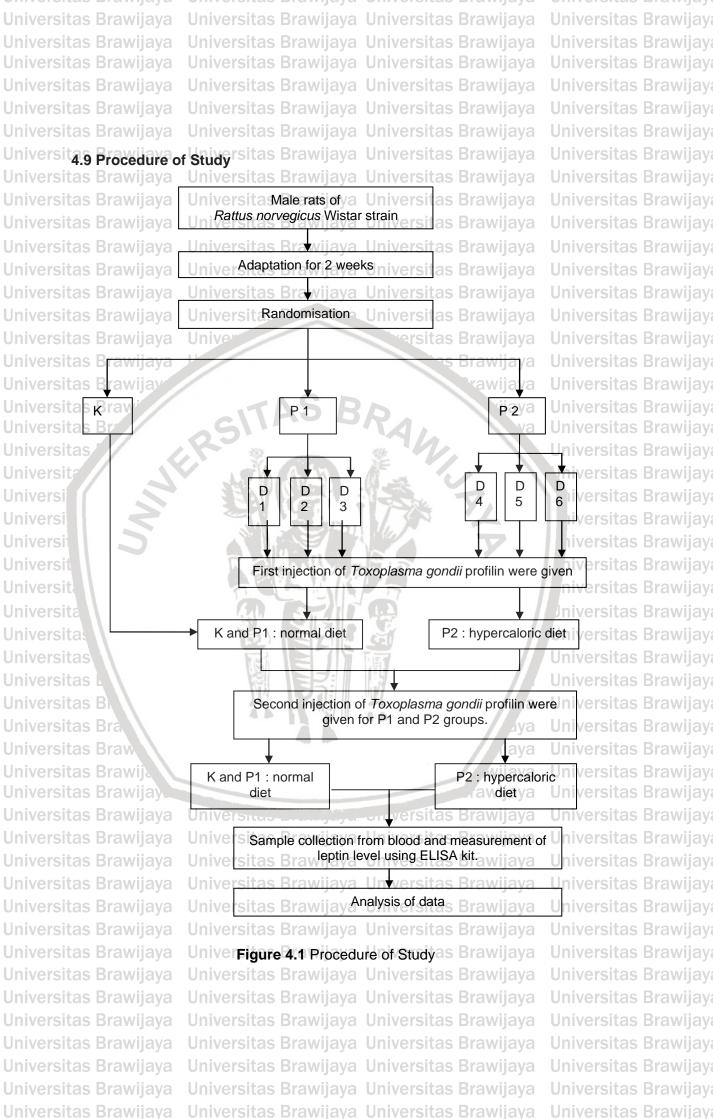
Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit<sup>g</sup>)s<sup>L</sup>eptin Standard Iniversitas Brawijaya Universitas Brawijaya rawijaya Universiths Sealinginger Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya i) Stop Solution rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universit4.6 B Operational Definition S D Universitas Brawijaya Universitas B1. Obese models are made by providing a hypercaloric diet according to ersitas Brawijaya Universitas Brawijaya Universitas Bra Nascimento et al., 2008. rawijaya Universitas Brawijaya Universitas B 2. The recombinant Toxoplasma gondii profilin taken from host Escherichiasitas Brawijaya **Universitas Brawijaya** rawijaya coli was imported from Adipogen Corp., San Diego, USA on 28th Marchersitas Brawijaya rawijaya 2017 by storage using Blue Ice -20°C, in phosphate-buffered saline. hiversitas Brawijaya 3. Toxoplasma gondii profilin had been injected on rats intraperitoneally, versitas Brawijaya rawijaya twice with time span of 11 weeks and 4 days between the first injectionersitas Brawijaya rawijaya Universit on 30<sup>th</sup> March 2017 and the second injection on 20<sup>th</sup> June 2017. 4. Measurement of leptin levels was done at week 15 using Rat Leptin iversitas Brawijaya rawijaya (LEP) Elisa Kit E0561Ra. Universit<sup>4.7</sup> B Data Collection **Universitas Brawijaya** Universit4.7.4 Division of the Group Universitas B35 rats were divided into 7 groups using randomization method to obtain Universit negative control group and positive control groups. Each groups differs insitas Brawijaya Universitas Brawijaya Universitas Engenerational Engenerational Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitions Bravionnal der without profilina wijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya D1 - Normal diet with 15 µg/mL profilin Universitas Brawijaya Universitas Brawijaya rawijaya UniversitD2 BrayNormal diet with 30 µg/mL profiling Universitas Brawijaya Universitas Brawijava Universitas Brawijava Universitas Brawijava D3 - Normal diet with 45 µg/mL profilin Universitas Brawijava Universitas Brawijava **Universitas Brawijaya** rawijaya UniversitD4 Bra Hypercaloric diet with 15 µg/mL profilim iversitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universit D5 Bray Hypercaloric diet with 30 µg/mL profilin iversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit D6 B - Hypercaloric diet with 45 µg/mL profilin Universit4.7.2 Procedure of the Research awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 4.7.2.1 Procedure to Obtain Profilin Universitas Brawijaya Universitas Brawijaya rawijaya Universitas B Toxoplasma gondii profilin were provided by Parasitology Laboratory ofsitas Brawijaya Universitas Brawijaya Medical Faculty Brawijaya University. Universitas Brawijaya University. Universitas Brawijaya Universit4.7.2.2 Procedure of Intervention on the Rats Universitas B The rats are left to get through adaptation for 2 weeks at ParasitologySitas Brawijaya va Universitas Brawijaya Universit Laboratory of Medical Faculty Brawijaya University. After 2 weeks, the positive sitas Brawijaya Universit control groups are injected with different dosage of profilin (15,30 and 45µg/ml)sitas Brawijaya Universi according to groups by intraperitoneal. The profilin takes approximately 6 weeks it as Brawijava Universi to react on the rats. In addition to profilin, hypercaloric diet is also given to 3 of the Sitas Brawijaya Universit positive control group. Universit4.7.2.3 Procedure of Leptin Level Measurement Universitas The serum of the rats are first obtained by withdrawal of blood sample from Universithe rats. The test tubes are placed in centrifuge machine and centrifugated withsitas Brawijaya Universities are speed of 3000 rpm for 5-10 minutes. The serum is taken with pipette and sitas Brawijaya Universimoved to eppendorf. The sample is then tested using ELISA (Enzyme-Linked Universitas Brawijaya Immunosorbent Assay) kit for the quantitative measurement of leptin levels. Universitas Brawijaya ie enversitas Brawijaya Universitas Brawijava Universitas BA Leptin specific antibody is precoated onto 96-well plates and blocked.sitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi specific biotinylated detection antibody is added and then followed by washing tas Brawijava with wash buffer. Streptavidin-Peroxidase Conjugate is added and unbound sitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi conjugates are washed away with wash buffer. Tetramethylbenzidine (TMB) is tas Brawijava Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya srawijaya

Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya rawijaya Hniversitas Brawijaya Universit then used to visualize Streptavidin-Peroxidase enzymatic reaction. rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit catalyzed by Streptavidin-Peroxidase to produce a blue color product that that Brawijaya rawijaya rawijaya Universit changes into yellow after adding acidic stop solution. The density of yellow sitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya coloration is directly proportional to the amount of Leptin captured in plate. Universitas Brawijaya rawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit4.8 BiData Analysis iversitas Description Universitas Brawijaya rawijaya Universitas B The tests used in the processing of the data are One-Way Annova Test, rawijaya **Universitas Brawijaya** rawijaya Universit Correlation Test (Pearson) and Linear Regression Analysis Test. Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** rawijaya Iniversitas Brawijaya hiversitas Brawijaya rawijaya Universi rawijaya hiversitas Brawijaya rawijaya Universit niversitas Brawijaya rawijaya rawijaya rawijaya rawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya rawijaya **Universitas Brawijaya** rawijaya **Universitas Brawijaya** rawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya srawijaya

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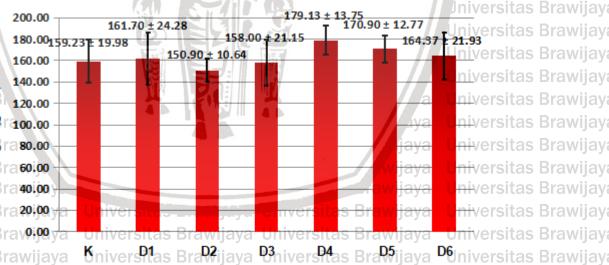
rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya **RESULTS AND DATA ANALYSIS** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Research Results** 5.1 rawijaya as Brawijaya Universitas Brawijaya Universit5.1.1 Collecting Samples itas Brawijaya Universitas Brawijaya Universitas Brawijava After the intervention has been completed, the rats were dissected to obtain Universi the blood plasma samples. With the initial step of anaesthesia using 50 mg ofsitas Brawijaya Universities Brawijay Ketamine as much as 0.4 to 0.5 ml. After the blood plasma has been taken, it was Universi centrifuged with a speed of 3000 rpm for 10 minutes. The serum from the sample sitas Brawijaya that has been centrifuged was taken to be inserted into eppendorf. It was then Universi stored in the freezer for -2 to -8 degree Celsius.

Universit5,2 Average Weight of Rattus Norvegicus Wistar Strain Rats Based on The Universitas 🛢 Universitas Sra00.00 Universitas Braso.00 Universitas Šra 60.00 Universitas Bra40.00 Universitas Bra<sup>20,00</sup> Universitas Braveio

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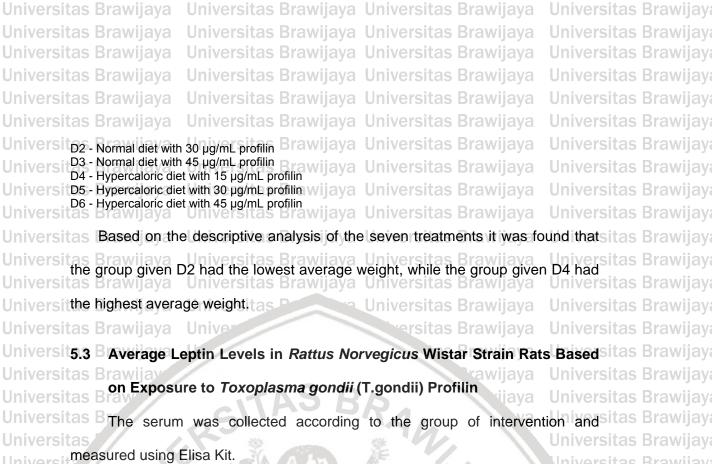
Exposure To Toxoplasma gondii Profilin

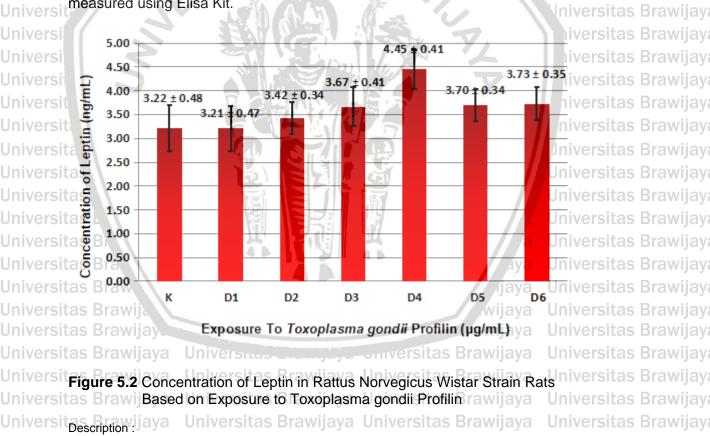


University Exposure of Toxoplasma gondii Profilin (µg/mL)

Brawijava Universitas Brawijava Figure 5.1 Average Weight of Rattus Norvegicus Wistar Strain Rats Based on Exposure To Toxoplasma gondii Profilin Universitas Brawijaya Universitas Brawijaya Description : K<sup>S</sup>-Normal diet without profilinsitas Brawijaya Universitas Brawijaya UniversitD1-Normal diet with 15 µg/mL profilin Brawijaya Universitas Brawijaya

niversitas Brawijaya niversitas Brawijaya niversitas Brawijaya <del>ni</del>versitas Brawijaya <del>ni</del>versitas Brawijava <del>ni</del>versitas Brawijaya <mark>uni</mark>versitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya





K s- Normal diet without profilingings Brawijaya Universitas Brawijaya D1 - Normal diet with 15 µg/mL profilin Universitp2 - Normal diet with 30 µg/mL profilin Brawijaya Universitas Brawijaya D3 - Normal diet with 45 µg/mL profilin D4 - Hypercaloric diet with 15 μg/mL profilin wijaya Universitas Brawijaya D5 - Hypercaloric diet with 30 µg/mL profilin wijava Universitas Brawijaya D6 - Hypercaloric diet with 45 µg/mL profilin Universitas Brawijaya **Universitas Brawijava** Universitas Brawijaya Universitas Brawijaya

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4.45 \$ 0.41

D4

D3

3.73 ± 0.35

aya D6

3.70 **± 0**.34

D5

Universitas Brawijaya Jniv

rawijaya Universitas Brawijaya Universitas Based on the descriptive analysis of the seven groups, it was found that the group given D1 had an average leptin level in the lowest, whereas the group given Universit D4 had an average leptin level in the highest. Universitas Brawijaya 5.4 <sup>B</sup> Normality Test for The Effect of Toxoplasma gondii Profilin Exposure Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Bon Leptin Level in Rattus Norvegicus Wistar Strain Rats java Universitas BResidual normality test of the effect of T.gondii profilin exposure on leptin Universitlevel in the rats aim to determine the normal or absence of residuals resulting from sit Universit the effect of T.gondii profilin exposure on leptin levels in rats. Residual normality Sitas Universi test is performed using Kolmogorov-Smirnov, with criterion if probability value sites level of significance (alpha = 5%), then the residual is stated normal. The result of  $\frac{1}{100}$ residual normality test can be seen through the following table: Table 5.1. Normality Test of Data between T.gondii Profilin and Leptin Level Kolmogorov- Smirnov 0.111 Probability 0.200 rawijava Based on the above table it can be seen that testing of residual normality of sites effect of T.gondii profilin exposure on leptin level in the rats yield the Universi Kolmogorov-Smirnov statistic of 0.111, with probability equal to 0.200. It can besit as Br seen that the residual normality test yields probability > alpha (5%), so the Universitresidual is stated normal. Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B Profilin on Leptin Level in Rattus Norvegicus Wistar Strain Rats Iniversitas Brawijava Tests of residual homogeneity of the effect of T.gondii profilin exposure on leptin level in rats aim to determine whether residuals have homogeneous variety or not. The residual homogeneity test was performed using Levene Test, with ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit criterion if probability value > level of significance (alpha = 5%), then the residual Universitas Brawijaya Universitas Brawijaya

rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitis homogeneous. The result of residual homogeneity test can be seen through the sites Brawijaya following table: Universitas Brawijaya Universitas Brawijaya Universitas Bra Table 5.2. Homogeneity Test of Data between T.gondii Profilin and Leptin Level Universitas Brawijaya 0.318 as Brawijaya Levene Statistic rawijaya 0.922 Probability Universitas Brawijava Universitas B Based on the above table it can be seen that residual homogeneity testingsitas Brawijaya of the effect of T.gondii profilin exposure on leptin level in the rats yield Levene Universi statistics of 0.318 with a probability of 0.922. It can be seen that residual testingsitas yields probability > alpha (5%), so the residual is expressed as homogenous. Testing Differences of The Effect of Toxoplasma gondii Profilinsitas Brawijaya Universit<sup>5.6</sup> Exposure on Leptin Level in Rattus Norvegicus Wistar Strain Rats using Anova Testing of the effect of T.gondii profilin exposure on leptin level in the rats Brawijaya Universitivas performed using Anova with the following hypothesis: Universited There was no significant difference in the effect of Toxoplasma gondiisitas Brawijaya profilin exposure on leptin levels in Rattus Norvegicus Wistar Strain rats. Universites B At least one pair of the effect of Toxoplasma gondii profilin exposure onsitas leptin levels in Rattus Norvegicus Wistar strains rats are significantly Universitas Bravdifferent. The test criteria stated that if the probability ≤ level of significance (alpha = Universi 5%), then H0 is rejected and it can be stated that there is at least one pair of it as Brawljay T.gondii profilin exposure which affect leptin levels in the rats are significantly Universitdifferentwijaya Universitas Brawijaya Universitas Brawijaya The result can be seen through the following table: Universitas Brawijaya wilava Univ rawijaya Universitas Brawijaya srawijaya

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|----------|-----------|--------------------------------|-------------------------|-----------|------------------------|-------------------|-----------------|-----------------|-----------------|--------------------|-----------------|-------|---------|
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| rawijaya | Universit | as Brawija                     | ya Unive                | ersitas   | s Braw                 | /ijaya            | Unive           | rsitas          | Brawi           | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as Brawija                     | Table 5.3. A            | Anova Te  | st betwe               | en T.gor          | ndii Profili    | in and Le       | eptin Leve      | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as Brawija                     | ya Unive                | ersitas   | s Braw                 | Anova             | Unive           | rsitas          | Brawi           | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as<br>F Statis                 | <del>ya Unive</del>     | ersitas   | Braw                   | /ijaya<br>5.5     | Unive           | rsitas          | Brawi           | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as Probab                      | <del>ya Unive</del>     | ersitas   | <del>Braw</del>        | <del>/liava</del> | Unive           | rsitas          | Brawi           | <del>jaya</del>    | <u>Un</u> ivers | sitas | Brawija |
| rawijaya | Universit | as Brawija                     | ya Unive                | ersitas   | Braw                   | rijaya            | Unive           | rsitas          | Brawi           | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as Brine ab                    | ove table s             | shows t   | hat the                | test yie          | elded F         | statisti        | c test s        | tatistic           | of 5.520        | sitas | Brawija |
| rawijaya | Universit | as Brawija                     | va Unive                | ersitas   | Braw                   | /iiava            | Unive           | rsitas          | Brawi           | iava               | Univers         | sitas | Brawija |
| rawijaya | Universit | with probabi                   | lity of 0.00            | )1. It is | s know                 | n that            | probab          | llity s         | alpha (         | 5%), s             | o H0 Is         | sitas | Brawija |
| rawijaya | Universit | rejected. The                  | erefore, it o           | can be    | stated                 | that th           | ere is          | at leas         | t one p         | bair of            | T.gondii        | sitas | Brawija |
| rawijaya | Universit | as Brawija                     | ya 🕛                    | 20. 1.    | C. 1                   | 1.0 ( )           |                 | 95              | Brawi           | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | profilin expos                 | sure group              |           |                        |                   | s signiti       | cantly c        | Interen         | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | as Brawi                       |                         | 17        | AS                     | R                 | D.              |                 | , i             | jaya               | Univers         | sitas | Brawija |
| rawijaya | Universit | 5.7 B Post H                   | oc Test                 | 511       |                        |                   |                 |                 |                 | va                 |                 |       | Brawija |
| rawijaya | Universit | as                             | s Honest S              | Significa | ant Diff               | erence            | (Tuke)          | v HSD           | ) test is       | s perfo            | Univers         | sitas | Brawija |
| rawijaya | Universit |                                |                         | 1.9.1     | <b>1.(</b> ), <b>1</b> | 5                 | 15 -2           |                 |                 |                    | Univers         |       | Brawija |
| rawijaya | Universi  | determine w                    | hether the              | effect    | of T.go                | ondii p           | rofilin e       | exposur         | e on le         | eptin le           | vel was         | sitas | Brawija |
| rawijaya | Universi  | significantly                  | different or            | not: w    | ith the                | criteria          | a that if       | f one p         | air of -        | T.aondi            | i profilin      | sitas | Brawija |
| rawijaya | Universit |                                |                         |           |                        |                   |                 |                 |                 |                    | hivers          |       | Brawija |
| rawijaya | Universit | exposure gro                   | oup resulted            | d in pro  | bability               | ∕ ≤ leve          | l of sigi       | nificanc        | e (alph         | a = 5%             | ), it can       | sitas | Brawija |
| rawijaya | Universit | be stated that                 | at there is             | a differ  | ence ir                | h the in          | fluence         | e of exp        | osure           | to Tox             | oplasma         | sitas | Brawija |
| rawijaya | Universit | d l                            |                         |           | A A                    |                   | and the second  |                 |                 |                    | Drivers         | ธาเสร | Drawija |
| rawijaya | Universit | gondii profilir                | n on leptin             | levels    | in rats.               | The re            | esult of        | Tukey           | HSD a           | inalysis           | can be          | sitas | Brawija |
| rawijaya | Universit | known throug                   | gh the follow           | wing tal  | ble:                   | 11                | M               |                 |                 |                    | Univers         | sitas | Brawija |
| rawijaya | Universit | as L                           |                         |           |                        | 3                 |                 |                 |                 |                    | Univers         | sitas | Brawija |
| rawijaya | Universit | as Bl                          | Table 5.4. Po           |           | 161                    | een I.go          | ondii Prof      | ilin and L      | eptin Le        | vel                | Univers         | sitas | Brawija |
| rawijaya | Universit | Concentr                       | Average                 |           | ability                | Do                | <b>D</b> 2      | DE              | DC              | aya                | Notat           | sitas | Brawija |
| rawijaya | Universit | -ation                         | 3.21                    | D1        | <b>K</b>               | <b>D2</b> 0.979   | <b>D3</b> 0.555 | <b>D5</b> 0.477 | <b>D6</b> 0.412 | <b>D4</b><br>0.001 | -ion            | sitas | Brawija |
| rawijaya | Universit | D1<br>Brawija<br>K             | 3.21                    | 1.000     | 1.000                  | 0.979             | 0.555           | 0.477           | 0.412           | 0.001              | a               |       | Brawija |
| rawijaya | Universit | a <mark>S Brawija</mark><br>D2 | 3.42                    | 0.979     | 0.985                  | 0.000             | 0.956           | 0.923           | 0.885           | 0.001              | univer:         | sitas | Brawija |
| rawijaya | Universit | a <mark>53</mark> Brawija      | y <sub>3.67</sub> Unive | 0.555     | 0.589                  | 0.956             |                 | 1.000           | 1.000           | 0.064              |                 | sitas | Brawija |
| rawijaya | Universit | ap₅Brawija                     | y3.70 Unive             | 0.477     | 0.511                  | 0.923             | 1.000           |                 | 1.000           | 0.083              |                 |       | Brawija |
| rawijaya | Universit | aD6Brawija                     | y3.73 Unive             | 0.412     | 0.444                  | 0.885             | 1.000           | 1.000           |                 | 0.105              | labivers        | sitas | Brawija |
|          |           |                                |                         |           |                        |                   |                 |                 |                 |                    |                 |       |         |

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B The results of the above analysis informed that the group D4 had the stas Brawijay Universit highest leptin level and significantly different with the groups D1, D2 and K; but did sites Brawijava Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit not differ significantly with the group D3, D5 and D6. While the group D1 had the stas Brawijaya

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0.083

0.105

niversitas Brawijaya

|                       |  |  |                         |                            | DIGHTIGH |
|-----------------------|--|--|-------------------------|----------------------------|----------|
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              |  | rawijaya Universitas B                           |                         | Universitas                |          |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              | Universit lowest leptin level and significar   | tly different with group D                       | 4; but did i            | not differsitas            | Brawijay |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                |          |
| rawijaya              | Universi significantly with the other groups.  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| Irawijaya             | Universitas Brawijaya Universitas B  |  |                         | Universitas                |          |
| Irawijaya             | Universit5.8 B Testing The Relationship  |  |                         |                            |          |
| rawijaya              | Universitas Brownia Diet and Average   | Weight of Rattus Norve                           | gicus Wista             | universitas<br>ar Strain   | Brawijay |
| rawijaya              | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | srawijaya               | Universitas                | Brawijay |
| rawijaya              | Universitas BRatsjaya Universitas P  |  |                         | Universitas                |          |
| rawijaya              | Universit5.8.1 Data Normality Test of  | Toxoplasma gondii Prof                           | ilin Expos              | ure with                   | Brawijay |
| rawijaya              | Universitas Brawijaya<br>Universitas BNormal Diet and Average                            | Woight of Pattus Norvo                           | Srawijaya<br>nicus:Wist | Universitas                |          |
| rawijaya              |  |  |                         | 0                          | Brawijay |
| rawijaya<br>Irawijaya | Universitas Brats  | SBRA   | vijaya<br>va            | Universitas<br>Universitas |          |
| rawijaya              | Universitas of The normality test of data is   |  |                         |                            |          |
| rawijaya              |  |  |                         |                            |          |
| Irawijaya             | Universitif probability value> level of sign<br>Universi                                 | ificance (alpha = 5%) the                        | n the data              | is stated                  | Brawijay |
| rawijaya              | Universi normal. The results can be seen the   | hrough the following table:                      |                         | niversitas                 |          |
| rawijaya              | Universi Table 5.5. Normality Test of Data betwee  | en <i>T gondii</i> Profilin and Weight of        | Rats given No           |                            |          |
| rawijaya              | Universit  |  |                         | bility                     |          |
| rawijaya              | Universit  | Kolmogorov- Smirnov                              | Proba                   | niversitas                 | Brawijay |
| rawijaya              | Toxoplasma Gondii Profilin with<br>Normal Diet   | 0.215  | 0.00                    | <sup>61</sup> Jniversitas  | Brawijay |
| rawijaya              | Universit Average body weight  | 0.157  | 0.20                    | line in second site of     |          |
| rawijaya              | Universitas  |  |                         | Universitas                |          |
| rawijaya              | Universitas Based on the above table it  | can be seen that T.gondii                        | orofilin expo           | sure with                  | Brawijay |
| rawijaya              | Universitas Dr   |  | a                       | UIIIVEISILAS               | Diawijay |
| rawijaya              | Universitnormal diet and body weight of ra   |  |                         |                            |          |
| rawijaya              | Universit 0.215 and 0.157 with probabilitie  | s of 0.061 and 0.200. It c                       | an be seen              |                            |          |
| rawijaya              | Universitas Brawija<br>Universitnormality test produce probabilitys                      | $_{\rm alpha}$ (5%) so the data is               | wijaya                  | Universitas                |          |
| rawijaya              |  |  |                         | Universitas                |          |
| rawijaya<br>Irawijaya | Universitas Brawijaya Universitas B  |  |                         | Universitas                |          |
| rawijaya              | Universitas Brawijava Universitas B  |  |                         |                            |          |
| rawijaya              | Universitas Brawijaya Universitas B<br>Normal Diet and Average<br>Universitas Brawijaya  | Weight of Rattus Norveg                          | gicus Wista             | ar Strain                  | Brawijay |
| rawijaya              |  | rawijaya Universitas B                           |                         | Universitas                |          |
| rawijaya              |  |  |                         |                            |          |
| rawijaya              | Universitas Brawijava Universitas B<br>Analysis was performed u<br>Universitas Brawijava | using Pearson correlation                        | with the                | Universitas<br>following   | Brawijay |
| rawijaya              |  | rawijaya Universitas B                           |                         | Universitas                |          |
| rawijaya              |  | rawijaya Universitas B                           | Brawijaya               | Universitas                |          |
| rawijaya              |  | rawijaya Universitas B                           |                         | Universitas                |          |
|                       | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
| rawijaya              |  |  | -                       |                            |          |
| rawijaya<br>Irawijaya | Universitas Brawijaya Universitas B  | rawijaya Universitas B                           | Brawijaya               | Universitas                | Brawijay |
|                       |  | rawijaya Universitas B<br>rawijaya Universitas B |                         | Universitas<br>Universitas |          |

| rawijaya<br>rawijaya<br>rawijaya   | Universites Providers  |   |   |  |  |
|--|--|---|---|--|--|
|  | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawiiava   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| ·····JuJu  | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitae Bravrijava   | is no significant relations   | hip of Toxoplasma gone  | dii Univilinsitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  |  |
| rawijaya   | Universitas Brawijaya  | e with normal diet and avera  | age body weight of Rattus N   | Vorvegicus   | Brawija  |
| rawijaya   | Universitas Brawistars   | Strain ratsitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas Brawijaya   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | a significant association of  | l oxoplasma gondil profilin   | Exposure   | Brawija  |
| rawijaya   | Universitas Brawith)noi  | rmal diet and average body  | weight of Rattus Norvegio   | cus WistarSitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | Universitas P   | Universitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brawijaya  | ats   | ersitas Brawijaya   | Universitas  | Brawija  |
| rawijaya   | Universitas Brheitesta   | riteria states if the probabili   | ty of $\leq$ level of significance  | e (alpha=sitas   | Brawija  |
| rawijaya   | Universitas Brawijay<br>5%) then H0 is re  | ejected. The result can be se   | een through the following to  | Universitas  | Brawija  |
| rawijaya   | Universitas Braw   | TAJ R   | l aya   | Universitas  |  |
| rawijaya   |  | on Correlation between <i>T.gondii</i> Pr   | ofilin and Weight of Rats given N   |  |  |
| rawijaya   |  | tion Coefficient  | Probability   | Universitas  |  |
| rawijaya   | Universit  | -0.084  | 0.767   | Universitas  |  |
| rawijaya   | Universi   |   | TAK Y   | niversitas   |  |
| rawijaya   | Universi The above   | table shows that the associa  | ation yields a probability of   | 0.767. It is   | Brawija  |
| rawijaya   |  |   |   | inversitas   | Diawija  |
| rawijaya   | Universit known that proba   | ability> alpha (5%), so H0 is   | accepted. Therefore, it can   | I DE SIAIEUS TAS   | <b>Krawla</b>  |
|  | Universit  |   |   | 1.00   |  |
| rawijaya   | Universit that there is no   | significant association of T  |   | ith normal sitas   | Brawija  |
| krawijaya<br>krawijaya   | Universita   |   |   | <sub>ith</sub> niversitas<br>Jniversitas   | Brawija<br>Brawija   |
| rawijaya<br>rawijaya<br>rawijaya   | Universita<br>Universitatet and average  | body weight of the rats.  | <i>gondii</i> profilin exposure w   | ith normal itas<br>Iniversitas<br>Universitas  | Brawija<br>Brawija<br>Brawija  |
| rawijaya<br>rawijaya<br>rawijaya<br>rawijaya   | Universita<br>Universitation average<br>Universitas The correl   |   | <i>gondii</i> profilin exposure w   | ith normal <sup>sitas</sup><br>Iniversitas<br>Universitas<br>a negative <sup>sitas</sup>   | Brawija<br>Brawija<br>Brawija<br>Brawija   |
| rawijaya<br>rawijaya<br>rawijaya<br>rawijaya<br>rawijaya   | Universita<br>Universitas<br>Universitas<br>Universitas  | e body weight of the rats.<br>ation coefficient of -0.084   | <i>gondii</i> profilin exposure w<br>indicates that there is a  | ith normal <sup>sitas</sup><br>Iniversitas<br>Universitas<br>negative <sup>sitas</sup><br>Universitas  | Brawija<br>Brawija<br>Brawija<br>Brawija<br>Brawija  |
| grawijaya<br>grawijaya<br>grawijaya<br>grawijaya<br>grawijaya<br>grawijaya   | Universita<br>Universitas The correl<br>Universitas<br>Universitas<br>Universitas  | e body weight of the rats.<br>ation coefficient of -0.084<br>ery weak relationship. This r  | <i>Gondii</i> profilin exposure w<br>indicates that there is a<br>means the average weight  | ith normal <sup>sitas</sup><br>Iniversitas<br>Universitas<br>a negative <sup>sitas</sup><br>Universitas<br>decreases <sub>sitas</sub>  | Brawija<br>Brawija<br>Brawija<br>Brawija<br>Brawija<br>Brawija   |
| rawijaya<br>rawijaya<br>rawijaya<br>rawijaya<br>rawijaya<br>rawijaya   | Universitation diet and average<br>Universitation The correl<br>Universitation<br>Universitation<br>Universitation<br>Universitation<br>Universitation<br>Universitation   | e body weight of the rats.<br>ation coefficient of -0.084   | <i>Gondii</i> profilin exposure windicates that there is a means the average weight mal diet increases and vice windicates and vice with the second vice with the | ith normal sitas<br>Universitas<br>a negative sitas<br>decreases sitas<br>versa.   | Brawija<br>Brawija<br>Brawija<br>Brawija<br>Brawija<br>Brawija   |
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| rawijaya              | Universitas Analysis of the effect of                                       | f T.gondii profili | n exposure with normal die            | et on leptinsitas  | Brawijay |
| rawijaya              | Universitas B<br>levels in the rats was perform<br>Universitas Bra          | ed by using sig    | onle linear regression                | <b>Universitas</b> | Brawijay |
| rawijaya              | Universitas Bra   | ice by using sin   | aya                                   | <b>Universitas</b> | Brawijay |
| rawijaya              | Universitas Braw  | of The Effect      | ijaya                                 | ii Drofilin        | 5 5      |
| rawijaya              | oniversitas Drawija   |                    | t of Toxoplasma gond                  |                    | Brawijay |
| rawijaya<br>          | Universitas BravExposure with nor   | nal diet on Lep    | otin Levels awijaya                   |                    |          |
| rawijaya              | Universitas Brawijaya Universitas<br>Universitas BThe results of the influe | ance of T gondii   | profilin exposure with porr           | Universitas        | Brawijay |
| rawijaya              |   |                    |                                       |                    |          |
| rawijaya              | Universit leptin levels can be seen thro                                    | •                  | •                                     |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   |                    | Universitas Brawijaya                 |                    |          |
| rawijaya              |   | 5 5                | Universitas Brawijaya                 |                    |          |
| rawijaya              | Universitas Brawijaya Universita  | as Brawijaya       | Universitas Brawijaya                 | Universitas        | Brawijay |

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Universitas Brawijaya Table 5.9. Pearson Correlation between T.gondii Profilin and Leptin Level in Rats given Normal Diet Universit Variablevii ava Coefficient ver T statistic vi Probability UniversitConstant/ijaya 2.742/a 0.000 7.096 Brawi T.gondii profilin with normal diet 0.230 1.851 0.087 = 0.557R-squared 0.310 Universit5.10.1.1 Coefficient of Determination Test Universitas Brawijaya The amount of contribution of T.gondii profilin exposure with normal diet on Universi leptin levels can be known through the coefficient of determination (R2) that issitas 0.310. It means the diversity of leptin levels can be explained 31.0% by the Universit exposure of T.gondii profilin with normal diet or in other words the contribution of sitas T.gondii profilin exposure with normal diet to leptin level is 31.0%. While the rest of Universi 69.0% is a contribution from other variables that are not discussed in this study. If a 5.10.1.2 Correlation Coefficient The correlation coefficient is used to determine the level of closeness of the Universit relationship and the direction of the relationship between the exposure to T.gondii profilin with normal diet and leptin levels according to table below (Sarwono Universit2006): 
 Table 5.10.
 Relationship Strength on The Correlation Test
Statistical Correlation Value Relationship Strength No correlation between the two variable 0 - 0.05 0.05 - 0.19Very weak correlation Universitas Brawijaya 0.20 - 0.39Weak correlation Universitas Brawijava Correlation is partially strong 0.40 - 0.59Universitas Brawijava 0.60 – 0.79 Strong correlation Universitas Brawijava 0.80 - 0.99Very strong correlation Universitas Perfect correlation The result of the correlation coefficient of 0.557 shows there is a partially Universitations relationship between exposure to Toxoplasma gondii profilin with normals t

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Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universit diet and leptin level with positive direction (unidirectional). This means that the stas Brawijaya Universitas Brawijaya Universitas Brawijaya higher the exposure to Toxoplasma gondii profilin with normal diet, the higher the Universitas Brawijaya Universitas Brawijaya Universit leptin level aya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya 5.10.1.3 Hypothesis Testing rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B Hypothesis testing is used to determine the presence or absence of in the stas Brawijava Universit effect of T.gondii profilin exposure with normal diet on leptin levels. The test Universi criteria states that if probability < level of significance (= 5%), there is a significant Universit effect of exposure to T.gondii with normal diet on leptin levels. **Universitas Brawijaya** Universita. Hypothesis Test of The Effect of Toxoplasma gondii Profilin Exposuresitas Brawijaya Iniversitas Brawijaya with Normal Diet on Leptin Levels Testing of the hypothesis yields t value count equal 1.851 with probability stas Brawijava equal to 0.087. The test results show probability > level of significance (= 5%). rawijaya This shows that there is no significant effect of exposure to T.gondii profilin with rawijaya Universita normal diet on leptin level. b. Hypothesis Test between Constants and Leptin Levels Testing the hypothesis of the constant yields a t value of 7.069 with a sitas Brawijaya probability of 0.000. The test results show the probability < level of significance Universitas(= 5%). It means there is a partial significant effect of the constant on leptinsitas Brawijaya Universitas Bray Universitas Brawijaya Universitas Dium juju omversitas Brawijaya Universit 5.10.1.4 Empirical Model of Simple Linear Regressions Brawijava Universitian B The equation of the result from simple linear regression analysis is: Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universită = 2.742 j.a. 230 Xniversitas Brawijaya Universitas Brawijaya srawijaya

rawijaya Universitas Brawijaya Universitas B This equation shows the following: and Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 1. The constant of 2.742 indicates that if exposure to T.gondii profilin with normal Universitas diet is constant (unchanged), then average leptin level change is 2.742 ng/mL. Universitas Brawijava Universitas Brawijava 2. Coefficient of T.gondii profilin exposure with normal diet of 0.230 indicates that rawijaya Universitasexposure to T.gondii profilin with normal diet has a positive effect on leptin level. This means that any increase of 1 µg/mL in exposure to T.gondii profilin with Universitasnormal diet will increase leptin level by 0.230 ng / mL.s Brawijaya Universitas Brawijava Universit5.11 Analysis of The Effect of Toxoplasma gondii Profilin Exposure with Sitas Brawijaya Hypercaloric Diet on Leptin Level in Rattus Norvegicus Wistar Strain Universit Rats Analysis of the effect of T.gondii profilin exposure with hypercaloric diet on Universil leptin levels in the rats was performed by using simple linear regression analysis. Universit Estimation Results in The Effect of Toxoplasma gondii Profilin 5.11.1 Exposure with Hypercaloric Diet on Leptin Levels The results of the effect of exposure to T.gondii profilin with hypercaloric diet Universion leptin levels can be seen through the following table: Pearson Correlation between T.gondii Profilin and Leptin Level in Rats given Table 5.11. Hypercaloric Diet Coefficient T statistic Variable Probability 6.119 Universit Constant/ijav 7.920 0.000 Univer Universi Profilin with hypercaloric diet -0.360 -2.8220.014 Un<u>1/0.380</u>as Braveljaya Univers<u>it o 616</u>awijaya Univer R-squared Va Universitas Brawijava Brawijaya 5.11.1.1 Coefficient of Determination Test Universitas Brawijaya The amount of contribution of exposure to T.gondii profilin with hypercaloric Universi diet on leptin levels can be known through the coefficient of determination (R2)<sup>SILOS</sup> that is equal to 0.380. This means that the diversity of leptin levels can be Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitexplained by exposure to T.gondii profilin with a hypercaloric diet of 38.0% or insites Brawijay ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya other words the contribution of T.gondii profilin exposure to hypercaloric diet on Universit leptin levels is 38.0%. While the rest of 62.0% is a contribution from other stars variables that are not discussed in this study. Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit5.11.1.2 Correlation Coefficient \_\_\_\_\_ Universitas Brawijaya Universitas Brawijaya Universitas B The correlation coefficient was used to determine the level of closeness of Universithe relationship and the direction of the relationship between the exposure to sitas Universit T.gondii profilin with hypercaloric diet and leptin levels. The result of correlation sites Brawijay Universitas Brawijaya Universi coefficient of -0.616 shows there is a strong correlation between exposure to stas Brawijava T.gondii profilin with hypercaloric diet and leptin level with negative direction Sitas Brawijaya (opposite). This means that the higher exposure to T.gondii profilin with sitas Universi hypercaloric diet decreases the leptin levels, and lower exposure to T.gondiisitas Brawijaya profilin with hypercaloric diet increases the leptin levels. 5.11.1.3 Hypothesis Test rawijava Hypothesis testing is used to determine the presence or absence of the sitas Brawijaya effect of T.gondii profilin exposure with hypercaloric diet on leptin levels. The test Universit criteria states that if probability < level of significance (= 5%), then there is a sitas Brawijaya significant effect of exposure to T.gondii profilin with hypercaloric diet on leptin Universitievelsrawija a. Hypothesis Test of The Effect of Toxoplasma gondii Profilin Exposure Universitas with Hypercaloric Diet on Leptin Levels Universitas Brawijaya Universitas Brawijaya Testing of hypothesis yield t value count equal to -2.822 with a probability Universitas Braw Universitas of 0.014. The test results show the probability < level of significance (= 5%).sitas Brawijava This means that there is a significant effect of exposure to T.gondii profilin with Universitashypercaloric diet on leptin levels a universitas Brawijaya rawijava Universitas Brawijava Universitas Brawijava

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universit b. Hypothesis Test between Constant and Leptin Levels rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Bra Testing the hypothesis of the constant yields a t value of 7.920 with a Universitas probability of 0.000. The test results show the probability < level of significance sitas (= 5%). This means there is a partially significant effect of the constant on leptin rawijaya Universitas eversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit 5.11.1.4 Empirical Models of Simple Linear Regression Universitas B The equation of the result from simple linear regression analysis is: University = 6.119 - 0.360 X **Universitas Brawijaya** Universit This equation shows the following: Universitas Brawijaya Universita. Constant of 6.119 indicates that if exposure to T.gondii profilin with hypercaloric diet is constant (average), then average leptin level is 6.119 sitas Brawijaya ng/mL. Universit2. Coefficient of -0.360 indicates that exposure to T.gondii profilin with hypercaloric diet has a negative effect on leptin levels. This means that any SILAS increase of 1 µg/mL in exposure to T.gondii profilin with hypercaloric diet will Universitasdecrease leptin level by 0.360 ng/mL. Universit5.12 Testing Average Weight and Leptin Level of Rattus Norvegicus Wistar Universitas B Strain Rats vijava 5.12.1 Data Normality Test of Average Weight and Leptin Level of Rattus Universitas BravNorvegicus Wistar Strain Ratsva Universitas Brawijaya Normality test of average body weight and leptin level of the rats is intended Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universi to determine the normality of data. The test is done using Kolmogorov-Smirnov, sitas Brawijava with criterion if probability value> level of significance (alpha = 5%) then the data Universitas Brawijaya Universitas Brawijaya Universitis stated normal. The results can be seen through the following table: Universitas Brawijaya srawijaya

| rawijaya  | Universitas Brawijaya Unive                                    | ersitas Brawijaya  | Universita        | s Brawijaya                     | Universitas         | Brawijay  |
|-----------|--|--|-------------------|---------------------------------|---------------------|-----------|
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| Irawijaya |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  | Universit Table 5.12. Normality Test be                        |  |                   |                                 | Universitas         |           |
| rawijaya  | Universi as Brawijava Universi                                 | reitae Brawilava   | Universita        |                                 |                     | Brawijaya |
| rawijaya  | Universites Previlieve Unive                                   | Kolmogorov- S  | Smirnov           | Probabili                       | ty                  | Brawijay  |
| rawijaya  | Average weight   | 0.100  | Universita        | 0.200                           |                     | Brawijay  |
| rawijaya  | Leptin Level   | 0.070  | Universita        | 0.200                           |                     | Brawijay  |
| Irawijaya |  | ersitas Brawijaya  | Universita        | s Brawijaya.                    |                     |           |
| rawijaya  | Dased on the above   | e table it can be see<br>ersitas Brawijaya   |                   |                                 | Universitas         |           |
| rawijaya  | yield Kolmogorov-Smir  | nov statistics of  | 0.100 and 0       | .070 respectiv                  |                     | Brawijay  |
| Irawijaya |  |  |                   |                                 |                     |           |
| rawijaya  | Universit probabilities of both 0.20<br>Universitias Brawijava | but it can be seen th  | at probability>   | alpna (5%), so<br>s Brawijaya   | Universitas         |           |
| Irawijaya | of average weight and le                                       | eptin level are norma  | al.               | rawijaya                        | Universitas         |           |
| rawijaya  | Universitas Brawi  | ANG E  |                   | vijava                          | Universitas         |           |
| rawijaya  |  | Correlation of Ave   | erage Weight      |                                 |                     |           |
| rawijaya  | Universitas  |  | 224               |                                 | Universitas         |           |
| rawijaya  | Universita Rattus Norveg                                       | jicus Wistar Strain  | Rats              |                                 | Universitas         |           |
| rawijaya  |  | performed using Pe   | arson with the    | following hypo                  |                     |           |
| rawijaya  | Universit  |  | 1765              |                                 | hiversitas          | Brawijay  |
| rawijaya  | H0 : There is no sign  | nificant relationship  | average weigh     | it and leptin lev               | /el<br>niversitas   |           |
| rawijaya  |  | ficant correlation of  | average weigh     | nt and leptin lev               |                     |           |
| rawijaya  | Universit  | tates if the probabil  |                   | of oignificance                 | nivoreitae          |           |
| rawijaya  | Universita   | tates if the probabi   |                   | or significance                 | Jniversitas         |           |
| rawijaya  | Universit5%) then H0 is rejected.                              | The result can be s  | een through th    | ne following tab                |                     |           |
| rawijaya  | Universit Table 5.13. Pearson Correlat                         |  |                   |                                 | Universitas         |           |
| rawijaya  | Universitas Correlation Co                                     |  | G L S             | obability                       | Universitas         | Brawijay  |
| rawijaya  | Universit <del>as Broot</del> 0.159                            |  |                   | 0.363                           | Universitas         | Brawijay  |
| rawijaya  | Universit <del>as Bra</del>                                    |  | 4.6               | 0.303                           | <b>Univer</b> sitas | Brawijay  |
| rawijaya  | Universitas Bithe table above sl                               | hows that the testing  | g of the relatior | nship yields a p                | robabilitysitas     | Brawijay  |
| rawijaya  | Universitas Brawija  | Construction in the last of th | (50() 10          | wijaya                          | Universitas         | Brawijay  |
| rawijaya  | Universit of 0.363. It is known that                           | it probability> alpha  | (5%), so hu is    | accepted. The                   | erennreeltsitas     | Brawijay  |
| rawijaya  | Universit can be stated that there                             | -  |                   |                                 | -                   |           |
| rawijaya  | Universitas Brawijaya Universitas                              | ersitas Brawijaya  | Universita        | s Brawijaya                     | Universitas         | Brawijay  |
| rawijaya  | Universit leptin level of the rats.                            |  |                   |                                 |                     |           |
| rawijaya  | Universitas B The Jcorrelation Vo                              |  |                   |                                 | •                   |           |
| Irawijaya | Universitas Brawijaya Unive                                    | ersitas Brawijaya  | Universitas       | s Brawijaya<br>e lentin level a | Universitas         | Brawijay  |
| rawijaya  | Universit (unidirectional) and wea                             |  |                   |                                 |                     |           |
| rawijaya  | Universitas the average weight of                              |  |                   |                                 |                     |           |
| rawijaya  | Universitas Brawijaya Unive                                    | ersitas Brawijaya  | Universita        | s Brawijaya                     | Universitas         |           |
| rawijaya  | Universitäte verage weight increase                            |  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         |           |
| rawijaya  |  | ersitas Brawijaya  |                   |                                 | Universitas         | Brawijay  |
| rawijaya  | Universitas Brawijaya Unive                                    | ersitas Brawijaya  | Universita:       | s Brawijaya                     | Universitas         | Brawijay  |

Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit 5.12.3 Correlation of Body Weight Delta and Leptin Level Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas BrayThe analysis was performed using Spearman correlation withiversitas Brawijaya rawijaya Universit following hypothesis: iversitas Brawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya H0: There is no significant relationship of weight delta and level of leptin rawijaya rawijaya rawijaya UniversitH1: There is a significant correlation of weight delta and level of leptin a Universitas Brawijaya Universitas Porte universitas Brawijaya The result can be seen through the following table: Universitas Brawijaya rawijaya Universi Table 5.14. Correlation of Body Weight Delta and Leptin Level Universitas Bravila

| Universit <del>as B</del> i | Correlation coefficient | Probability <sup>jaya</sup> | <del>- Unive</del> rsitas Brawijay |  |  |
|-----------------------------|-------------------------|-----------------------------|------------------------------------|--|--|
| Universitas Bi              | awi TAS                 | <b>R</b> vijaya             | Universitas Brawijaya              |  |  |
| Universitas Bj              | 0.750                   | 0.052 va                    | Universitas Brawijaya              |  |  |
| Universit <del>as –</del>   |                         |                             | Universitas Brawijaya              |  |  |

The table above informs that the correlation of weight delta and leptinsitas Brawijaya level yields a probability of 0.052. It is known that probability> alpha (5%), so H0 is hiversitas Brawijaya Universit accepted. Therefore, it can be stated that there is no significant correlation of sitas Brawijaya Universit weight delta and leptin level in Rattus Norvegicus Wistar Strain rats. Iniversitas Brawijaya

The correlation coefficient of 0.750 indicates that there is a positive sitas Brawijaya Universit direction and a strong relationship. This means that the higher the weight delta, sitas Brawijaya Universithe higher the leptin level, and conversely the lower the weight delta, the lower the sitas Brawijaya 4 4

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## Universitleptin level.

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Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya

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rawijaya Universitas Brawijaya Universitas BDISCUSSION Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Brawilava Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 6.1 Universitas B The purpose of this study was to determine the increase in leptin levels insitas Brawijaya Rattus Norvegicus wistar strains rats exposed to Toxoplasma gondii profilin. The versi intervention was performed by intraperitoneally injecting T.gondii profilin in thesitas Brawijava rats according to the dosage of 15µg/mL, 30µg/mL, and 45µg/mL. At week 15 Universitafter injection, surgery had been done on rats to obtain blood. The serum wassitas Braw obtained after centrifugation and it was used to measure leptin level. Leptin level ersi was calculated using ELISA kit. T.gondii is an intracellular pathogenic parasite that has a heteroxenous life si cycle and can infect all warm-blooded animals (mammals and birds) and humans. Sitas Profilin used in this experiment is an extract from Toxoplasma gondii tachyzoites Brawijaya I Dniversit with a particular strain whose RNA profilin is broken down (Yuan, et al., 2015). ersit The process had been carried out in the United States and the results of its it as Brawijaya recombinant profilin was imported into Indonesia. This molecular extraction Universitapproach is used because the reaction to antibodies have been demonstrated insitas Brawijaya rabbit and gene specimens gene-coded profilin Toxoplasma gondii in order to support a stronger hypothesis. *T gondii* profilin molecule had been associated with the Brawlin infection of host cells through activation of toll-like receptor (TLR) (Iskandar et al, 2011). *T. gondii* profilin binds to TLR-11 to enhance the expression of Brawlay interleukin-12 (IL-12). IL-12, a cytokine largely produced by phagocytic cells in ersi response to intracellular bacteria and also parasites. IL-12 will activate NK and Tsitas Brawijava cells. Furthermore, interferon gamma (IFN  $\gamma$ ) will be formed which activates Universi phagocytic cells and inflammatory cells (Yarovinsky, 2014). Brawijava Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B According to Asean Pacific Journal of Tropical Disease (Iskandar et al, Brawijaya Universitas Brawijaya Universitas Brawijaya 2016), the occurrence of infection by T.gondii would increase the expression of profilin, including fat cells. The bond between profilin-like protein and TLR-11 would further increase the expression of pro-inflammatory cytokines which will ersi eventually lead to the increase of inflammation in adipocytes. This shows that it as Universitas P Universitas Brawijaya Universit T.gondii profilin is strongly correlated with lipid metabolism but the pathogenesis is Si yet to be understood well. Leptin is a hormone produced mainly by adipocytes (fat cells) that is Universitinvolved in the regulation of body fat. It regulates food intake and body weight bysitas acting on specific receptors in the hypothalamus to inhibit appetite through both counteractive and stimulatory mechanisms (Mandal, 2014). Leptin is a neurotransmitter expressed in the brain. Transcription of the leptin gene expressed primarily in adipose tissues, but few of the studies confirmed that some other tissues also express leptin, including Universi placenta, ovaries, skeletal muscle and stomach. Moreover, leptin circulates in the itas blood as protein. In humans, leptin is encoded by a gene located in human ers chromosome and is similar to that in rodents (Margetic et al, 2002). Universitas B People who are overweight have increased body fat. Because fat cells produce leptin in proportion to their size, overweight people also have increased level of leptin. Given the way leptin supposed to work, people shouldn't be eating ersi and their brain should know that they have plenty of energy stored. However, the sitas problem is that the leptin signal isn't working. There's a whole ton of leptin in the Universi fat cells, but they are not transmitted to the brain. So, the brain does not get the signal of leptin. This condition is known as leptin resistance. It is now believed to be the main biological abnormality in human obesity. When the brain doesn't Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijava** Universitas Brawijaya Universitas Brawijaya receive the leptin signal, it erroneously thinks that the body is starving and so the sitas Brawijaya ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya person eats more (Myers et al, 2010), jaya Universitas Brawijaya Universil 6.1.1 Effect of exposure to Toxoplasma gondii on average weight of Rattus Norvegicus wistar strain rats a Universitas Brawijaya Universitas Brawijaya Universitas B The weight of the rats had been correlated with T.gondii profilin to analysesitas Brawijaya the relationship between both variables. The results showed that the weight of the ersi trats had negative (opposite) effect and a weak relationship for both major group of sitas Brawijava rats given normal diet and hypercaloric diet. It means the average weight Universit decreases as the exposure of T.gondii profilin increases. In support to this finding, sitas Bra a study shows that anorexia, which is seen in the course of infections, is believed ers to be the host's acute phase response to infection. Bacterial or viral products stimulate the production of proinflammatory cytokines. Cytokines, in turn, increase leptin expression in adipose tissue (Baltaci and Mogulkoc, 2012). Increased amount of leptin will increase the feel of satisfaction and therefore the rats reduce their food intake (Benoit, 2002). Reduced food intake will decrease the weight which supports the results of this experiment. Apart from that, another study proves that T.gondii infected mice presented a Universit reduction in the serum VLDL cholesterol fraction. Specifically, a decrease in serum sitas cholesterol was also described by (Milovanovi et al, 2009) who fed infected with *T.cruzi* a high-fat diet. Further, systemic chronic infections and inflammations are associated with low cholesterolemia and HDL cholesterol. However, in the ersi examples provided above, the reduction of total cholesterol reflects an unspecifical as reduction of all lipoprotein fractions. The reduction of total cholesterol leads to rsitreduction of weight niversitas Brawijaya Universitas Brawijaya Universitas Brawijaya 6.1.2 Effect of exposure to *Toxoplasma gondii* on leptin level in *Rattus* Universitas B Norvegicus wistar strain ratsvijava Universitas Brawijava

Universitas Brawijaya Universitias B Based on the measurement data of leptin, it can be seen that the leptin level has increased gradually with the dosage of profilin 15, 30 and 45µg/ml in groups ersi of rat given normal diet. The results partially supports the hypothesis that sitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit exposure to profilin has the effect of increasing leptin levels in rats. Leptin is ersi known to have a substantial part in natural and acquired immunity. As leptin levels it as are elevated during infection/ inflammation, it has been argued that leptin is a Si crucial factor in the host's response to inflammation (Ziylan et al, 2009). Elevated Sitas leptin levels were established in rats with induced T.gondii infection and may be Universi seen as an expected result (Baltaci and Mogulkoc, 2012). However, the group of rats given hypercaloric diet had decreasing level of leptin as the T.gondii profilin exposure increases. As explained above, T.gondiistas profilin reduces the lipoprotein fractions and the weight of rats. As fat cells produce Si leptin in proportion to their sizes, the level of leptin reduces as the weight reduces it as (Ahima, 2008). The hypercaloric diet given could be a factor of interference in hormonal feedback that takes place in central nervous system, causing changes it as in the level of leptin. Diets that are high in fat and simple carbohydrates is often rs taken as and evidence that homeostatic (energy demand-driven) systems are being overridden by non-homeostatic (palatability, pleasure or reward-based) and the interaction between these systems may underlie the tendency to ignore feedback repletion signals such as leptin and insulin to over-consumption of rsi calories (Figlewicz and Benoit, 2009). There is an extensive motivational circuitrysitas involved in the regulation of food intake within the limbic system of the central rsitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit nervous system. Both circulating glucose and fatty acids decrease food intake via a central mechanism involving the hypothalamus and brain stem (Rijnsburger et ers al, 2016). Leptin is an external hormonal signal that can influence Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

rawijaya Universitas Brawijaya Universitas Brawijava non-homeostatic behaviour in addition to its role in energy homeostasis in the hypothalamus. Leptin receptors are expressed throughout the limbic forebrain, for Universit example, in dopaminergic neurons, suggesting that these neurons are directly sit as ersitas Brawijava Universitas Brawijava Universitas Brawijava Universitas targeted by the leptin hormone (Figlewicz, 2003). The effect of leptin on these Universifineurons is based on the behaviours influenced. Food restriction enhances the sitas Br Universitas P tas Brawiiava rewarding properties of a variety of stimuli including food, and such states of erst negative energy balance are accompanied by reduced levels of leptin (Joost, sitas Braw 2012). This would explain why leptin level decrease in wistar rats given Universithypercaloric diet. 6.1.3 Effect of weight on leptin level in Rattus Norvegicus wistar strain rats From the result of analysis, it is stated that there is no significant correlation of average body weight and leptin level of the rats. The correlation indicates that there is a positive (unidirectional) effect but a weak relationship. This means that Universitive leptin level gets lower as the average weight decreases whereas the level of leptin gets higher as the average weight increases. When fat mass decreases, the Universitievel of plasma leptin falls so that appetite is stimulated until the fat mass is sitas recovered. There is also a decrease in body temperature and energy expenditure Universitis suppressed. By contrast, when fat mass increases, so do leptin levels and sitas Brawijaya appetite is suppressed until weight loss occurs (Mandal, 2014). This could explain Universit the result that leptin level is directly proportional to fat cells and weight. Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Implications for the field of Medicine Universitas Brawijaya Universitas B ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas B This study is expected to provide knowledge about the lipid metabolism induced by Toxoplasma gondii infection by measuring the leptin levels. Increased Universitas Brawijaya Universitas Brawijaya universi exposure to T.gondii infection could interfere lipid metabolism and respark Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya rawijava

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indicator of leptin in order to see the difference in serum and tissue leptinsitas Brawijaya

added to confirm the effect of T.gondii profilin exposure with hypercaloric dietsitas Brawijaya

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Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Appendix 1. Analysis of Differences in Effect of *Toxoplasma* gondii Profilin Exposure on Leptin Level in *Rattus Norvegicus* Wistar Strain

| Universit Dependent Variable: UKonser                         | ntrasi Leptin |                | ersitas B | rawi |
|---|---------------|----------------|-----------|------|
| Universit Serumawijaya  | Mean          | Std. Deviation | Nas E     | rawi |
| Universit Normal diet without Profilin                        | 3.5620        | .58781         | 5         | rawi |
| Universit Normal diet + Profilin 15<br>Universit µg/mL        | 3.7000        | 57131          | 5         | j    |
| Universit Normal diet + Profilin 30                           | 3.7860        | .30550         | 5         |      |
| Jniversi Normal diet + ProfiliN 45<br>Jniversi µg/mL          | 3.6060        | .66131         | 5         |      |
| Jniversi Hypercaloric diet + Profilin<br>15 μg/mL             | 4.4480        | .42008         | 5         | 4    |
| Jniversi<br>Hypercaloric diet + Profilin<br>Jniversi 30 μg/mL | 3.7000        | .33638         | 5         | Y    |
| Jniversit Hypercaloric diet + Profilin<br>45 μg/mL            | 3.7280        | .34666         | 5         |      |
| Jniversite  | 3.7900        | .51859         | 35        |      |

## Tests of Normality

| Universitas                         |           | Tests of No | rmality           |              |        | Univer             |  |
|-------------------------------------|-----------|-------------|-------------------|--------------|--------|--------------------|--|
| Universitas B                       | Kolm      | ogorov-Smi  | rnov <sup>a</sup> | Shapiro-Wilk |        |                    |  |
| Universitas Bra                     | Statistic | df          | Sig.              | Statistic    | dfya   | Sig.ver            |  |
| Universit Standardized Residual for | .081      | 35          | .200 <sup>*</sup> | .988         | (ja)35 | Un <sub>.964</sub> |  |

Universit \* This is a lower bound of the true significance. Universit a. Lilliefors Significance Correction

Universita Levene's Test of Equality of Error Variances<sup>a</sup> va Universitas Brawijaya Universit Dependent Variable: UKonsentrasi Leptinawijaya Universitas Brawijaya

| IVEISI  | Pop | chucht v | undoic. | UIN |                             | bilawijayo          |
|---------|-----|----------|---------|-----|-----------------------------|---------------------|
| iversit | as  | Brawi    | jayæf1  | Un  | verdfizas                   | Brasigijay          |
| iversit | as  | Br.879   | jaya    | U6  | versit228                   | Brawi <u>5</u> 23/  |
| iversit |     |          |         |     | that the error equal across | variance of groups. |

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Interd X Universi Error Total Universi Corre

Universitas Brawijaya Universitas Brawijaya

UniveTests of Between-Subjects Effects tas Brawijava UKonsentrasi Leptinawijava Universitas Brawijava

| Brawijaya                | Type III Sum of           | Brawijay     | a Universita             | s Brawija                | ya        |
|--------------------------|---------------------------|--------------|--------------------------|--------------------------|-----------|
| rceawijava               | In Squares as             | Bradfiiav    | Mean Square              | s Br <mark>ā</mark> wija | va        |
| ected Model              | Univer 2.694 <sup>a</sup> | Brawija§     | a Univer <del>4</del> 49 | s Bra1.950a              | ya        |
| ceptwijaya               | Unive 502.743             | 1            | Uni 502.743              | S 2182.628               | ya        |
| Brawijaya                | Univer 2.694              | 6            | .449                     | s Br 1.950               | va        |
| Brawijaya                | 6.449                     | 28           | .230                     | s Brawija                |           |
| Brawijay                 | 511.887                   | 35           |                          | rawija                   | va        |
| ected Total              | 9.144                     | 34           |                          | u wije                   | уч        |
| Squared = .295           | (Adjusted R Squa          | ared = .144) | SRA                      | 10                       | iya<br>Na |
|                          | 23.                       |              | 4                        | . \                      |           |
| st Hoc) – Tul            | key's HSD                 |              |                          |                          | /         |
|                          | 75.01                     | (NA)         |                          |                          |           |
|                          | SAVN                      | Iultiple Com | parisons                 | V.                       |           |
| ndent Variable:<br>y HSD | Konsentrasi Le            | ptin         |                          | 4                        |           |

a. R Squared = .295 (Adjusted R Squared = .144)

(Post Hoc) – Tukey's HSD

| rsi | Dependent Variable: |  |
|-----|---------------------|--|
|     |                     |  |

**Universitas Brawijaya** 

| Universi Tukey HSD   | A State of the second                     |                                   |               |                           |                                 | hiver                      |
|--|---|-----------------------------------|---------------|---------------------------|---------------------------------|----------------------------|
| Universit  |   | Mean                              | J.            |                           | 95% Cor<br>Inter                |                            |
| Universit  | (J) Serum                                 | Difference<br>(I-J)               | Std.<br>Error | Sig.                      | Lower<br>Bound                  | Upper C<br>Bound           |
| Universit Normal diet without<br>Universit Profilin        | Normal diet +<br>Profilin 15 µg/mL        | 1380                              | .30354        | .999                      | -1.1009                         | .8249                      |
| Universitas  | Normal diet +<br>Profilin 30 µg/mL        | 2240                              | .30354        | .989                      | -1.1869                         | U. <sub>7389</sub>         |
| Universitas L<br>Universitas Bl                            | Normal diet +<br>ProfiliN 45 µg/mL        | 0440                              | .30354        | 1.000                     | -1.0069                         | Univer<br>Univer<br>Univer |
| Universitas Bra  | Hypercaloric diet +<br>Profilin 15 µg/mL  | 8860                              | .30354        | .087                      | -1.8489                         | U1.0769                    |
| Universitas Braw<br>Universitas Brawii                     | Hypercaloric diet +<br>Profilin 30 µg/mL  | 1380                              | .30354        | .999                      | -1.1009                         | .8249                      |
| Universitas Brawijay                                       | Hypercaloric diet +<br>Profilin 45 µg/mL  | 1660                              | .30354        | .998                      | av-1.1289                       | U1.7969                    |
| Universit<br>Profilin 15 µg/mL                             | Normal diet without<br>Profilingsitas Bri | .1380<br>Wijava                   | .30354        | .999<br>.999              | 8249                            | 1.1009                     |
| Universitas Brawijaya                                      | Normal diet +<br>Profilin 30 µg/mL        | wija0860                          | .30354        | 1.000                     | ra 1.0489                       | .8769                      |
| Universitas Brawijaya                                      | Normal diet + S Bri<br>ProfiliN 45 µg/mL  | wija.0940                         | .30354        | 1.000                     | raw                             | 1.0569                     |
| Universitas Brawijaya<br>Universitas Brawijaya             | Hypercaloric diet +<br>Profilin 15 µg/mL  | awijaya<br>                       | .30354        | itas B<br>.211<br>sitas B | rawijaya<br>-1.7109<br>rawiaya  | .2149                      |
| Universitas Brawijaya                                      | Hypercaloric diet +<br>Profilin 30 µg/mL  | awija9000l                        | .30354        | 1.000                     | raw-19629                       | U .9629                    |
| Universitas Brawijaya                                      | Hypercaloric diet +<br>Profilin 45 µg/mL  | awijava<br>0280                   | .30354        | 1.000                     | rawijava<br>9909                | .9349                      |
| Universit <del>as Brawijaya</del><br>Universitas Brawijaya | Universitas Bra                           | <del>awijaya (</del><br>awijaya ( | Univers       | sitas B                   | <del>rawijaya</del><br>rawijaya | Univers                    |

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|-----------------------|--|--|------------------|-------------------|---------------------|----------------------------------|---------------------|-------|----------------------|
| rawijaya              | Universitas Brawijaya                    | <b>Universitas Braw</b>                  | ijaya            | Univers           | sitas B             | rawijaya                         | Univers             | sitas | Brawijay             |
| Irawijaya             | Universitas Brawijaya                    | <b>Universitas Braw</b>                  |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         | ijaya            | Univers           | sitas B             | rawijaya                         | Univers             |       | Brawijay             |
| rawijaya              | Universit Normal diet +                  | Normal diet without                      | <b>ijaya</b><br> | .30354            | itas B<br>          | rawijaya                         | Univer              |       | Brawijay             |
| rawijaya              | Universit Profilin 30 µg/mL              |  | ijaya °          | Univers           | sitas B             | 7389<br>rawijaya                 | 1.1869              | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Normal diet + Braw<br>Profilin 15 µg/mL  | 0860             | .30354            | 1.000               | raw.8769                         | 1.0489              |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Normal diet +                            | (ijaya<br>       | .30354            | sitas B             | rawijaya<br>7829                 | Univer              | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | 0  | ijaya            | Univers           | sitas B             | rawijaya                         | Univer              | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Hypercaloric diet +<br>Profilin 15 µg/mL | . <b>6</b> 620   | .30354            | sita337             | ra -1.6249                       | U.3009              | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Hypercaloric diet +                      | (ijaya<br>.0860  | Univers<br>.30354 | itas B              | rawijaya<br>8769                 | Univer<br>. 1.0489  | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Profilin 30 µg/mL                        | .0000            | Univers           | sitas B             | rawijaya                         | Univer              | sitas | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Hypercaloric diet +<br>Profilin 45 µg/mL | .0580            | .30354            | 1.000               | raw-190491                       | U1.0209             | sitas | Brawijay             |
| rawijaya              | Universit Normal diet + 4 ya             | Normal diet without                      | .0440            | .30354            | 1.000               | rawijaya<br>9189                 | 1.0069              | sitas | Brawijay             |
| rawijaya              | Universit ProfiliN 45 µg/mL              | Profilin                                 | .0++0            | .00004            | 1.000               | rawijaya                         | Univer              | sitas | Brawijay             |
| rawijaya              | Universitas Brawi                        | Normal diet +<br>Profilin 15 µg/mL       | 0940             | .30354            | 1.000               | -1.0569                          | U .8689             |       | Brawijay             |
| rawijaya              | Universitas Br                           | Normal diet +                            | 1800             | .30354            | .997                | -1.1429                          | Univer<br>          |       | Brawijay             |
| rawijaya              | Universitas                              | Profilin 30 µg/mL                        |                  |                   |                     |                                  | Univer              | sitas | Brawijay             |
| rawijaya              | Universit                                | Hypercaloric diet +<br>Profilin 15 µg/mL | 8420             | .30354            | .117                | -1.8049                          | .1209               | sitas | Brawijay             |
| rawijaya              | Universi                                 | Hypercaloric diet +                      | 0940             | .30354            | 1.000               | -1.0569                          | .8689               |       | Brawijay             |
| rawijaya              | Universi                                 | Profilin 30 µg/mL                        | SEN              |                   |                     |                                  | ilver               |       | Brawijay             |
| rawijaya              | Universit                                | Hypercaloric diet +<br>Profilin 45 µg/mL | 1220             | .30354            | 1.000               | -1.0849                          | .8409               | sitas | Brawijay             |
| rawijaya              | Universit Hypercaloric diet +            | Normal diet without                      | .8860            | .30354            | .087                | 0769                             | 1.8489              | sitas | Brawijay             |
| rawijaya              | Universit Profilin 15 µg/mL              | Profilin<br>Normal diet +                |                  | 17                |                     |                                  | niver               |       | Brawijay             |
| rawijaya              | Universita                               | Profilin 15 µg/mL                        | .7480            | .30354            | .211                | 2149                             |                     |       | Brawijay             |
| rawijaya              | Universita                               | Normal diet +<br>Profilin 30 µg/mL       | .6620            | .30354            | .337                | 3009                             | 1 6240              |       | Brawijay             |
| rawijaya              | Universitas                              | Normal diet +                            |                  | H-Dup-            |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas L                            | ProfiliN 45 µg/mL                        | .8420            | .30354            | .117                | 1209                             |                     |       | Brawijay             |
| rawijaya              | Universitas Bl                           | Hypercaloric diet +<br>Profilin 30 µg/mL | .7480            | .30354            | .211                | 2149                             | 1 7100              |       | Brawijay             |
| rawijaya              | Universitas Bra                          | Hypercaloric diet +                      | A                |                   |                     | aya                              |                     |       | Brawijay             |
| rawijaya              | Universitas Braw                         | Profilin 45 µg/mL                        | .7200            | .30354            | .247                | 2429                             |                     |       | Brawijay             |
| rawijaya<br>Irawijaya | Hypercaloric diet +<br>Profilin 30 µg/mL | Normal diet without<br>Profilin          | .1380            | .30354            | .999                | 8249                             | 4 4000              |       | Brawijay<br>Brawijay |
| rawijaya              | Universitas Brawijaya                    | Normal diet +                            |                  | 000210            | itas R              | rawijaya                         |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Profilin 15 µg/mL                        | 5.0000<br>/ijaya | .30354<br>Univers | itas B              | raw <sub>-9629</sub><br>rawijaya |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Normal diet +<br>Profilin 30 µg/mL       | - 0860           | .30354            | 1.000               | -1.0489                          | .8769               |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    |  | ija.0940         |                   | itas B              |                                  | U <sub>1.0569</sub> |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | ProfiliN 45 µg/mL                        | ijaya            | .30354<br>Univers | 1.000<br>titas B    | raw <sub>8689</sub><br>rawijaya  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Hypercaloric diet +<br>Profilin 15 µg/mL | 7490             | .30354            | ita <sup>21</sup> B | -1.7109                          | 0440                |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Hypercaloric diet +                      | ij2.0280         | I                 | the second          |                                  |                     |       | Brawijay             |
| rawijaya              | Universit <del>as Brawijaya</del>        | Profilin 45 µg/mL                        |                  | Univer            | itas B              | rawiiava                         | .0010               |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  | Universit         | sitas R             | rawijava                         |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| rawijaya              | Universitas Brawijaya                    | Universitas Braw                         |                  |                   |                     |                                  |                     |       | Brawijay             |
| awijaya               | Universitas Diawijaya                    | Universitas DIAW                         | ijaya            | Univers           | bildo D             | awijdyd                          | Univers             | bildS | Diawijay             |

rawijaya srawijaya

**Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** Universit Hypercaloric diet + Profilin 45 µg/mL Universit Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

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| I had the weither a Day                  |                               | land a second | data and D                |                                |
|--|-------------------------------|---------------|---------------------------|--------------------------------|
| Normal diet without<br>Profilin          | awijaya (<br>awijaya l        | .30354        | 998<br>998                | rawijaya<br>- 7969<br>rawijaya |
| Normal diet +<br>Profilin 15 µg/mL       | awijava<br>.0280<br>awijava l | .30354        | itas B<br>1.000<br>itas B | rawijava<br>9349<br>rawijava   |
| Normal diet +<br>Profilin 30 µg/mL       | awija0580l                    | .30354        | 1.000                     | ra -1.0209                     |
| Normal diet +<br>ProfiliN 45 µg/mL       | awijaya l<br>1220 awijaya l   | .30354        | 1.000                     | rawijaya<br>8409<br>rawijaya   |
| Hypercaloric diet +<br>Profilin 15 µg/mL | 7200                          | .30354        | itas B<br>.247            | -1.6829                        |
| Hypercaloric diet +<br>Profilin 30 µg/mL | .0280                         | .30354        | 1.000                     | raw:193493                     |
| means                                    |                               |               |                           | rawijaya                       |

UniversitaThe error term is Mean Square(Error) = .230.

| U | n | ive | rsi | itas |     |
|---|---|-----|-----|------|-----|
| U | n | ive | rsi | ita  |     |
| U | n | ive | rsi | Tulu |     |
|   |   |     |     | Tuke | у н |

| Konsentrasi Lo | eptin |
|----------------|-------|
|----------------|-------|

|                    | as Brawijaya                                | Profilin 30 µg/mL               | .02   | .30354 | 1.000 | raw-19349        |
|--------------------|---|---------------------------------|-------|--------|-------|------------------|
| iversit            | Based on observed m<br>The error term is Me | neans.<br>ean Square(Error) = . | .230. | BD.    |       | cawijay<br>vijay |
| iversit<br>iversit | as  | RS                              |       | 業      | 2,    |                  |
| iversit<br>iversi  | Tukey HSD <sup>a,b</sup>                    | Konsentrasi Leptin              | n' sr |        |       | 7.               |
| iversi             |   | 111                             | C.    | Subset | 2     | ~                |
| iversi             | Serum                                       |                                 | N     | 1      |       |                  |
| iversit            | Normal diet without P                       | Profilin                        | 5     | 3.5620 |       |                  |
| iversit            | Normal diet + ProfiliN                      | 45 µg/mL                        | 5     | 3.6060 |       |                  |
| iversit            | Hypercaloric diet + P                       | rofilin 30 µg/mL                | 5     | 3.7000 |       |                  |
| iversit            | Normal diet + Profilin                      | 15 µg/mL                        | 5     | 3.7000 |       |                  |
| iversit            | Typercalone diet + 1                        |                                 | 5     | 3.7280 |       |                  |
| iversit            | Normal diet + Profilin                      | 30 µg/mL                        | 5     | 3.7860 |       |                  |
|                    | Hypercaloric diet + P                       | rofilin 15 µg/mL                | 5     | 4.4480 |       |                  |
| iversit            | sig.Bra                                     |                                 | ÀÀ    | .087   |       | Ay               |

Universit Means for groups in homogeneous subsets are displayed. Based on observed means.

The error term is Mean Square(Error) = .230.

b. Alpha = .05. Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** 

a. Uses Harmonic Mean Sample Size = 5.000. Universitas Brawijaya Universitas Brawijaya

Jniversitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya sitas Brawijaya Unive 1.1289 .9909 sitas Brawijaya **Universitas Brawijaya** sitas Brawijaya .9049 Universitas Brawijaya 1.0849 Universitas Brawijaya Universitas Brawijaya Ur9909 sitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya hiversitas Brawijaya niversitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya **Universitas Brawijaya** 

**Universitas Brawijaya** 

Universitas Brawijaya rawijaya **Universitas Brawijaya** rawijaya srawijaya 🛛 rawijaya Universitas Brawijaya rawijaya Universitas Brawijaya rawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universit Annendix 2 Simple Linear Regression Analysis of Effect of Profilinsitas Brawijay rawijaya rawijaya rawijaya rawijaya U rawijaya U rawijaya rawijaya rawijaya rawijaya U rawijaya rawijaya rawijaya rawijaya U rawijaya rawijaya rawijaya rawijaya rawijaya U rawijava rawijaya rawijaya rawijaya rawijaya U rawijaya Universit a. Dependent Variable: Leptin rawijaya Universitas Brawijay rawijaya rawijaya rawijaya rawijaya rawijaya **Universitas Brawijaya** rawijaya **Universitas Brawijaya** rawijaya **Universitas Brawijaya** rawijaya rawijaya Universitas Brawijaya rawijaya **Universitas Brawijaya Universitas Brawijaya** rawijaya **Universitas Brawijaya** 

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Universitas Brawijaya Universitas Brawijaya

<del>ver</del>sitas Brawijaya versitas Brawijaya versitas Brawijaya <del>ver</del>sitas Brawijaya Wersitas Brawijaya 779 sitas Brawijaya **Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya

| Appel                         | ndix 2. Simpl                 | e Linear Reg          | ression                  | Analysis of E   | Effect of | Profilin            |          |
|-------------------------------|-------------------------------|-----------------------|--------------------------|-----------------|-----------|---------------------|----------|
| Universitas Bi                | rawijayæxpos                  | sure given Norr       | nal Diet o               | n Leptin Levels | awijaya   | Universitas         |          |
| Universitas Bi                | rawijaya Un                   | niversitas Bra        | wijaya U                 | niversitas Br   | awijaya   | Universitas         | Brawijay |
| Jniversitas Bi                |                               | iversitas Bra         |                          |                 |           | Universitas         | Brawijay |
| Universit <mark>as B</mark> i | rawijaya Un                   | Model Summar          |                          | niversitas Bra  | awijaya   | Universitas         | Brawijay |
| Universitas Bi                |                               | intersities bid       | wijaya O                 |                 | awijaya   | Universitas         | Brawijay |
| Universit Model               |                               | R Square 🚬 Sc         | uare U                   | Estimateas Bra  | awijaya   | Universitas         | Brawijay |
| Universit <mark>as B</mark> i | rawijay.079 <sup>a</sup> l In | iver.006 P            | 070                      | nivere51793 Bra | awijaya   | Universitas         | Brawijay |
| Universitas <sup>p</sup> B    | dictors: (Constant)           | , Profilin + Normal o | diet                     | versitas Br     | awijaya   | Universitas         | Brawijay |
| Universitas Bi                | rawijaya 🖓                    |                       |                          | as Bra          | awijaya   | Universitas         | Brawijay |
| Universitas Bi                | rawijay                       |                       |                          |                 | awijaya   | Universitas         | Brawijay |
| Universit <u>as B</u> i       | rawi                          | ITAS                  | ANOVAª                   |                 | vijaya    | <u>Univers</u> itas |          |
| Universit Model               |                               | Sum of Squares        | df                       | Mean Square     | F Va      | Universitas         | Brawijay |
| Universitas                   | Regression                    | .022                  | 1                        | .022            | .082      |                     | Brawijay |
| Universita                    | Residual                      | 3.487                 | 13                       | .268            |           | Universitas         | Brawijay |
| Universi                      | Total                         | 3.509                 | 14                       |                 |           | niversitas          | Brawijay |
| Universi a Den                | bendent Variable: L           |                       | Salar                    | 19              |           | niversitas          | Brawijay |
| Iniversi                      |                               | , Profilin + Normal c | liot                     |                 |           | hiversitas          | Brawijay |
| Universit                     |                               | , I Tomin' + Normare  |                          |                 | *         | hiversitas          | Brawijay |
| Universit                     |                               |                       | E.KP                     | 77              |           | niversitas          | Brawijay |
| Universita                    |                               |                       |                          |                 |           | Jniversitas         | Brawijay |
| Universit <del>as</del>       |                               | 142) 15               | oefficients <sup>a</sup> |                 |           |                     | Brawijay |
| Universitas                   |                               | H.M.T.                | ndardized                | Standardized    |           | Universitas         |          |
| Universitas L                 |                               | Keil E                | ficients                 | Coefficients    |           | Universitas         |          |
| Universit Model               |                               | В                     | Std. Error               | Beta            | t         | Cia.                | Brawijay |
| Universitas Bi                | (Constant)                    | 3.791                 | .3                       | 54              | 10.716    | 000                 | Brawijay |
| Universit <del>as B</del> i   | Profilin + Normal             | l diet003             | .0                       | 11079           | 287       | 770                 | Brawijay |
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| Universit |                                     |                   |   | <b>Universitas B</b> |           |   |
| Universit | as Brawijaya U                      | Model Sum         | mary  | Universitas R        | rawijaya  |   |
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| Universit | Model                               | R Square          | Square  |                      | Brawijaya |   |
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| Universit | a. Predictors: (Constant            | ), Profilin +Hype |   | versitas B           |           |   |
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|           | tas Brawijay                        |                   |   |                      | kawijaya  |   |
|           | tas Brawi                           |                   | ANOVAª  |                      | vijava    |   |
| Universit | Model                               | Sum of Squar      | 4 47  | Mean Square          | F va      | _ |
| Universit |                                     | 81/1              |   | ate A                |           | _ |
| Universit | 2                                   |                   | A 4 4   | 1 1.296              | 7.869     |   |
| Universi  | Residual                            | 2.1               |   | TSS -                |           | 5 |
| Universi  | Total                               | 3.4               | 37 14   | 4                    |           |   |
| Universi  | a. Dependent Variable:              | Leptin            |   | 1 te                 |           |   |
| Universit | b. Predictors: (Constant            | ), Profilin +Hype | ercaloric diet  |                      |           |   |
| Universit |                                     |                   | 1177  |                      |           |   |
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| Universit | la                                  |                   | Coefficients  | s <sup>a</sup>       |           |   |
| Universit | ast                                 | (2)               | Unstandardized  | 650                  | ed        | ſ |
| Universit |                                     | 133               | Coefficients  | Coefficient          |           |   |
| Inivorcit |                                     |                   | a second s |                      |           | 1 |

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**Universitas Brawijaya** Universitas Brawijaya Universit Appendix 4. Analysis of Relationships between Toxoplasma gondii given itas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijay Normal Diet and Average Weight of Rattus Norvegicus Wistarsitas Brawijaya Universitas Brawijay Strain Ratsitas Brawijaya Universitas Brawijaya

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Universitas Brawijava Tests of Normality Kolmogorov-Smirnov<sup>a</sup> Statistic Universi Leptin .070

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| Universit |        |                     | Leptin | Weight |
| Universit | Leptin | Pearson Correlation | 1      | .159   |
| Universit | a      | Sig. (2-tailed)     |        | .363   |
| Universit | as     | N                   | 35     | 35     |
| Universit | Weight | Pearson Correlation | .159   | 1      |
| Universit | as Bl  | Sig. (2-tailed)     | .363   |        |
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| Iniversit | as Brawijaj<br>as Brawijaj | Kolm      | nogorov-Smir | gorov-Smirnov <sup>a</sup> |           | Shapiro-Wilk           |                      |  |
|-----------|----------------------------|-----------|--------------|----------------------------|-----------|------------------------|----------------------|--|
| Iniversit | as Brawijaj                | Statistic |              | Sig.                       | Statistic | as ldf, awi            | Sig.                 |  |
| niversit  | Toxoplasma                 | .215      | 15           | .061                       | .805      | as Bra <sup>15</sup> i | iava <sup>.004</sup> |  |
| niversit  | Weight                     | .157      | 15           | .200 <sup>*</sup>          | .950      | Brol5                  | .525                 |  |

Universit\* This is a lower bound of the true significance.

a. Lilliefors Significance Correction

**Universitas B** 

## Universit Pearson

Universit Universit Toxoplasma Universit Weight Universit **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** Universitas Brawijaya **Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya** 

RAW, JURI Correlations Weight Toxoplasma Pearson Correlation -.084 1 Sig. (2-tailed) .767 15 Ν 15 Pearson Correlation -.084 1 .767 Sig. (2-tailed) Ν 15 15 4 4.4

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|---------|-------------|-----------|--------------|------------------------|--------------------|--------------|------------|
| iversit | as Brawija  | a UrKolm  | nogorov-Smir | nov <sup>a</sup> ijava | Universit          | Shapiro-Wilk | iava Ur    |
| iversit | as Brawijav | Statistic | rsitefs Br   | awSig.va               | Statistic          | as Bfrawi    | iavSig. Ur |
| iversit | Toxoplasma  | a U.215   | rsitas 15    | .061                   | Unive805t          | as Bra15     | jaya .004  |
| iversit | Weightawija | a U:126   | 15           | .200*                  | .977               | as Brats     | iava .940  |

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Universit Pearson

| a. Lilliefors Sig<br>as Braw | nificance Correction                   | SDA            |             |
|------------------------------|--|----------------|-------------|
| Pearson                      | Correlation                            |                | 44          |
|                              |  | Toxoplasma     | Weight      |
|                              |  |                |             |
| Toxoplasma                   | Pearson Correlation                    |                | 375         |
| Foxoplasma                   | Pearson Correlation<br>Sig. (2-tailed) |                | 375<br>.169 |
| Toxoplasma                   |  | 1              |             |
| Toxoplasma<br>Weight         | Sig. (2-tailed)                        | 1<br>15<br>375 | .169        |
| 5                            | Sig. (2-tailed)<br>N                   |                | .169        |

## UniversitB) Weight delta - Rank Spearman

| Universitas Bl                    | Correlations                             |
|-----------------------------------|--|
| Universitas Bra                   |  |
| Universit Spearman's rho          | D_BB Correlation Coefficient             |
| Universitas Brawija               | Sig. (2-tailed)                          |
| Universitas Brawijay              | N  |
| Universitas Brawijaya             | Universitas                              |
| Universitas Brawijaya             | Leptin Correlation Coefficient           |
| Universitas Brawijaya             | Sig. (2-tailed)<br>Universitas Brawijaya |
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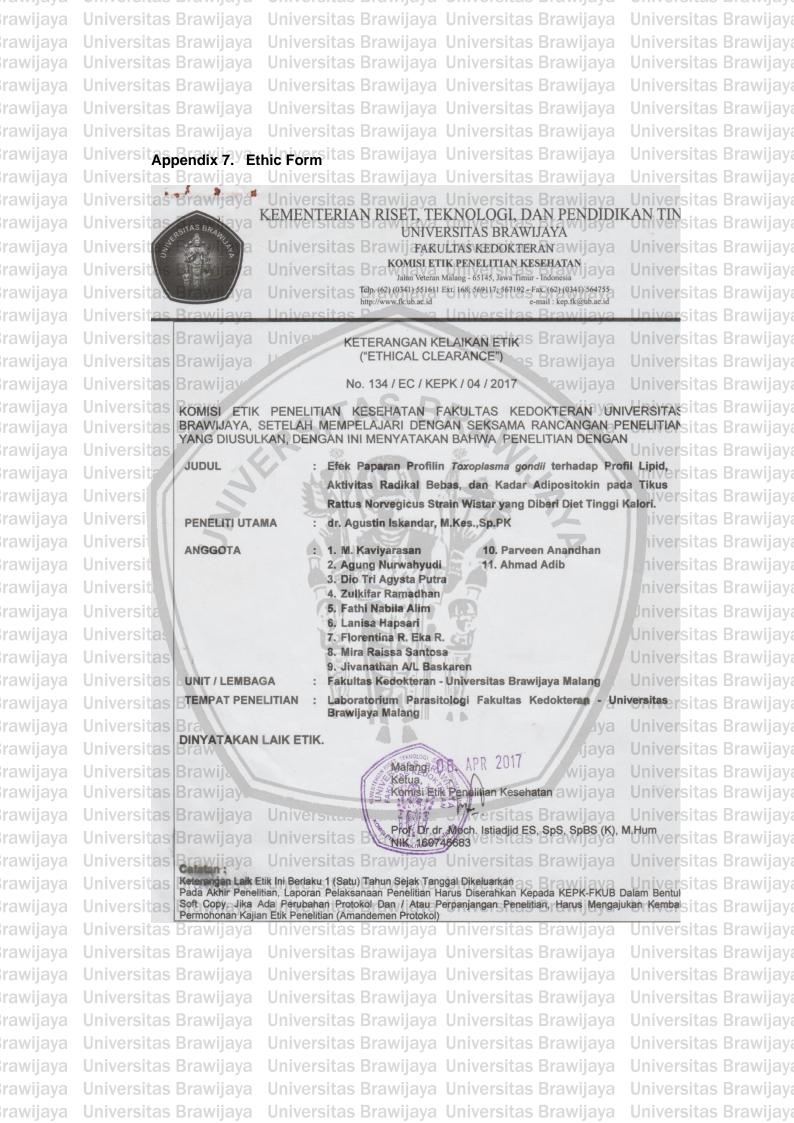
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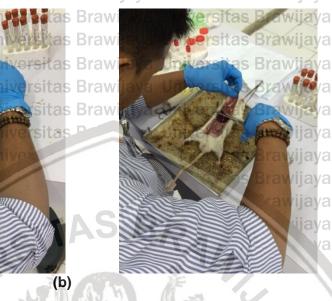
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Universi Figure 1 Surgery Process of Rats: a. Rats were drugged first using 50 mgsitas Brawijaya ketamine as much as 0.4 to 0.5 ml; b. Surgery of mice; c. Rat blood withdrawal; d. The blood samples were then centrifuged for serum.

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Universi Figure 2 Sample collection; e. The process of taking the serum after centrifugation; f. The end result of serum and were stored in the freezer

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Figure 3 Leptin Level Measurement; a. Preparation of standard solutions; Universitb. Addition of leptin specific antibody and serum; c. Making of Washing Buffer; versitas Brawijaya

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Stop Solution were added Universitas Brawijaya

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Figure 3 Leptin Level Measurement ; e. Solution A and Solution B added; Universi f. Stop Solution added.

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