

# The Effect of High Protein Supplement Towards Arm and Thigh Muscle Hypertrophy of Fitness Center Members

A Fardi<sup>1</sup>, W Welis<sup>1\*</sup>

<sup>1</sup>Fakultas Ilmu Keolahragaan, Universitas Negeri Padang, Indonesia

\*Corresponding author. Email: [wildawelis70@gmail.com](mailto:wildawelis70@gmail.com)

## ABSTRACT

The purpose of this research is to determine the effect of high protein supplement (natural and artificial) towards maximal strength and muscle hypertrophy (arm muscle and leg muscle) of fitness members. This research is a quasi-experimental research design involving 39 new male members who have never taken high protein supplements. Muscle hypertrophy was measured using a tape measure and skinfold thickness. Data were analyzed using ANOVA. The results showed that: (1) the average of natural protein supplement was 21.9 mm for arm muscle, and 19.2 mm for thigh muscle, and (2) the average of artificial protein supplement was 27.9 mm for arm muscle, and 26.3 mm for thigh muscle. From the result of the research, it can be concluded that there is a significant effect of high protein supplement towards arm and thigh muscle hypertrophy of fitness center members in Padang.

**Keywords:** Protein supplement, hypertrophy, fitness

## 1. INTRODUCTION

Appropriate weight training should apply the basic principles of weight training to achieve optimal results. Regular and programmed weight training results better muscle growth and formation. This change is characterized by the enlargement of muscle fibers following with the increasing muscle mass. In hypertrophy points of view, the increasing of muscle strength relates to its muscle function. The maximum strength is the ability of the muscle in lifting weights in a single force (one repetition maximal).

In an attempt to get ideal and well-built body, it is not as easy as a matter of seconds. It requires discipline and nutritional intake consumed. According to Irianto (2006), "the formation of muscle mass (hypertrophy) and its strength are determined by well-programmed exercise and supported by a healthy and balanced diet". Nutrition needed by the body consists of macro and micro nutrients. A group of macro nutrients include carbohydrates, fats, and proteins, while a group of micronutrients are such as vitamins and minerals. Those are called macronutrients because the body needs this type of nutrients in large amounts every day, in contrast to the amount of micronutrients needed. Without consuming these two nutrients in sufficient quantities, the body will not be able to gain weight and build muscle well. In a weight training exercise, the macro nutrients (carbohydrates, fats and proteins) are needed, but protein has the dominant role in weight training as the nutrients that form the muscle. On the other hand,

supplements are also needed for those who want a well-built body shape. Supplements are given because the body needs more protein intake than before. Protein is necessary to form the muscles. For example, muscle supplements containing protein nutrients. Supplements are consumed as they work to restore damaged muscles.

In supporting the formation of muscle hypertrophy, supplements are must-consumed-items for fitness members. The use of supplements is an option to get instant and satisfying results. Nevertheless, many fitness members do not know the ingredients of supplements so the use of supplements is not in accordance with the dosage or not adjusted to physical activity performed, especially on beginners. Some weight training practitioners believe that in order to increase muscle mass (hypertrophy), they need to take special supplements such as tablet-shaped amino and powder-shaped weight gainers or milk, and other types of supplements.

Based on interview result, the purpose of fitness member is to get the ideal body shape and the expected muscle enlargement. However, this goal is getting difficult to achieve. There are various factors suspected to cause the failure of ideal body shape and the expected muscle formation, namely, the lack of quantity and frequency of daily protein consumption, the timing of consuming protein, the intensity and frequency of exercise, the lack of energy intake so that the protein is used as a source of energy as well, inadequate exercise program and knowledge about

supplements to increase muscle enlargement and strength. Protein consumption should be in accordance with the needs of the body. However, the weight lifter often exceeds the training set causing body disorders, especially in their liver and kidneys. Recent findings published in the British Journal of Cancer show that those who take muscle-building supplements for three years or more and under age 25 (especially pills and powders containing creatine or androstenedione) are associated with an increased risk of testicular germ cell cancer (JPNN, 2015). Furthermore, The British Dietetic Association (BDA) in Kompas (2017) says that additional protein in high doses can cause various health problems such as kidney and liver damage. The UK Department of Health recommends that adults should avoid protein consumption higher than what is recommended (55.5 grams for men and 45 grams for women) (Kompas, 2017).

Due to the side effects arising from the use of protein supplements and the lack of fitness member knowledge of protein supplements, the alternative to support the formation of muscle hypertrophy is the consumption of protein supplements from natural-based ingredients. Based on the background of the problem, it is necessary to do research on the effect of high protein intake on muscle hypertrophy on fitness center members.

**2. METHOD**

The design of this research used was twogroups pretest-posttest design. This research had two groups, namely: 1) the group consuming manufactured supplement and 2) the group consuming high and natural-based protein. This research was conducted at One Gym Fitness Center of Padang. The total of samples was 39 males registered as a member of One Gym Fitness Center of Padang, were active in doing fitness activities, registered in One Gym Padang no more than 1 month, had never consumed a variety of supplement products, and were willing to follow the predetermined rules and time of the exercise. The measurement of muscle hypertrophy was done through measuring the circumference of the muscles using the measuring tape (meter) and skinfold thickness. An increased amount of muscle mass (hypertrophy) can be seen and measured through a muscle loop with a predetermined instrument. In this case, the measurement of hypertrophy used a tape measure and Skinfold. After the fat thickness measurement data was obtained, then it was converted using MMC formula:  $MMC = (3.14 \times TSF)$ . The data was processed by analysis of variance (Anova).

**3. RESULTS AND DISCUSSION**

Based on the results of research conducted in One Gym City of Padang on 39 samples, it was found that:

Table 1 shows the average age of respondents in the control group was  $24.3 \pm 2.6$  years, the average height was around  $170.1 \pm 2.7$  cm, and the mean body weight was about  $67.7 \pm 6.2$  kg. In natural-based protein group, the mean of age was  $23.3 \pm 3.2$  years, the mean of height was about  $169.5 \pm 4.6$  cm, and the mean of body weight was about  $67.4 \pm 5.4$  kg. In manufactured protein group, the average age was  $24.9 \pm 2.9$  years, the average height was about  $168.8 \pm 4.3$  cm, and the average body weight was about  $66.0 \pm 7.2$  kg. There was no statistically significant difference in the three groups of study subjects ( $p > 0.05$ ).

**Table 1.** Characteristics of Research Subjects

Characteristic	Treatment		
	Control Group	Control Group	Control Group
<b>Age (year)</b>	$24,3 \pm 2,6$	$23,3 \pm 3,2$	$24,9 \pm 2,9$
<b>Height (cm)</b>	$170,1 \pm 2,7$	$169,5 \pm 4,6$	$168,8 \pm 4,3$
<b>Weight (kg)</b>	$67,7 \pm 6,2$	$67,4 \pm 5,4$	$66,0 \pm 7,2$

**Hypertrophy Muscle Data**

In the control group, the highest score of arm muscle circumference measurement before the treatment was 290.02 mm and the lowest score was 230.30 mm, the distribution mean score was 255.6 mm and the standard deviation was 17.7 mm. The highest score of arm muscle circumference measurement after giving the weight training was 299.16 mm and the lowest score was 231.30 mm, the distribution mean score was 262.5mm and the standard deviation was 17.2 mm. The average score of arm muscles hypertrophy of the control group was 6.9 mm.

The result of thigh muscle circumference measurement before the treatment showed that the highest score was 479,76 mm and the lowest score was 441,74 mm, the distribution mean score was 458,3 mm and the standard deviation was 8,7 mm. The measurement result of thigh muscle circumference of control group after doing the weight training showed that the highest score was 492.90 mm and the lowest score was 449,02 mm, the distribution mean score was 468,8 mm and the deviation standard was 11,5 mm. The average score of thigh muscles hypertrophy of the control group was 10.5 mm.

In the natural-based protein treatment group, the highest score of muscle arm circumference measurements before the treatment given was 278.02 mm and the lowest score was 227.30 mm, the mean score was 252.7 mm and the deviation standard was 16.1 mm. The highest score of arm muscle circumference measurement after the treatment was given was 300.72 mm and the lowest score was 250.58 mm, the mean score of distribution was 274.6mm and the deviation standard was 16.9 mm. The hypertrophy average score of arm muscle on natural-based protein

group was 21.9 mm. The result of thigh muscle circumference measurement before the treatment was given on natural-based protein treatment showed that the highest score was 466,76 mm and the lowest score was 440,88 mm, the mean score of distribution was 459,5 mm and the deviation standard was 7.00 mm.

**Table 2.** Mean Hypertrophy Data of Research Subject Muscles

Muscle hypertrophy (mm)	Treatment Control		Natural Protein		Artificial	
	Arm	Thigh	Arm	Thigh	Arm	Thigh
Pretest	255,6 ±17,7	458,3 ±8,7	252,7 ±16,1	459,5 ±7,0	254,6 ±18,3	459,4 ±8,1
Posttest	262,5 ±17,2	468,8 ±11,5	274,6 ±16,9	478,1 ±9,1	282,5 ±17,5	485,7 ±8,8
Deviation	6,9	10,5	21,9	19,2	27,9	26,3

The result of thigh muscle measurements after was given the natural-based protein treatment showed that the highest score was 491.32 mm and the lowest score was 461.16 mm, the average score distribution was 478.70 mm and deviation standard was 9.1 mm. The hypertrophy average score of thigh muscle in natural-based protein group was 19.2 mm. In manufactured-supplement protein treatment group, the measurement of arm muscle circumference before treatment was given showed that the highest score was 288.02 mm and the lowest score was 228.16 mm, the mean score of distribution was 254.6 mm and the deviation standard was 18.3 mm. The result of arm muscle circumference measurements after treatment was given showed that the highest score was 313.44 mm and the lowest score was 253.73 mm, the mean score distribution was 282.5 mm and the deviation standard was 17.5 mm. The hypertrophy average score of arm muscle on manufactured-supplement protein group was 27.9 mm.

The result of measurement on thigh muscle circumference before the treatment was given to manufactured-supplement protein group showed that the highest score was 472,76 mm and the lowest score was 441,74 mm, the mean score distribution was 459,4 mm and the deviation standard was 8,1 mm. The result of measurement on thigh muscle circumference after the treatment was given to manufactured-supplement protein group showed that the highest score was 499.18 mm and the lowest score was 468,6mm, the distribution of mean score was 485,7 mm and the deviation standard was 8,8 mm. The hypertrophy average of thigh muscle on manufactured-supplement protein group was 26.3 mm.

Table 3 shows the results of hypertrophy data analysis of arm muscles that have been calculated by using Anova test. It was found that F value was 88.533 and F table was 3.88 ( $\alpha = 0.05$ ). Based on this data, it can be seen that F value is greater than F table, so it can be concluded that  $H_0$  is rejected. Thus, there is effect of high protein supplementation to increase arm muscle hypertrophy in weight training.

**Table 3.** Summary of Anova Hypertrophy of Arm Muscle

	Df	Sum of Squares	Mean Square	F	F <sub>tab</sub>
Mean	1	13914,56	13914,56	88,533	3,88
Between Groups	2	3049,94	1524,969		
Within Groups	36	620,10	17,225		
Total	39	17584,5	97		

Based on the result of hypertrophy data analysis that have been done by using anova test, the result of  $F_{value}$  was 22,52 and  $F_{table}$  was 3,88 ( $\alpha = 0,05$ ). Based on the results of anova test, it can be seen that  $F_{value}$  is greater than  $F_{table}$ , so it can be concluded  $H_0$  is rejected. Thus, there is influence of high protein supplementation on thigh muscle hypertrophy in weight training.

According to Thomas R. (1999), weight training can maintain muscle strength and endurance, improve coordination of nerve muscles and bone density. Thomas and Roger (1999) mentioned that weight training can cause dramatic changes to body. Many people doing weight training say that having a sturdy body not only gives a good feeling on body but also affects how to relate or interact with others, as well as increasing muscle strength and endurance, and strengthen the muscle and nerve coordination. The formation of arm muscle enlargement that occurs on the experimental group in this study was caused by regular, programmed and sustainable exercise. In addition, another factor that also dominantly determines the increase in arm muscle enlargement in this experimental group was the effect of the supplements consumed by the samples. Coulman (2014) argues that "Muscles need protein to get big and strong, when you're working on building them, you'll have to fuel them with a lot of protein-heavy food". From that opinion, it can be concluded that muscles indeed need protein to grow big and strong, followed by regular practice. It means that as the muscle size increases, the function of the muscle will also increase as well as its strength.

Zabala and Naclerio (2016) argue "Whey protein as upper and lower body strength". Consuming high-protein milk will increase upper and lower body

strength. It means that whey protein also gives effect to the power possessed by someone. If it is seen from the ingredients, Manufactured-supplement (WheyProtein) is high protein milk needed in muscle enlargement. It has been well known that muscle requires adequate intake of protein as a staple food for them. Withal the fulfillment of protein intake required by the muscle, and coupled with the exercises performed, then the function of the muscle will also increase. Zabala and Naclerio (2016) argue that "Whey protein alone or as a part of a multi-ingredient appears to maximize lean body mass or fat-free mass gain, as well as upper and lower body strength." Manufactured-supplements such as high-protein milk will maximize lean body mass and increase fat-free muscle mass. It means that when consuming high-protein milk, the muscle growth will occur maximally. The increase of mass is not derived from fat but from fat-free muscle. Furthermore Zabala and Naclerio (2016) mentioned that consuming manufactured-supplements such as high-protein milk will also increase the upper and lower body strength. It can be interpreted that by consuming high-protein milk, it will increase overall muscle strength (a person's body). According to Tipton et al. (2004), acute ingestion of both whey protein and casein after exercise results in similar increases in muscle protein net balance, resulting in net synthesis despite different patterns of blood amino acid responses.

According to Cribb PJ, et al. (2007), "Whey Protein seems to promote greater strength gains and muscle morphology during RE training, the hypertrophy responses within the groups varied". They say that whey protein or high-protein milk will provide an increase in muscle strength and hypertrophy, but the increase is various. Furthermore, related to muscle hypertrophy, it was also found that there is a significant effect of high-protein supplement against muscle hypertrophy. Based on the average difference obtained from the three study groups, the group taking the manufactured- supplements had the highest average of muscle hypertrophy, that is 27.88 mm for arm muscle and 26.31 mm for the thigh muscle. It proves that manufactured-supplements give a better effect on muscle hypertrophy in weight training.

According to Burke (2001) in Harahap (2014), in several trials involving strength training, protein supplementation (1,2-1,5 gr / kg / day for 6-12 weeks) significantly improved muscle strength in some assessments in comparison to carbohydrates and / or protein control groups. On hypertrophic muscle, there is an increase in the number of myofibrils, filament actin and myosin, sarcoplasm, and other supportive tissues. Lieby (2013) says, "studies show that consuming soy milk after exercise can facilitate the delivery of amino acids to muscle and protein synthesis all of which will support perfect muscle formation ". Egg white is part of the fat-free and cholesterol which is

easily absorbed by the body, as said by Sukmandityo (2015), "egg white is also considered as a good source of protein because it is perfectly absorbed by the body to be used as a muscle building substance".

The exercise provides maximum emphasis or stimulation of the trained muscles, so that the potential for muscle to develop is increased. According to Bafirman (2012), muscle hypertrophy can be improved through strength training and anaerobic exercises with high intensity and short duration. Long-acting, low intensity anaerobic exercises generally do not produce effective tissue hypertrophy. Biological factors that affect muscle hypertrophy such as age and nutrition, basically need an adequate supply of amino acids to produce muscle hypertrophy. Furthermore Guyton & Hall (1997) argues that one of the main principles of muscle development during exercise is as follows: a) Muscles that work without weight, although practicing for hours, then the strength is only slightly increased, b) The muscle strength that contracts more than 50% of the maximum contraction force will develop rapidly even if the contraction is done only several times each day. Based on the results of the study, it can be concluded that high-protein supplements provide a meaningful effect to increase muscles hypertrophy on arms and thigh muscles of fitness center members. High protein supplements can be given to fitness members as a support in achieving muscle enlargement. Further research is needed on the impact of high protein supplementation on health.

#### 4. CONCLUSION

There is a significant effect of high protein supplement towards arm and thigh muscle hypertrophy of fitness center members.

This can be shown from the result that state (1) the average of natural protein supplement was 21.9 mm for arm muscle, and 19.2 mm for thigh muscle, and (2) the average of artificial protein supplement was 27.9 mm for arm muscle, and 26.3 mm for thigh muscle. From the result of the research, it can be concluded that there is a significant effect of high protein supplement towards arm and thigh muscle hypertrophy of fitness center members in Padang

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