

# The Influence of Protein Supplementation on Muscle Hypertrophy

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**Abstract.** The problem of this study was the lack of knowledge about nutrition, so the use of protein supplements to support the occurrence of muscle hypertrophy is not optimal. The use of natural supplements is a substitute of the manufacturer's supplements. The purpose of this study was to determine the effect of natural protein supplementation to muscle hypertrophy. The method of the research was a quasi experiment. There are 26 subject and were divided two group. Instrument of this research is to use tape measure and skinfold to measure muscle rim and thickness of fat in arm and thigh muscle. Then to calculate the circumference of the arm and thigh muscles used the formula  $MTC = (3.14 \times TSF)$ . MTC is the arm muscle or thigh muscle and TSF is the thickness of the muscles of the arm or thigh muscles. Data analysis technique used was t test at 5% significant level. The result of the research showed that average score of arm muscle hypertrophy at pretest control group was  $255.61 \pm 17.69$  mm and posttest average score was  $263.48.58 \pm 17.21$  mm and average score of thigh muscle hypertrophy at pretest control group was  $458.32 \pm 8.72$  mm and posttest average score was  $468.78 \pm 11.54$  mm. Average score of arm muscle hypertrophy at pretest experiment group was  $252.67 \pm 16.05$  mm and posttest average score was  $274.58 \pm 16.89$  mm and average score of thigh muscle hypertrophy at pretest experiment group was  $459.49 \pm 6.99$  mm and posttest average score was  $478.70 \pm 9.05$  mm. It can be concluded that there was a significant effect of natural protein supplementation on muscle hypertrophy.

## 1. Introduction

Exercise is a human effort to obtain health and fitness, characterized by a series of organized and planned gestures or exercise activities with rhythmic and composed movements. To achieve this, it is necessary to exercise in the sport systematically and sustainably. In accordance with the opinion of Bo that exercise is a systematic exercise activity in a long time, progressively enhanced and individual that leads to the characteristics of the function and psychological man to achieve goals has been determined [1]. In addition to getting health and fitness, the goal of people doing sports is to get the ideal body and proportional, has a proportionate body muscles is the dream of everyone, because this is enough to affect the performance or appearance in the eyes of others. The best way to achieve that goal is by weight training. Weight training ground can be done in fitness centers. But there are still many fitness members who exercise has not achieved the expected goal of muscle enlargement.

Structured and programmed weight training will result in better muscle growth and formation or increased muscle mass (hypertrophy). In weight training, nutritional intake is a factor to consider. Adequate nutrition intake or in accordance with the needs of the body, will enable the occurrence of muscle hypertrophy. Formation of muscle mass (hypertrophy) and strength is determined by well-



programmed exercises supported by a healthy and balanced diet [2]. The role of protein in exercise is the basic ingredient of muscle formation. On the other hand, supplements are also needed to help muscle growth. Protein is also to repair the damaged muscles resulting from exercise.

Excessive consumption of supplements will cause disorders of the body, especially in the liver and kidneys. The findings, published in the British Journal of Cancer, show that those taking muscle-building supplements for three years or more and under age 25 (especially pills and powders containing either creatine or androstenedione) is associated with an increased risk of testicular germ cell cancer (3). Furthermore, The British Dietetic Association (BDA) in Compass (2017) says high doses of additional proteins can cause various health problems such as kidney and liver damage. The UK Department of Health recommends that adults avoid protein consumption higher than recommended (55.5 grams for men and 45 grams for women) [4].

In weight training, to support the occurrence of muscle hypertrophy supplements become a mainstay for fitness members. The use of manufacturer supplements is an option to get instant and satisfying results, but many fitness members do not know the content of supplements or the composition of the supplements they consume. Lack of knowledge about nutrition, resulting in the use of supplements are not in accordance with the dose or not adjusted to physical activity, especially for beginners. Given the side effects and lack of fitness member knowledge about the use of manufacturer supplements, the alternative or substitute to support the occurrence of muscle hypertrophy in weight training is by consuming supplements in natural form. Natural protein supplements are the consumption of protein-containing ingredients such as pure cow's milk or soy milk, eggs and tofu. Compared to the manufacturer's supplements sold in the market or in fitness places, the price of natural protein supplements is much more affordable. Based on the background of the problems already raised, the researcher is interested in conducting research on the effects of weight training with natural supplementation on increasing muscle mass (hypertrophy). The purpose of this study was to analyze the effect of natural protein supplementation in weight training on increasing muscle mass (hypertrophy).

## 2. Research Methods

Research type is experiment with two-group pretest-posttest design. The study was conducted on One Gym Fitness Padang City. The study was conducted during June to October 2017. Subjects were recruited from registered male fitness members for less than 1 month. Subjects consisted of 13 treatment groups and 13 controls. Subjects do weight training with pyramid method with intensity 75% - 95%, reps 4 - 12, series / set 1 - 5, and interval 30 - 40 seconds. The treatment group received natural foods containing high protein of 1.5 g / kg BW given 4 times a week for 4 weeks. Types of food given are soy milk, egg whites and tofu. Measurement of hypertrophy in the muscles of the arms and thighs using a tape measure and skinfold caliper which aims to measure the muscle circumference and measure the thickness of fat in muscle. After the data obtained then converted with the formula:

$$\text{Muscle Hypertrophy} = \text{MMC} - (3.14 \times \text{TSF}) \quad (1)$$

where:

MMC : Mid Muscle Circumference

TSF : Skinfold thickness

The effect of high protein supplementation on muscle hypertrophy was analyzed using independent test t test.

## 3. Results and Discussion

The results showed that the mean body weight of experimental group subjects was 69.3 + 10.8 kg and control group 60.4 + 7.8 kg. The average height of the experimental group was 168.1 + 5.6 cm and the mean height of the control group was 173.6 + 6.6 cm. Statistically, there was no difference in body weight and height of study subjects (p value > 0.05). Measurement data of hypertrophy muscle of arm and thigh muscle before and after intervention can be seen Table 1.

**Table 1.** Data of Hypertrophy of Arm and Tigh Muscles Experimental Group

	Hypertrophy of Arm Muscle (mm)		Difference (mm)	Hypertrophy of Tigh Muscle (mm)		Difference (mm)
	Pretest	Posttest		Pretest	Posttest	
Maximum score	278.02	300.72	26.28	466.76	491.32	31.28
Minimum score	227.30	250.58	16.42	440.88	461.16	12.14
Mean	252.67	274.58	21.92	459.49	478.70	19.21
Deviation Standard	16.05	16.89	3.05	6.99	9.05	5.28

From the Table 1 shows that average score of arm muscle hypertrophy in the experimental group was  $252.67 \pm 16.05$  mm. After high-protein diet treatment, the average score of arm muscle hypertrophy was  $274.58 \pm 16.89$  mm with an average change of  $21.92 \pm 3.05$  mm. The average score of thigh muscle hypertrophy was  $459.49 \pm 6.99$  mm. After a high protein diet treatment, the average score of thigh muscle hypertrophy was  $478.70 \pm 9.05$  mm with a change of  $19.21 \pm 5.28$  mm.

**Table 2.** Data of Hypertrophy of Arm and Tigh Muscles Control Group

	Hypertrophy of Arm Muscle (mm)		Difference (mm)	Hypertrophy of Tigh Muscle (mm)		Difference (mm)
	Pretest	Posttest		Pretest	Posttest	
Maximum score	290.02	299.16	16.28	479.76	492.90	21.28
Minimum score	230.30	231.30	4.64	441.74	449.02	3.14
Mean	255.61	263.48	16.28	458.32	468.78	10.46
Deviation Standard	17.69	17.21	1.00	8.72	11.54	5.51

In the control group (Table 2), the average score of arm muscle hypertrophy was  $255.61 \pm 17.69$  mm. After a high-protein diet treatment, the average score of arm muscle hypertrophy was  $263.48 \pm 17.21$  mm with an average change of  $16.28 \pm 1.00$  mm. The average score of thigh muscle hypertrophy before treatment was  $458.32 \pm 8.72$  mm. After a high protein diet treatment, the average score of thigh muscle hypertrophy was  $468.78 \pm 11.54$  mm with a change of  $10.46 \pm 5.51$  mm. The results of statistical tests showed that there were also differences in hypertrophy of arm muscle and hypertrophy of thigh muscles in the control group. The result of statistical test shows that there was difference of hypertrophy of arm muscle and thigh muscles ( $p = 0.00$ ). From the statistical analysis it can be concluded that there was influence of high protein feeding to hypertrophy of arm muscle and thigh muscle.

The results of this study indicate that there was the effect of high-protein feeding on subjects who are weight training against the hypertrophy of arm and thigh muscles. Hypertrophy is the enlargement or increase of the total mass of a muscle. All hypertrophy is the result of an increase in the number of actin filaments and myosin in each muscle fiber, thus causing the enlargement of each muscle fiber, which is simply called fiber hypertrophy. This event usually occurs in response to a muscle contraction that takes place at maximum or almost maximum strength. To increase muscle hypertrophy requires a good exercise program and optimal protein intake. The formation of muscle mass (hypertrophy) and strength is determined by a well programmed exercise and supported by a healthy and balanced diet [2].

Muscle protein synthesis is stimulated in the recovery period after resistance exercise [5, 6]. However, the rate of muscle protein breakdown is also increased, thereby blunting the change in the net balance between synthesis and breakdown. Although net muscle protein balance is generally improved after resistance exercise, it remains negative. Therefore, nutrient intake is necessary to achieve positive net muscle protein balance.

Hypertrophy following resistance training requires net protein synthesis of the myofibrillar proteins, and hence, a maximal stimulation of protein synthesis is favourable for the development of muscle hypertrophy. Mixed muscle protein synthesis rate is increased in humans after bouts of resistance training provided the stimulus is of a sufficient magnitude [5].

Consuming soy milk after exercising can facilitate the delivery of amino acid to muscle and protein synthesis which will all support perfect muscle formation [7].

Athletes and exercisers consume high-protein diets for a number of reasons. Probably, the most prevalent reason for high protein intake is to enhance gains of strength and mass with resistance training. Muscle mass and strength can be gained on a wide range of protein intakes, from as little as the RDA up to very large amounts. There is little support for the necessity of very high amounts, e.g. > 2g protein/kg body mass per d, for optimal muscle hypertrophy during energy balance or excess. There are more recent studies showing that protein intakes as low as 1.2 g protein/kg body mass per d are sufficient for increased muscle mass [8].

Borsheim *et al.* proposed the existence of a dose-response relation between muscle protein synthesis and amino acid consumption after resistance exercise on the basis of a comparison of data from 2 studies [10]. They observed a postexercise stimulation of muscle protein synthesis almost twice as great after ingestion of 6 g compared with only 3 g Essential Amino Acids (EAA's) [6,9].

#### 4. Conclusion

The research results can be concluded that the muscle hypertrophy in the experimental group is better than the control group. There was an effect of high protein supplementation against muscle hypertrophy ( $p < 0.05$ ).

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