Northern Illinois University

Timing of Milk Supplementation on Muscular Hypertrophy and Strength in Trained Males

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Abstract

Problem- The inconsistency of information on recommendations regarding the most beneficial timing of protein supplementation in relation to a workout, when muscle hypertrophy and strength is the goal.

Purpose- To investigate milk supplementation before and after exercise and its effects on muscle hypertrophy, muscle strength, and body composition.

Design- On day 1, subjects reported to the exercise lab for anthropometrics,strength and muscle hypertrophy assessment. On day 28, subjects reported to the lab to reassess strength gains and to readjust lifting routines as needed to allow for additional strength gains. On day 56, subjects again reported to the exercise lab for final anthropometrics, strength and muscle hypertrophy assessment. During the 8 week study, subjects were randomly assigned to one of three workout groups: 16 oz skim milk prior to each resistance weight training session, 16 oz of skim milk following each resistance weight training session, or no protein at all 2 hours before or after each resistance weight training session. Despite the milk supplementation, milk drinking participants were asked to consume no other protein 2 hours before or after each resistance weight training session.

Each participant completed an identical weight training workout dependent on the week of the study. These workouts consisted of 45-60 minute resistance training sessions of 70%-85% of their 1 repetition max.

Major findings- Protein supplementation in a half-hour time frame of one's strength training workout helpd to increase strength and muscle size. Post-workout protein supplementation wasmore favorable than pre-workout protein supplementation in allowing for gains in strength and muscle size.

Conclusion- To maximize benefits on strength and muscle size; ingest 480 mL milk within 30 minutes of completing resistance weight training sessions.

Hypotheses:

1. There will be a statistical difference in muscle hypertrophy in the groups that use milk supplementation before or after a resistance weight training compared to those in the control group.

   Evaluated through circumference measurements at the upper arm, chest, waist, hips, and thighs.

2. There will be a statistical difference in muscle strength in the groups that use milk supplementation before or after a resistance weight training compared to those in the control group.

   Evaluated through 1 repetition max of the bench press and leg press.

3. There will be a difference in body composition in any of the groups.

   Evaluated using the InBody 520 body composition scale.

Variables Affecting Muscle Growth:

Independent Variables:

Diet: An individual's diet can affect muscular growth. Caloric intake must exceed calories being burned to ensure that muscle hypertrophy occurs. "Resistance exercise is a powerful stimulus to augment muscle protein anabolism [...], however, muscle hypertrophy can only occur when sufficient food intake is ingested during post-exercise recovery (4). An individual must also be consuming adequate protein, specifically all of the essential amino acids (6). The Recommended Dietary Allowance (RDA) for protein is 0.8 g per kg of body weight. A higher intake of protein consumption is recommended for strength-training athletes. Between 1.5 to 2.0 g of protein per kg of bodyweight or 12%-20% of total energy intake is recommended to maintain protein balance for athletes (11). Completion of a three day food log was asked of the participants in order to evaluate caloric and protein intake and offer suggestions for improvement where necessary. Participants were asked to keep their diets consistent for the 8-week duration of the study.

Hormones: Hormone levels and the factors that impact these levels can have an effect on the results of muscle growth. Age, gender, and current fitness level are three factors that impact hormone levels (7), which we were able to control for this study by using adult males within the age group of 18-30 years old having more than one year of weightlifting experience. We forbade participants from consuming anabolic steroids and supplements such as creatine, testosterone boosters, or prohormones.

Genetics: Genetics can impact muscle size, strength, and your body's reaction to the exercise stimulus. Genetics are inherent and cannot be manipulated, but can act to a certain

degree as a predictor of athletic performance and body structure/make up (10). These genetic differences were somewhat controlled in this study by using males ages 18-30 years old.

Dependent Variables:

Timing of milk ingestion: The timing of milk ingestion, pre- or post-workout, can affect three dependent variables- muscle hypertrophy, muscle strength, and body composition.

Supplementation groups:

Pre-workout supplementation: 480 milliliter fat free milk 5 minutes pre-workout; no other protein consumption within 2 hours before or after training.

Post-workout supplementation: 480 milliliter fat free milk 5 minutes post-workout; no other protein consumption within 2 hours before or after training.

Control: No milk supplementation; No protein consumption within 2 hours before or after training

Methods of Data Collection

The methodology of research of this study is relative to the aspect of the hypotheses that are being tested.

Muscle strength was measured using specialized weight training equipment and free weights. The measurements were of a 1 repetition max in both the bench press and leg press exercises. A 1 repetition max is completion of one complete repetition of an exercise at the maximum amount of weight able to complete without assistance.

To measure muscular hypertrophy, all participants had specific points of the body measured on days 1 and 56 of the 8-week study. The chest, upper arm, waist, hips, and thighs were the places of greatest interest. These measurements were completed using a 60-inch cloth tape. These assessments were done on days 1, 28, and 56 of the study.

Finally, the body composition was tracked, via a body- fat analyzing scale (InBody 520, Biospace Inc, Los Angeles, CA), on days 1 and 56 of the study to see if the timing of milk supplementation influences an individual's weight, BMI, or amount of lean body mass and fat mass.

A three day food log was analyzed through Nutrition Calc Plus Software. The diet was evaluated in order to assure proper intake of participants and for participants to be instructed as to how to improve their diet if necessary.

Results/Major Findings:

Significant muscle hypertrophy changes were seen in both the pre-workout supplementation group and the post-workout supplementation group. Hypertrophy changes were significantly seen in the legs in the pre-workout group and in the chest, arms waist, and thigh (the right more than the left) of the pre-workout group. The control group saw no statistically significant improvements in muscular hypertrophy.

Notable strength increases were documented in all three lifting groups in both the bench press and the leg press. The milk supplementation groups did see more significant increases than the control group, yet all three were significant.

Notable body composition changes of lean body mass were statistically significant in the post-workout milk supplementation group only.

Discussion/Conclusion:

In all, it appears that protein supplementation is significant in regards to experiencing the most potential benefit of strength training workouts; specifically that post-workout protein supplementation is more beneficial than pre-workout protein supplementation in receipt benefit from weight training.

Strength training is an obvious important factor stimulating muscular growth and anthropometric changes. This stimulus paired with protein supplementation post-workout is a likely the best combination available legally to assure optimal results from strength training.

It is still unknown of whether the protein supplementation itself or the supplementation of protein plus carbohydrates, the macronutrient intake of fat-free milk, may have been a key factor of the benefits seen by participants.

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