ISSN-MusclePharm Grant Application Example

Title of Proposed Research:

"The Effects of MusclePharm Arnold Cuts™ on Maximal Strength, Body Composition, and Skeletal Muscle Hypertrophy"

Submitted to:

Cover Letter of Application

ISSN/MusclePharm

We would like to thank you for the opportunity to apply this grant to study the effects of MusclePharm Arnold Iron Cuts™ on acute and chronic resistance training performance and body composition. The study design that I have included in this grant application is very comprehensive in nature. There are two different aspects to the proposed investigation: an acute resistance exercise performance aspect and a chronic adaptations aspect. Broadly speaking, the acute arm proposed will investigate the effects of Arnold Cuts™ on an acute bout of resistance exercise. In this study, participants will ingest Arnold Cuts™ (or a placebo) about 30 minutes prior to a whole body resistance exercise workout. The workout will include both lower and upper body exercises, and each set will be taken to muscular failure. The primary dependent variable in this acute study will be total lifting volume. The chronic aspect of this study will have participants resistance train three times per week for a 10-week period. Prior to each resistance exercise bout, participants will ingest Arnold Cuts™ (or a placebo). Prior to and at the end of the 10-week training period, maximal strength, explosive power, and body composition will be assessed.

Essentially, the research that will be conducted will answer two questions:

1) Does Iron Cuts™ ingestion significantly increase the amount of weight that can be lifted during an acute bout of resistance exercise?
2) If so, does this improvement that is demonstrated during an acute bout of resistance exercise have an accumulative effect, such that after 10-weeks of resistance training and Iron Cuts™ ingestion are maximal strength, power, and body composition significantly improved (as compared to a placebo)?

Receiving funding directly impacts our ability to conduct this research. With a funding award of $9,360, we will be able to pay for our research staff to supervise all training sessions, obtain resistance training equipment that will make the training program more efficient, and pay the participants for their time. We believe that we will deliver not only an outstanding product (two separate research studies, with one of them being a full-scale 10-week training program), but one that can be completed with relatively low costs. The size of our weight room in our research facility allows us to deliver on these two research studies in a cost-efficient manner.

We would like to thank you for your time in reviewing this grant application.

Applicant Information and required materials

1. Type of grant you are applying for (example):

- I am applying for a $10,000 grant for the University of (include name of University, or if private include name, business name, etc...)

2. Project Title (example):

- The Effects of MusclePharm Arnold Cuts™ on Maximal Strength, Body Composition, and Skeletal Muscle Hypertrophy

3. Submitters/Principal Investigators information (complete information below for all principle investigators):

- Name:
- Address:
- ISSN Number:
- Email Address:

4. Investigators/Co-Investigators information (complete information below for all investigators/co-investigators):

a. Name:

b. Position and Title:

c. College and Universities attended and degrees awarded:

d. Professional Experience

e. Memberships, honors, and Certifications:

f. Additional Relevant Information:

5. List of relevant publications by the investigators/co-investigators:

6. Proposal Abstract (example):

This proposal contains two independent investigations - an acute bout design and a 10-week training study.

Acute Bout Study Design

The inclusion of caffeine as one of the ingredients of Iron Cuts™ is important for its potential to significantly increase the total amount of weight that can be lifted during one bout of resistance exercise. In this arm of the study, 10 resistance trained males will be randomly assigned to ingest either Iron Cuts™ or a placebo 30 minutes prior to performing four sets of back squats and four sets of bench press. The main dependent variable will be total lifting volume, and will be calculate by sets x reps x resistance. Approximately one week later, participants will repeat the workout but ingest the other

supplement 30 minutes prior to the workout. Data (total lifting volume) will be analyzed via a dependent samples t-test and the alpha level for statistical significance will be set at $p \leq 0.05$.

Chronic Adaptations Arm of Study (10-week training study):

Despite the favorable reports of caffeine-containing supplements improving acute bouts of resistance exercise (as measured by total lifting volume), there is little to no research investigating the effects of caffeine ingestion taken repeatedly before resistance exercise over several weeks of a training program on muscular strength and lean body mass. In addition to caffeine, Iron Cuts™ contains several other ingredients (including L-carnitine, green tea extract, Maca 4:1, and gymnema sylvestre leaf extract) that have potential to reduce body fat, that are involved in fat oxidation, and improve performance. Approximately 40 resistance-trained subjects will be recruited for this randomized, double-blind, placebo controlled investigation. At baseline and following 10-weeks of periodized resistance training, participants will be assessed for bench press 1RM, back squat 1RM, body composition (fat mass and lean body mass), cross sectional area of the biceps brachii (via ultrasound technology), and explosive power (via vertical jump). Data will be analyzed via a 2 (group) x 3 (time points) repeated measures ANOVA. Univariate ANOVAs (Bonferroni adjusted) will be conducted as follow-up tests to the ANOVA. The alpha level for statistical significance will be set at $p \leq 0.05$ for all analyses.

7. Detailed Purpose of the Study Including References

Acute Bout Arm of Study

The inclusion of caffeine as one of the ingredients of Iron Cuts™ is important for its ability to significantly increase the total amount of weight that can be lifted during one bout of resistance exercise. In fact, when caffeine is one of several ingredients within a dietary supplement and is ingested prior to a bout of resistance exercise, research has consistently reported significant improvements in both upper [Forbes et al., 2007] and lower body total lifting volume. Interestingly, the amount of caffeine contained in these dietary supplements (i.e. energy drinks) was only about 2mg/kg body mass. Hence, relatively low levels of caffeine can be present in a dietary supplement and exert a significant effect on an acute bout of resistance training performance. Also, a caffeine-containing supplement with higher levels of caffeine (5 mg/kg body weight) has also been shown to significantly increase upper body/bench press total lifting volume [Woolf et al., 2008]. Given the consistent findings of caffeine-containing supplements improving total lifting volume, we propose that the pre-workout ingestion of a caffeine-containing supplement Iron Cuts™ may also significantly increase total lifting volume in both upper and lower body exercises.

References

- Forbes SC, et al. Effect of Red Bull energy drink on repeated Wingate cycle performance and bench-press muscle endurance. Int J Sport Nutr Exerc Metab. 2007 Oct;17(5):433-44.
- Woolf K, et al. The effect of caffeine as an ergogenic aid in anaerobic exercise. Int J Sport Nutr Exerc Metab. 2008 Aug;18(4):412-29.

Chronic Adaptations Arm of Study (10-week training study):

Interestingly, despite the favorable reports of caffeine-containing supplements improving acute bouts of resistance exercise (as measured by total lifting volume), there is little to no research investigating the effects of caffeine ingestion taken repeatedly before resistance exercise over several weeks of a training program on muscular strength and lean body mass. It would appear plausible that if pre-exercise ingestion of caffeine significantly improves total lifting volume of an acute bout of resistance exercise, then doing so over several weeks of training should significantly improve maximal strength and lean body mass. Iron Cuts™ contains caffeine, and for this reason and the reasons stated below we believe that investigating this supplement in conjunction with a 10-week training program would result in improvements in training adaptations.

In addition to caffeine, Iron Cuts™ contains several other ingredients (including L-carnitine, green tea extract, Maca 4:1, and gymnema sylvestre leaf extract) that have potential to reduce body fat, that are involved in fat oxidation, and improve performance. Wutzke and Lorenz (2004) reported that L-carnitine ingestion led to a significant increase in fat oxidation whereas protein breakdown rates remained unchanged. This was an important finding as it implies that the effects of L-carnitine may be tissue specific, favoring fat loss and maintaining lean body mass. Green tea extract with a standardized level of catechins has been shown to elicit significant increases in daily energy expenditure and fat oxidation (Harada et al., 2005; Rumpler et al., 2001). Its effects also have been shown to reach a greater magnitude when combined with caffeine (Dulloo et al., 1999; Dulloo et al. 2000). The increase in energy expenditure reported by multiple researchers implies that caffeine and green tea-containing supplements may be useful for fat loss.

Maca (Lepidium meyenii Walp) has not been thoroughly investigated. In one study (Stone, et al. 2009), it was reported that 14 days Maca supplementation improved 40 km cycling time trial performance in trained male cyclists. It is currently not known if Maca supplementation improves resistance-training performance, therefore more research needs to be done on this particular ingredient. Similar to Maca, there has been very little research on gymnema sylvestre leaf extract. In one study (Preuss et al., 2004) which investigated the effects of a weight loss supplement containing gymnema sylvestere leaf extract (among other ingredients), it was reported that body weight was significantly decreased over a period of 8-weeks in moderately obese subjects. It is currently not known if this particular ingredient would have favorable changes in body composition in physically active males.

In conclusion, the ingredients contained in Iron Cuts™ have a lot of potential to improve the physique and performance of males during resistance training. Therefore, the purpose of this study is to investigate the effects of pre-workout ingestion of Iron Cuts™ in conjunction with a periodized resistance training program on maximal strength, muscular power, and body composition.

References

- Dulloo A, Duret C, Rohrer D, Girardier L, Mensi N, Fathi M, Chantre P, Vandermander J. (1999) Efficacy of a green tea extract rich in catechin polyphenols and caffeine in increasing 24-h energy expenditure and fat oxidation in humans. American Journal of Clinical Nutrition 70, 1040-1045.
- Dulloo AG, Seydoux J, Girandier L, Chantre P, Vandermander J. (2000) Green tea and thermogenesis: interactions between catechin-polyphenols, caffeine and sympathetic activity. International Journal of Obesity and Related Metabolic Disorder, 24, 252-258.

- Harada U, Chikama A, Saito S, Takase H, Nagao T, Hase T, Tokimitsu I. (2005) Effects of the Long-Term Ingestion of Tea Catechins on Energy Expenditure and Dietary Fat Oxidation in Healthy Subjects. Journal of Health Science, 51(2) 248-252.
- Preuss HG, et al. Effects of a natural extract of (-)-hydroxycitric acid (HCA-SX) and a combination of HCA-SX plus niacin-bound chromium and Gymnema sylvestre extract on weight loss. Diabetes Obes Metab. 2004 May;6(3):171-80.
- Rumpler W, Seale J, Clevidence B, Judd J, Wiley E, Yamamoto S, Komatsu T, Sawaki T, Ishikura Y, Hosoda K. (2001) Oolong tea increases metabolic rate and fat oxidation in men. Journal of Nutrition, 131, 2848-2858.
- Stone M, et al. A pilot investigation into the effect of maca supplementation on physical activity and sexual desire in sportsmen. J Ethnopharmacol. 2009 Dec 10;126(3):574-6.
- Wutzke KD, and Lorenz H. The effect of l-carnitine on fat oxidation, protein turnover, and body composition in slightly overweight subjects. Metabolism. 2004 Aug;53(8):1002-6.

8. Specific Aims, Independent and Dependent Variables, and Hypotheses in Detail

The specific aim of this study is to determine if Arnold Iron Cuts™ ingestion significantly improves total lifting volume during one bout of resistance exercise. Further, a second aspect to this study will investigate if Arnold Iron Cuts™ significantly improves maximal strength, explosive power, and body composition (lean body mass) in conjunction with a periodized, 10-week resistance-training program. Below are the independent variables, dependent variables, and hypotheses for both the acute and chronic aspects to this study:

Acute Bout Arm of Study:

- Independent variable: Dietary supplement treatment (Arnold Iron Cuts™ or placebo)
- Dependent variable: Total lifting volume achieved during an acute bout of resistance exercise
- Null Hypothesis: There will be no differences in total lifting volume between the Arnold Iron Cuts™ and placebo treatments
- Research Hypothesis: There will be a difference in total lifting volume between the Arnold Iron Cuts™ and placebo treatments, with the Arnold Iron Cuts™ treatment resulting in a significantly greater total lifting volume as compared to the placebo treatment.

Chronic Adaptations Arm of Study:

- Independent variable: Dietary supplement treatment (Arnold Iron Cuts™ or placebo) and time (baseline testing, mid-point testing [5 weeks], and post-training testing [10 weeks])
- Dependent variable: Bench press 1RM, Squat 1RM, lower body muscular power (assessed via the vertical jump); upper body muscular power (medicine ball throw), body composition (estimation of fat mass and lean body mass via ultrasound technology); skeletal muscle hypertrophy (assessed via skeletal muscle cross sectional area via ultrasound technology).
- Null Hypothesis #1: There will be no differences in any performance measure (bench press 1RM, squat 1RM, lower body power, upper body power) or body composition measure (fat mass, lean body mass, or skeletal muscle hypertrophy) between the Arnold Iron Cuts™ and placebo treatments

- Research Hypothesis: There will be a difference in performance measures (bench press 1RM, squat 1RM, lower body power, upper body power) and measures of body composition (fat mass, lean body mass, or skeletal muscle hypertrophy) between the Arnold Iron Cuts™ and placebo treatments, with the Arnold Iron Cuts™ treatment resulting in significantly greater performance and body composition measures.

9. Experimental Design and Methodology in Detail

Acute Bout Arm of Study

The design of this arm of the investigation will be a randomized, double blind, placebo controlled crossover study. Participants will be resistance-trained males between the ages of 18 and 40. Resistance trained will be defined as consistent resistance training for the past year and the ability to bench press one's own body weight and squat 1.25 times one's body weight. Approximately 10 participants will be recruited for this investigation. Participants will be required to visit the Exercise and Performance Nutrition Laboratory on three occasions. On the first visit, subjects will be familiarized to the acute bout of resistance exercise. Specifically, each participant will perform four sets of back squats and four sets of bench presses at 80% 1RM to failure. The two exercises will be alternated starting with the squat, then the bench press, and continuing until four sets of each exercise are completed. There will be three minutes of rest between each set. Approximately one week later, participants will return to the laboratory (visit #2) in the morning after an overnight fast and repeat the same workout. However, 30-mintues prior to the workout, participants will randomly ingest either three capsules of the Iron Cuts™ or three capsules of a placebo. Total lifting volume will be calculated as sets x reps x weight. Approximately one week later, participants will repeat the same procedures as they did is visit #2, except that they will ingest the other treatment that they did not consume during visit #2.

10-Week Training Study

The design of this arm of the investigation will be a randomized, double blind, and placebo controlled design. Participants will be resistance-trained males between the ages of 18 and 40. Resistance trained will be defined as consistent resistance training for the past year and the ability to bench press one's own body weight and squat 1.25 times one's body weight. Approximately 40 participants will be recruited for this investigation. Participants will be randomized (while controlling for bench press 1RM strength) to the Iron Cuts™ or placebo group.

<u>Baseline and Post-Testing</u>:

At baseline and post-testing (after 10-weeks of resistance training), participants will be assessed on 5 different variables:

- Bench Press 1RM
- Squat 1RM
- Body Composition (Fat mass and lean body mass)
- Biceps cross sectional area (via ultrasound)
- Vertical Jump (explosive power)

Bench Press and Back Squat 1RM: 1RM will be determined by following the protocols for 1RM assessment put forth by the National Strength & Conditioning Association (Baechle & Earle, 2000). Participants will warm-up by completing 1 set of light resistance for about 10 repetitions, followed by a 1-minute rest period, which is then followed by another warm-up set of 3-5 repetitions with a slightly heavier load. A final warm up set is then completed by adding more resistance. Next, participants will then perform successive 1RM attempts. For the bench press, weight will be increased by 10 – 20 pounds and for the back squat weight will be increased by 30 – 40 pounds. The final weight successfully lifted one time, for each exercise, will be recorded as the participant's 1RM for each exercise.

Body Composition: Body composition will be assessed using the Bodymetrix hand-held ultrasound wand. The 7 anatomical sites that will be measured include the chest, midaxillary (about 4 inches below the armpit), triceps, subscapular (below the shoulder blade) abdomen, suprailiac (above the hip bone), and thigh. To conduct this body composition assessment, the research assistant will apply a small amount of ultrasound gel to the hand-held ultrasound wand, then apply the wand to the appropriate anatomical landmark, and then move the wand back and forth over the area of the skin across a range of about 5cm. The BodyMetrix works by using ultrasound. When ultrasound waves penetrate tissue, reflections occur at different tissue boundaries. For example, there are strong ultrasound reflections at fat-muscle and muscle-bone boundaries. Ultrasound allows the BodyMetrix to detect the true fat thickness at each measurement point. Fat thickness measurements are made in millimeters. Once the fat thicknesses are recorded for each of the 7 anatomical sites, they are plugged into a population specific regression equation. The American College of Sports Medicine 7-site formula will be used to predict body composition (fat mass and lean body mass).

Biceps Cross Sectional Area: Cross sectional area of the biceps will be measured with the Bodymetrix hand-held ultrasound wand. The assessment will occur on the right side of the body at the point of maximal circumference with the elbow fully extended, palm up, and arm abducted to parallel with the floor.

Vertical Jump: The vertical jump will utilize a commercial device (Vertical Challenger®) to determine how high each participant jumps vertically from the ground. We will be following the National Strength and Conditioning Association's (NSCA) testing protocol (Baechle & Earle, 2000). The research assistant will adjust the height of the stack of moveable color-coded horizontal plastic vanes to be within the participants reach. The highest vane that can be reached and pushed forward with the dominant hand while the participant stands flat-footed determines the standing touch height. The vane stack is then raised by a measured distance (marked on the vane shaft) so that the participant will not jump higher or lower than the set of vanes. This requires a rough estimate of how high the participant will jump (correction can be made on the second jump if needed). Without a preparatory or stutter step, the participant performs a countermovement by quickly flexing the knees and hips, moving the trunk forward and downward, and swinging the arms backwards (behind the back). During the jump, the dominant arm reaches upward while the non-dominant arm moves downward relative to the body. At the highest point in the jump, the participant taps the highest possible vane with the fingers of the dominant hand. The score is the vertical distance between the standing touch height and the highest vane tapped during the jump. Each participant will attempt three vertical jumps, with the highest vertical jump being recorded.

Reference

- Baechle, T. R., & Earle, R. W. (Eds.). (2000). Essentials of strength training and Conditioning. Champaign, IL: Human Kinetics.

Supplementation Protocol

Participants will be randomized (while controlling for bench press 1RM strength) to the Iron Cuts™ or placebo group. Prior to each resistance exercise workout, participants will ingest 3 capsules (Iron Cuts™ or placebo) 30 minutes prior to the workout. Participants will ingest the supplements in the presence of a research assistant to ensure compliance with the supplementation protocol. In addition to the pre-workout supplementation, all participants (regardless of Iron CutsTM or placebo treatments) will ingest approximately 30 grams of protein (Iron Whey™) following each workout to control for nutrient timing effects of protein intake in the post-workout time period. Also, participants will be instructed to not change their dietary habits during the investigation. Three day food records will be completed and analyzed at baseline, week 5, and week 10 to assess if any differences exist between the groups in relation to dietary intakes.

Resistance Training Protocol

Participants in each treatment group (Iron Cuts™ and the placebo group) will follow the same identical training program. The resistance training program will utilize a daily undulating periodization plan. Participants will lift three days per week, each Monday, Wednesday, and Friday. One workout will be designated as a 'strength' day, one workout will be a 'hypertrophy' day, and the final workout of the week will be a 'power' day. Each workout will be whole body in nature and will utilize similar basic lifts, but the main differences will be the repetition ranges and the tempo/time under tension utilized for each specific workout. Below is an overview of each workout that will be conducted on a weekly basis for 10-weeks. Each workout is designed to last about one hour in duration.

Strength Day (each exercise is conducted at a 3-6RM intensity with an explosive concentric and a controlled eccentric muscle action). Four sets of each exercise will be completed with three minutes of rest between each set and exercise.

- Back Squat
- Bench Press
- Shoulder Press
- Lat Pulldown
- Chin-Ups
- Dips

Hypertrophy Day (each exercise is conducted at a 10-12RM intensity with an explosive concentric and a 2-second eccentric muscle action. Four sets of each exercise will be completed with 2.5 minutes of rest between each set and exercise.

- Back Squat

- Bench Press
- Barbell Row
- Deadlift
- Barbell Curl
- Tricep Pressdown

Power Day (each exercise is completed explosively with about 60% 1RM for each lift for 6 repetitions. Four sets of each exercise will be completed with 3 minutes of rest between each set and exercise).

- Back Squat
- Bench Press
- Lat Pulldown
- Deadlift
- Barbell Curl
- Dips

10. Statistics

Acute bout:

- Since this aspect of the investigation is a crossover design (with subjects ingestion both the Arnold Iron Cuts^{TM} and placebo treatments one week apart), data (total lifting volume) will be analyzed via a dependent samples t-test. The alpha level for statistical significance will be set at $p \leq 0.05$.

Chronic adaptations to 10-weeks of training:

- Data will be analyzed via a 2 (group) x 3 (time points) repeated measures ANOVA. Univariate ANOVAs (Bonferroni adjusted) will be conducted as follow-up tests to the ANOVA. The alpha level for statistical significance will be set at $p \leq 0.05$ for all analyses.

11. Itemized Budget

Our laboratory is set up to handle a relatively large amount of subjects at one time. For this reason, we will be able to supervise about 10 subjects per hour for this training study. With 40 subjects needed to train (20 subjects in the Arnold Cuts^{TM} group and 20 subjects in the placebo group), about 4 hours of supervised training will need to take place on training days. Training days are set at 3 days per week for 10-weeks. Therefore, to supervise all workouts three days per week for a 10-week period we will need to budget for $1,800 in order to pay the research assistants $15.00 per hour for their time. We would also like to offer compensation to the participants who will be volunteering their time to participate in this study. For this budgetary item, we are requesting $100 for each participant, totaling $4,000. The only equipment that our laboratory is in need of are

adjustable incline benches. We would like to use these for the upper body power production measures (upper body of subjects will be placed at a 45^{o} angle prior to the medicine ball throw). We will also be able to use these benches during the periodized workouts as well. We are asking for the purchase of 4 of these benches, which maximizes our space usage to the extent that these benches will be paired with each of our squat racks currently in the laboratory space. Below is an overview of the budget that we are requesting to carry out these two studies.

Supervision of workouts (120 hours of supervision @ $15.00/hour)……	$1,800
Participant compensation ($100 x 40 subjects)……	$4,000
Supplies (office supplies, ultrasound gel, etc.) ……	$300
Rogue® incline bench press ($815 x 4 units)……	$3,260
Total Budget	**$9,360**

12. Facility Capabilities

The Exercise and Performance Nutrition Laboratory has the capabilities to perform this research. Specifically, our research laboratory includes a large weight room that is filled with 4 full squat racks/bench pressing stations, two large platforms for deadlifts and Olympic lifts, a Nebula 35^{o} leg press, full line barbell rack, and several thousand pounds of free weights. We are confident that our research facility and research team will be able to effectively and efficiently supervise 40 subjects undergoing periodized training for a 10-week period. In essence, 4,800 hours of total training will need to be conducted for this 10-week study (40 subjects training 3 days per week for 10-weeks). With our capabilities, every one of these workouts will be supervised, charted, and managed in an efficient and streamlined process.

13. Proposal Timeline

Date or Date Range Activity	
December - February	Obtain IRB approval set up accounts
March – April	Collect data
May	Analyze data and prepare poster to present at ISSN meeting
June	Present data at ISSN National Meeting
July-August	Prepare and submit manuscript for publication

14. IRB Consent and Approval

After receiving feedback from ISSN-MusclePharm regarding funding, the IRB application process will be initiated. This process will take approximately 4-6 weeks before IRB approval will be granted.