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The Use of Ergogenic Aids Among High School Athletes in Eastern Kentucky

John Robert Brandenburg

THE USE OF ERGOGENIC AIDS AMONG HIGH SCHOOL ATHLETES IN EASTERN KENTUCKY

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By

John Robert Brandenburg, RD

Kelli Williams, Ph.D. Candidate, RD, Committee Chairperson
Dan Martin, Ed.D, ATC
Mary Kathryn Gould, MS, RD

Marshall University

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ABSTRACT

The Use of Ergogenic Aids Among High School Athletes in Eastern Kentucky

By: John Robert Brandenburg, RD

A fifteen-question survey was developed to study the use of over-the counter nutrition supplements by high school athletes in eastern Kentucky. Athletic trainers from four local high schools were given one hundred permission forms and surveys. After two weeks only a small number (n=25) completed the requirements to participate in the study. The twenty-five participants consisted of male (n=15) and female (n=10). The athletes with the highest frequency of supplement use were football players (67.7%). The supplements with the highest use were protein powders (n=13) and creatine monohydrate (n=9).

DEDICATION

I would like to dedicate this to my son, Cody. Time spent working on this research was time spent away from you.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Ergogenic aid is defined as "any means of enhancing energy utilization, including energy production, control, and efficiency" (Silver, 2001, p. 61). The history of ergogenic aid use can be traced back to the superstitions and ritualistic behaviors of athletes (Applegate & Grivetti, 1997). As early as 500-400 B.C., trainers recommended the consumption of certain animal parts to confer agility, speed or strength associated with that animal (Applegate & Grivetti, 1997). Early Greek athletes crudely assessed the correlation between performance and dietary intake and manipulated their diets to improve performance (Applegate & Grivetti, 1997). However, the majority of the research that associated diet and supplements with improved performance comes from the early 20th century. At this time, research was focusing on understanding muscular work, fuel use during exercise, and the specific role of protein fat, and carbohydrates (Applegate & Grivetti, 1997). With the discovery and isolation of vitamins and a better understanding of metabolism, the quest for the competitive edge and ergogenic aids were placed on a "scientific footing" (Applegate & Grivetti, 1997).

The supplement market is a multi-billion dollar a year industry which has customers of all ages. The growing population in this market is young athletes in their search for "natural" athletic enhancement (Metzl, Small, Levine, & Gershel, 2001; McGuine, Sullivan, & Bernhardt, 2001). Adolescents with aspirations of competing at the college level are more likely to use supplements (Sobal & Marquart, 1994) with gender having a significant relationship to supplement use (Mason, Giza, Clayton, Lonning, &

Wilkerson, 2001). Though research shows mostly males using supplements, females also have a reported use but in smaller numbers (Mason et al., 2001).

The most popular supplements used today are creatine monohydrate, androstendione, beta-hydroxy beta-methlybutryate (HMB), amino acid complexes, and protein powders. Reasons for using these supplements are perceived short term health benefits, prevention of illness, improved immunity, parental supply of supplements, taste, energy boost, better sports performance and to rectify a poor diet (O'Dea, 2003). However, the more adolescents know about supplements the less likely they will be to use them (Massad, Sheir, Koceja, & Ellis, 1995).

Easy access may be one reason why adolescent use is on the rise. A new product with "ergogenic claims" appears on the market almost daily and gets classified as a supplement. For years, the Food and Drug Administration (FDA) controlled dietary supplements as food. This regulation involved if they were safe and wholesome and their label was truthful and not misleading. Ensuring the FDA's evaluation of safety, all new ingredients, even those in nutrition supplements, were placed under the Federal Food, Drug, and Cosmetic Act (FD&C Act). Since then, Congress has amended the FD&C Act in areas that only apply to dietary supplements and dietary ingredients used in dietary supplements (FDA, 1995). With the approval of the Dietary Supplement Health and Education Act (DSHEA) of 1994, dietary supplements and their ingredients no longer have to be evaluated by pre-market safety evaluations, which are still required by food ingredients or new uses for old ingredients (FDA, 1995).

Some argue that with the passage of DSHEA, the FDA is restricted in its control over dietary supplements. Morris and Avorn (2003) wrote that this restricted control over oral supplements has made it easier for manufacturers to make health claims and harder for the regulatory agencies to prevent them. There are, however, some suggestions being made like the mandatory registration of supplement manufacturers and vendors.

Purpose

The purpose of this study was to develop a survey and administer it to adolescent athletes in four eastern Kentucky high schools. The survey will attempt to identify the most commonly used supplements for the purpose of athletic enhancement according to the research above and test subjects' knowledge and use of these supplements.

Research Questions

1. What ergogenic aids are being utilized by adolescent athletes in the research sample?
2. What are their perceived benefits from using natural ergogenic aids? (i.e. increase strength)
3. Who has encouraged the use of these supplements?
4. Do grade level and specific sport participation impact kind and frequency of supplement use?

Assumptions and Limitations

Assumptions:

1. The students at all grade levels will understand the questions.
2. The student athletes have knowledge of the supplements inquired about on the survey.
3. High school athletes in the sample are currently using supplements.

Limitations:

1. Because the survey is self-reported, there is no way to verify that the athletes answered the questions truthfully.
2. Athletes were chosen from a convenient sample, for purposes of close proximity to researcher and the athletic trainers willingness to help with the study.
3. Small sample size due to the survey was administered at end of the academic year.

Definition of Terms

Adolescent Athlete: a student in grades 9-12, who participate in at least one school affiliated sport.

Anabolic: "referring to something that causes a building up of tissue, or anabolism (Antonio & Stout, 2001, pg. 15).

Androstendione: "a pro-hormone that is a precursor to testosterone. Its use is illegal by the National Collegiate Athletic Association (NCAA) and the International Olympic Committee (IOC)" (Antonio & Stout, 2001, pg.15).

Beta-hydroxy Beta-methlybutyrate: "is a metabolite of the BCAA leucine and is found in small quantities in foods such as catfish, citrus fruits, and breast milk" (Antonio & Stout, 2001, pg.15).

Branched Chain Amino Acids (BCAA): consists of leucine, isoleucine, and valine. The muscle instead of the liver metabolizes these amino acids.

Catabolic: tearing down of tissue, or catabolism.

Endogenous: originating from within the body.

Ergogenic: "possessing the ability to enhance work output, particularly as it relates to athletic performance" (Antonio & Stout, 2001, pg.15).

Metabolism: "the sum of all anabolic and catabolic reactions in the body" (Antonio & Stout, 2001, pg.15).

Metabolite: "any product of metabolism, such as an intermediate or waste product" (Antonio & Stout, 2001, pg.15).

Oxidation: “process by which oxygen is added to a compound and/or electrons are lost. Oxidation is involved in the derivation of energy from compounds and causes the release of free radicals” (Antonio & Stout, 2001, pg.15).

Prohormone: “a compound that can be converted into a hormone within the body. Prohormones are produced by glands in the body in which they await further processing to become functional hormones” (Antonio & Stout, 2001, pg.15).

Stacking: “consumption of two or more supplements during the same time frame in an attempt to maximize results” (Antonio & Stout, 2001, pg.15).

Supplement- the FDA’s definition of a dietary supplement as listed in the DSHEA:

A Dietary Supplement:

1. “Is a product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following ingredients: a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients” (FDA, 1995).

2. “Is intended for the ingestion in pill, capsule, tablet, or liquid form” (FDA, 1995).

3. “Is not represented for the use as a conventional food or as the sole item of a meal or diet” (FDA, 1995).

4. “Is labeled as a ‘dietary supplement’ “(FDA, 1995).

5. “Includes products such as an approved new drug, certified antibiotic, or licensed biologic that was marketed as a dietary supplement or food before approval, certification, or license (unless the Secretary of Health and Human Services waives this provision)” (FDA, 1995).

CHAPTER II

REVIEW OF LITERATURE

This chapter presents the review of a literature relevant to the use of ergogenic aids among high school athletes in Eastern Kentucky. It begins with the literature on adolescent use of nutrition supplements, followed by the research on common supplements such as creatine monohydrate, androstenedione, beta-hydroxy-beta-methylbutryate, ephedrine/caffeine stack, protein powders, and amino acids. The chapter concludes with a summary of pertinent considerations.

Adolescent Use of Supplements

High school athletes, grades 9-12, are among a growing number of Americans who use nutrition supplements. O'Dean (2003) noted that supplements are used because of their perceived benefits as well as their potential ergogenic effects. The research reviewed below attests to the extent to which high school athletes use these supplements.

Mason, Giza, Clayton, Lonning, and Wilkerson (2001) evaluated supplement use among high school football and volleyball players in Northwest Iowa, using an anonymous survey administered to 902 athletes, consisting of freshmen (n = 278), sophomores (n = 215), juniors (n = 233), and seniors (n = 186). The survey questions concerned the use of creatine, androstenedione, beta-hydroxy-beta-methylbutyrate, amino acid complex, Dehydroepiandrosterone (DHEA), and phosphogen. The results indicated that, among the different supplements, creatine was the most commonly used.

McGuine et al. (2001) specifically studied the use of creatine, as well as the behaviors associated with creatine supplementation, among high school football players in Wisconsin. To conduct the study, they decided to administer a questionnaire to all school athletes, from which they identified the football players. They defined an athlete as "an individual who participated in a school and Wisconsin Interscholastic Athletic Association (WIAA) interscholastic competition" (p. 248). The researchers randomly selected 90 schools, which they classified as small, medium, or large, and used a questionnaire that contained questions concerning demographics and sports participation. Athletes were encouraged to mark all sports in which they participated, or anticipated participating in, during the school year.

Of the 90 schools, 37 agreed to participate, resulting in a total of 4,001 athletes completing the survey, of which 1,394 were football players (1,388 males and 6 females). Of the male football players, 30.1% reported using creatine, but none of the females reported any creatine use. McGuine et al. (2001) also found that supplement use was correlated with grade level and sport. Specifically, among freshmen, 10.4% used creatine while, among seniors, 50.5% used it. Football players had the highest percentage (47.3%) of current creatine use.

McGuine et al. (2001) also found that, among football players, the top two perceived benefits were increased strength and power. Notably, however, 30% of the football players did not believe that there was any health risk with supplement use. In this regard, "young athletes often assume that a dietary supplement must be safe if they can purchase it in a retail store" (p. 251).

To study the frequency, risk factors, and demographics of creatine use among middle and high school student athletes, Metzl et al. (2001) administered a confidential survey to middle and high school athletes in New York City during annual sports physicals. A total of 1,103 athletes, ranging in age from 10 to 18 years, participated. The researchers found that, among the different grade levels, the majority of supplement users (44%) were in grade 12. This finding is similar to the results of the McGuine et al. (2001) research that showed that creatine use increased with age or grade. Metzl et al. (2001) also found that, although creatine use was seen in every sport, it was significantly more common among football players, wrestlers, hockey players, gymnasts, and lacrosse players. Similar to the results of McGuine et al. (2001), the athletes in the Metzl et al. (2001) study indicated that they used creatine for improved performance and improved appearance. Yet, some athletes indicated that, due to safety concerns, they did not use supplements.

Smith and Dahm (2000) studied the prevalence, frequency, and patterns of creatine use among high school athletes. They administered an anonymous questionnaire to 328 students, ages 14 to 18 years. The researchers noted that, while they had a 100% return rate, some athletes did not answer all of the questions. In keeping with the research cited above, they found that older athletes were more likely to use or had used creatine, but its use was present in all age groups. The questionnaire results also indicated that student information about supplements came from friends and that students bought supplements at health food stores. Importantly, Smith and Dahm reported the negative side effects that the students had listed, including diarrhea, cramps, and loss of appetite.

Overall, the above research on adolescent supplement use shows that athletes believe supplements will improve performance and that gender, grade, and sport (football, hockey, & wrestling) are related to the use of nutrition supplements. Health educators need to be aware that adolescents seek performance enhancement and other health benefits from nutrition supplements that, in reality, can be achieved with a well balanced diet (O'Dean, 2003). As such, the more knowledge students have about supplements, the less likely they are to use them (Massad et al., 1995).

In the sections that follow, research on both the potential benefits and adverse effects of various supplements will be presented. These supplements include creatine monohydrate, androstendione, beta-hydroxy-beta-methylbutyrate, ephedrine/caffeine stack, and protein and amino acids.

Potential Benefits and Adverse Effects of Supplements

Creatine Monohydrate

Creatine monohydrate, often referred to as creatine, is a naturally occurring compound found in protein rich foods such as red meats. It is formed endogenously from the amino acids glycine, arginine, and methionine and is produced in physiologic amounts by the liver, kidneys, and pancreas (Metzl et al., 2001). Approximately 95% of creatine is stored in skeletal muscle, while 5% is stored in the heart, brain, and testes (Kreider, 2003). Since its introduction in the early 1990s, over 500 articles have been published about creatine and performance benefits. What sets apart creatine from other supplements is that research has demonstrated its benefits.

The metabolic pathway of creatine is the basis for the theories regarding its ability to be an ergogenic aid and improve athletic performance. According to Kreider (2003), the usual dose of creatine is 20 grams per day for five days (loading phase) and 5 grams per day thereafter (maintenance phase). Meanwhile the loading phase tends to increase total creatine and phosphocreatine by 15-40% (Kreider, 2003). Theoretically, the increased availability of phosphocreatine will enhance the substrate's utilization during high intensity exercise.

The short-term research on creatine focuses on its ability to increase performance, while the long-term research considers the possible negative side effects as reported by athletes. Volek et al. (1997) studied the influence of oral creatine supplementation on muscular performance during repeated bouts of high-intensity exercise. Using bench presses and jump squats as the exercises, 14 men were divided into two groups: a creatine group (25 grams per day for one week) and a placebo group. The results indicated that the creatine group improved peak performance in all repetitions of bench presses and during all sets of jump squats, as well as increased in body mass by 1.4 kg. The researchers concluded that one week of creatine supplementation enhances performance during repeated sets of bench presses and jump squats.

Two years later, Volek et al. (1999) used a 12-week program to examine the effects of creatine supplementation in conjunction with resistance training on physiological adaptations, including muscle fiber hypertrophy and muscle creatine accumulation. Using a double-blind method, 19 resistance-trained males were matched and assigned to either a creatine group or a placebo group. The results indicated that the creatine group had a significant increase in fat free mass and strength. The creatine group also had an increase in Type I, Type IIA, and Type IIAB muscle fiber cross-sectional areas. The researcher concluded, however, that these results were due to higher quality training sessions secondary to creatine supplementation.

In similar research, Becque, Lochmann, and Melrose (2000) studied the effects of six-week creatine supplementation, during a periodized program of arm flexor strength, on arm flexor one repetition maximum (1RM), upper arm muscle area, and body composition. Using a double-blind method, the 23 males, each with at least one year of weight training experience, were assigned to either a creatine group or a placebo group. The creatine group received 20 grams per day of creatine in a 500 ml drink, containing 32 grams of sucrose for five days, which was then decreased two grams per day of creatine in the same solution. The placebo group received 500 ml of a sucrose solution. The results indicated that creatine supplementation significantly increased both fat free mass and muscular strength. This increase in strength and fat free mass is due to the ability to lift heavier weight during creatine supplementation.

Finally, Kilduff et al. (2002) studied the benefits of creatine using the isometric bench press with two groups of resistance-trained men. Using a double-blind method, the men were matched for peak isometric force and placed in either a creatine group (20 grams per day plus 180 grams per day of dextrose) or a placebo group (200 grams per day of dextrose). The results indicated that, after five days, creatine supplementation increased both strength and fat free mass.

Creatine's ability to improve strength and fat free mass in weight lifters is well documented. However, not all athletes involved in events lasting less than 30 seconds benefit from creatine supplementation. Sprinters are one group of athletes who have not benefited from creatine supplementation. Snow et al. (1998) examined the effect of creatine supplementation on sprint exercise performance and skeletal muscle anaerobic metabolism during and after sprint exercise. After five days of creatine supplementation (30 grams per day +30 grams of dextrose) or a placebo (30 grams of dextrose), eight active, untrained males performed a 20-second maximal sprint on an air-braked cycle ergometer. Each trial was separated by four weeks and a double-blind crossover method was used. The results indicated that, although creatine supplementation increased muscle creatine, 20-second sprint performance was not improved.

Using the same exercises as did Snow et al. (1998), Finn et al. (2001) increased the sets to 4 x 20 seconds. Their subjects included 16 triathletes, who had a muscle biopsy taken at rest. After using the 20grams per day for five days pattern of creatine supplementation, the researchers found that even though muscle creatine levels were increased, the 20-second sprint time was not improved. Both Snow et al. (1998) and Finn et al. (2001) concluded that high levels of muscle creatine did not improve sprint exercise performance.

The largest concern with creatine supplementation is the reported negative effects associated with its use. One of the less serious complaints about creatine is cramping. Greenwood et al. (2003) observed National Collegiate Athletic Association (NCAA) Division 1A Football players during training and competition for three years. Subjects who reported taking creatine had the usual loading dose, followed by the usual maintenance dose. The researchers found that creatine supplementation did not increase the incident of injury or cramping in these football players.

While some researchers have demonstrated side effects associated with creatine use, others claim that no negative effects are realized. Specifically, creatine supplementation does not increase either blood pressure (Mihic, MacDonald, McKenzie, & Tarnopolsky, 2000) or blood lipids (Volek et al., 2000), both of which increase risk of cardiovascular disease.

The long-term effects of creatine on kidney and liver functions are a concern of the medical community. Mayhew, Mayhew, and Ware (2002) studied the effects of creatine on NCAA Division IIA football players. In their study, 23 males were placed in either a creatine group, which voluntarily ingested creatine, or a placebo group that took no supplements. The average consumption in the creatine group was 5 to 20grams for .25 to 5.6 years. Blood parameters involving kidney and liver functions were studied. All tests, which included serum albumin, alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, bilirubin, urea, and creatinine, were within normal limits. As such, the researchers concluded that creatine supplementation has no long-term effect on kidney or liver functions. Kreider et al. (2003) conducted a 21-month study of creatine's long-term effects on 98 NCAA Division 1A football players. Using clinical markers similar to those above, they also concluded that creatine does not affect athletes over a long period of time.

Creatine supplementation has had a lot of attention due to its ability to improve fat free mass and strength, yet falls short of improving sprint performance. Creatine's ability to have positive results has some wanting it placed on the NCAA banned substance list. This is not possible, because creatine is currently classified as a food substance. At present, research has shown creatine to be safe and effective.

Androstenedione

Androstenedione, a major pro-hormone of testosterone, is available without prescription and is reported to increase strength and athletic performance (Antonio & Stout, 2001). Androstenedione, commonly known as "andro," is on the banned substance list of the NCAA and International Olympic Committee (IOC). The Anti-Doping Code from 1999 (Kamber, Baume, Saugy & Rivier, 2001), describes the doping of illegal substances as the "use of an expedient (substance or method) which is potentially harmful to athletes' health and/or capable of enhancing their performance, or the presence in the athlete's body of a Prohibited Substance or evidence of the use thereof or evidence of the use of a Prohibited Method" (p. 258).

Over-the-counter androstenedione will cause an athlete to have a positive urine test for anabolic steroids (Catlin et al., 2000). The metabolic pathway of androstenedione puts it one step away from converting to testosterone, which is the main feature of its possible benefits as a performance enhancer. During the late 1990s, Mark McGuire, a professional baseball player, reported using androstenedione and some believed that this was the reason behind his homerun record (Antonio & Stout, 2001). Scientific research, however, has not concluded that it has any value in performance enhancement and that while the hormonal risks are unknown, they still pose a threat.

King et al. (1999) studied androstenedione to determine whether short- and long-term supplementation increased serum testosterone, skeletal muscle fibers, and effects on blood lipids or liver function. Using a randomized method, 30 healthy men, ages 19-29, were administered either 300 mg androstenedione or a placebo. The subjects performed a eight-week whole body resistance training. During weeks one, two, four, seven, and eight, the androstenedione or placebo was administered. The results showed no increase in serum testosterone or skeletal muscle adaptation to resistance training in normotestosterogenic young men.

The findings of Broeder et al. (2000) agreed with those of King et al. (1999). Broeder et al. (2000) studied the physiological and hormonal effects of 200 mg/d of oral androstenedione and androstendiol. Subjects included 50 men, not taking androgenic-enhancing substances and with normal testosterone levels and no sign of cardiovascular disease, who participated in a 12-week high-intensity resistance-training program. The main outcome parameters included serum sex hormone profile, body composition assessment, muscular strength, and blood lipid profiles. The results were typical of most androstendione research. When compared to the results for the placebo group, androstenedione or androstenediol had no effect on adaptation to resistance training. High-density lipoproteins were adversely affected in the androgen groups and there was a down regulation of natural testosterone synthesis. Broeder et al. (2000) concluded that oral androgen supplements are a larger health risk than ergogenic aids.

Leder et al. (2000) studied whether oral administration of androstenedione increased serum testosterone in healthy males. Subjects included 42 men, aged 20 to 40 years, who were randomly assigned to receive oral androstenedione, either 100 mg (n = 15) or 300 mg (n = 14), or no androstenedione (n = 13). The results indicated that the mean changes for areas under the curve were –2%, -4%, and 34% for those receiving 0, 100 mg, and 300 mg respectively. Additionally, oral androstenedione, when given in dosages of 300 mg per day, increased serum testosterone concentrations.

Although androstenedione can be bought at any health food store, it is considered illegal by every sports governing body. The anabolic effects of its use remain inconclusive, but health risks have been demonstrated.

Beta-hydroxy-beta-methylbutyrate

Beta-hydroxy-beta-methylbutyrate (HMB) is a metabolite of the branched-chain amino acid leucine. It is found in small amounts in some fish and various citrus fruits.

Panton, Rathmacher, Baier, and Nissen (2000) studied the effects of supplemented HMB on resistance training. Subjects included 30 men and 36 women, ranging in age from 20 to 40 years, who were randomly assigned to either a placebo or HMB group (3.0 grams per day). All subjects trained three times a day for four weeks. The results indicated that there was no difference in strength gains, based on prior training status or gender. The HMB group increased in both fat free mass (1.4 ± 0.2 kg) and upper body strength (7.5 ± 0.6 kg), as compared to the placebo group (0.9 ± 0.2 kg and 5.2 ± 0.2 kg, respectively). The researchers concluded that, regardless of gender or prior training status, HMB might increase upper body strength and minimize muscle damage when combined with an exercise program.

Gallagher, Carrithers, Godard, Schulze, and Trappe (2000) wanted to determine whether HMB supplementation resulted in an increase in strength and fat free mass, during an eight-week resistance-training program, and whether higher doses, those above three grams per day, had any additional benefit. Subjects included 37 untrained, college-aged men, who were assigned to one of three groups: 0, 3.0 grams per day, or 6.0 grams per day. The training program was conducted three days a week for eight weeks and consisted of ten different exercises, at 80% of their 1RM. The 1RM was reevaluated every two weeks. The results indicated that there was no difference in 1RM between any of the groups. In addition, there was no difference in body fat; however, the 3.0 grams per day group did have an increase in fat free mass. The researchers concluded that HMB may increase fat free mass, but higher doses (> 3.0 grams per day) do not promote additional strength gains or fat free mass.

Testing the same dose of three grams per day HMB supplementation, Slater et al. (2001) utilized a six-week training and supplementation protocol. Tests were conducted pre-supplementation and again at three and six weeks. The tests included body mass, body composition (using dual energy x-ray absorptiometry), and three repetitions maximum. Biochemical markers, such as muscle damage and muscle protein turnover, also were documented. The results indicated that, after six-weeks of supplementation, HMB administration did not have any affect on the measured parameters.

As with other supplements, the research on HMB is inconclusive. In this regard, according to the research, HMB at a dose of 3.0 grams per day did not have any adverse effects on blood chemistry.

Ephedrine/Caffeine Stack

Ephedrine is a stimulate that mimics norepinephrine. This beta-2 agonist stimulates the sympathetic nervous system, which increases lipolysis, heart rate, heart contractility, and glycolysis (Antonio & Stout, 2001). With an increase in lipolysis, more free fatty acids will be in circulation, which will increase beta-oxidation. Ephedrine is found in over-the-counter weight loss pills as an extract from one of two herbs: ephedra or Ma Huang. Other related compounds, such as pseudoephedrine, are found in over-the-counter cold medicines (Tseng, Hsu, Kuo, Shieh, & Chang, 2003). Because many athletes fail drug tests due to these over-the-counter medications, the IOC has increased its threshold levels (Tseng et al., 2003). It is important to note that all forms of ephedrine are on the banned substance list (Appendix E).

Ephedrine is rarely found by itself. Research has shown that it is more effective with caffeine. The combination of 20 mg ephedrine and 200 mg caffeine, two or three times per day is the dosage used by researchers. Caffeine is found naturally in the leaves, seeds, or fruits of more than 60 different plants (Antonio & Stout, 2001). The primary activity of caffeine is to stimulate the central nervous system and promote lipolysis. Caffeine increases the release of free fatty acids by inhibiting the enzyme, phosphodiesterase. Caffeine, when found in concentrations of 14 mcg/ml or more, is on the NCAA's banned substance list.

Bell, Jacobs, and Zamecnik (1998) examined the effects of acute ingestion of caffeine, ephedrine, and the combination of both on time to exhaustion during high intensity exercise. In a double-blind design, eight male subjects set the baseline for placebo by exercising to exhaustion (12.6 minutes), using a cycle ergometer. Then the subjects repeated the exercise 1.5 hours after consuming caffeine (5 mg/kg), ephedrine (1mg/kg), caffeine and ephedrine, or a placebo. The mean times to exhaustion were 12.6 (placebo), 14.4 (caffeine), 15.0 (ephedrine), and 17.5 minutes (caffeine and ephedrine). The results indicated that the combination of ephedrine and caffeine was statistically significant in terms of prolonging exercise time to exhaustion, as compared to placebo, while no statistical significance was found for ephedrine or caffeine when used alone. The researchers concluded that this improved performance was secondary to central nervous system stimulation.

Bell, Jacobs, and Ellerington (2001), in a follow-up to the above study, examined the benefits of ephedrine and caffeine for anaerobic exercise through central nervous system stimulation, using two groups. Group One consisted of 16 untrained males who performed a 30-second Windgate test. Group Two consisting of eight untrained males who performed a cycle exercise to exhaustion. In a double-blind randomized design, the trials began 1.5 hours after ingesting caffeine (5 mg/kg), ephedrine (1 mg/kg), a combination of caffeine and ephedrine, or a placebo. The biochemical markers of lactate, glucose, and catecholamine levels were measured. The results showed an increase in power output during the Windgate test with ephedrine consumption, while caffeine improved time to exhaustion. Caffeine, ephedrine, and their combination increased blood lactate, glucose, and catecholamine levels. The researchers concluded that the improvement in anaerobic performance was likely due to both stimulation of the central nervous system by ephedrine and the skeletal muscles by caffeine.

Jacobs, Pasternak, and Bell (2003) studied the effects of caffeine and ephedrine on muscle endurance during resistance training. Using double-blind, repeated measures, 13 male subjects performed a weight training circuit consisting of three supersets of leg presses and bench presses 90 minutes after ingesting caffeine (4 mg/kg), ephedrine (0.8 mg/kg), their combination, or a placebo. The results indicated that all trials consisting of ephedrine ingestion resulted in a significant increase in the number of repetitions, as compared to non-ephedrine trials. One adverse effect, however, was the increase in systolic blood pressure in all ephedrine trials. The researchers concluded that acute ingestion of ephedrine, with or without caffeine, increased muscular endurance during traditional weight training exercises and that caffeine had no additive benefit.

Currently, ephedrine has been related to multiple deaths throughout the United States and the world. The FDA is ordering its sale illegal, and all forms of it are to be taken off the market by April 2004. Caffeine still can be purchased in pill form, but is mainly found in coffee, chocolate, and tea.

Protein and Amino Acids

Amino acids are the building blocks of protein, and proteins function as enzymes, hormones, immunoproteins, and structural and transport proteins (Groff & Gropper, 2000). The Recommended Daily Allowance for protein is 0.8 g/kg/d for non-athletes. Nitrogen balance studies suggest that endurance athletes need 1.2 to 1.4 g/kg/d, while strength athletes need 1.4 to 1.8 g/kg/d (Armsey & Grime, 2002). Protein supplements are more convenient than sitting down to meals, making them one of the most popular supplements on the market today. These protein supplements are made up of milk protein such as casein and whey. Proteins can be complete (containing all nine essential amino acids) or incomplete (lacking one or more essential amino acids). Complete proteins are found in such foods as meats and dairy products and incomplete proteins are found in plant sources. No research shows that protein powders have any added benefit over food sources.

The research on amino acid supplementation is controversial. Of the nine essential amino acids, three, leucine, isoleucine, and valine, have aliphatic side chains. These are known as the branched chain amino acids (BCAA). The difference in these amino acids is that muscle, and not the liver, metabolizes them. It has been hypothesized that BCAA supplementation will benefit those performing endurance events by attenuation of central fatigue through controlling changes in brain tryptophan levels and serotonin production (Burke, 2001).

Davis, Welsh, De Volve, and Alderson (1999) tested the effects of ingesting a carbohydrate beverage, with and without BCAA, before and during intermittent high-intensity running to fatigue. Eight subjects performed intermittent walking, sprinting, and running to fatigue. The subjects drank carbohydrate drinks given one hour before (5 ml/kg, 18% carbohydrate) and during exercise (2 ml/kg, 6% carbohydrate), carbohydrate drinks with seven grams of BCAA added to the one-hour before and immediately before, or a flavored placebo. The subjects who had ingested the carbohydrate and carbohydrate plus BCAA drinks ran longer, when compared to the placebo group. The carbohydrate and carbohydrate plus BCAA drink groups had higher plasma glucose and insulin, as well as fewer free fatty acids. The researchers concluded that a carbohydrate drink would be benefit in such sports as soccer, basketball, and hockey, but that BCAA added no additional benefit.

The use of single amino acid supplementation is also on the rise. However, the consumption of one amino acid in large quantities can block the absorption of another amino acid (Groff & Gropper, 2000). Glutamine is the most popular of these single amino acids (Antonio & Stout, 2001).Glutamine is the most abundant free form amino acid in the body and, during times of stress (e.g., trauma, surgery, sepsis, prolonged exercise), its levels drop off considerably. It is formed endogenously from glutamate by glutamine synthetase (Groff & Gropper, 2000). Glutamine is the major fuel used by the gut, and the GI tract accounts for as much as 40% of total glutamine stores (Antonio & Stout, 2001). Most research that has been performed on the glutamine has been in the clinical setting, yet some weightlifters who have reported using as much as 40-50 grams per day had no side effects, indicating that toxicity is rare (Antonio & Stout, 2001).

Summary and Conclusion

The use of supplements among athletes is widespread. Adolescent athletes believe that these supplements improve their athletic performance, but appear to have little understanding of their actual benefits or risks. While some research has indicated that some supplements offer benefits, other research has shown that they have no benefits or possible side effects. Moreover, athletic governing bodies, such as the NCAA and IOC, have banned some supplements. As such, young athletes must become better educated about these supplements, including the ethical issues and possible side effects. They must learn that the availability of such supplements does not mean that they are beneficial or without risks.

CHAPTER III

METHODOLOGY

This chapter presents the methodology used to plan and implement the research project and evaluate the data. The chapter begins with a discussion of the study participants, followed by a presentation of the questionnaire design and data collection techniques and analysis. The chapter concludes with a summary of the methodology.

Participants

All athletes, grades 9-12, in four local high schools were eligible for inclusion in the study sample. The four high schools were chosen for their convenient location. The athletic trainers, who were all certified by the National Athletic Trainers Association Board of Certification (NATABOC) and licensed by the state of Kentucky, were willing to work with the study coordinator.

Principals from the four schools were contacted through a letter mailed to them (Appendix B). This was followed up with a telephone call, asking for permission to conduct the study. Each principal granted written permission to perform the study in his or her school (Appendix C). The permission forms are kept on file by the researcher.

Since the athletes in the research were under the age of 18, each of the four school's certified athletic trainer (ATC) distributed parental permission forms (minor's assent form; Appendix D) to all the athletes wishing to participate in the study. The students were told they did not have to participate. However, if they chose to, they were informed that they had two weeks to return the signed permission form. These permission forms are also kept on file by the researcher. Only the athletes who brought back the permission forms were allowed to complete the questionnaire.

Questionnaire

The questionnaire was designed to generate data comparable to that obtained by Mason et al. (2001), Smith and Dahm (2000), and McGuine et al. (2001). Specifically, the survey was divided into four sections and contained 15 questions (Appendix A). Section I (Questions 1-3) contained demographic questions regarding age, grade, and sports in which the athletes compete during the school year.

Section II (Questions 4-10) contained questions regarding the use and frequency of the researched supplements. If the athletes had no prior knowledge of these supplements, they answered “no” to Question Four and stopped completing the survey.

Section III (Questions 11-13) focused on the origin of their knowledge, including such questions as where the students obtain information about sports supplements. While their choices included people, print, and the Internet, individual names could not be written on the questionnaire.

Finally, Section IV (Questions 14-15) contained questions about perceived benefits and who advised the use of supplements. As with Section III, no individual names were allowed on the questionnaire.

To ensure that the participants and their answers would remain anonymous and that there would be no differentiation between schools, all copies of the questionnaire were printed on white paper. An expedited research request was sent along with the final draft of the questionnaire to the Institutional Review Board (IRB) at Marshall University.

After review of the research request and questionnaire, permission to engage in research was granted. The IRB Study Number is 4005.

A committee consisting of two registered dietitians, a university ATC, and the four high school ATCs participating in the study reviewed the questionnaire for content validity. The changes that the committee suggested were made and the questionnaire was finalized. Based on the feedback received from the committee and the participants in the pilot study, the researcher concluded that the questionnaire had sufficient content validity to serve as the data-gathering instrument.

Data Collection

The ATCs collected the minor's assent form from the athletes who had a parent's signature for permission. The forms were placed in a separate envelope and are kept in the researcher's files. To expedite the procedure, the researcher, co-researcher, and each ATC identified a day for each school to receive their forms. Due to the time of the academic year, the ATCs had limitations on gathering available students, giving out and collecting the permission forms and administering the survey. Prior to administration, the researcher made copies of the questionnaire for the ATCs. This ensured that the schools could not be identified. The copies were hand carried by the researcher and co-researcher to each school. Each school was given a two-week time limit to give out the permission forms to have signed, collect them, and administer the survey.

To allay students' concerns about time constraints, there was no time limit placed on filling out the questionnaire. Since the students who did not have knowledge about the supplements being researched stopped after Question 4, students finished at different times.

During the survey, participants were not allowed to communicate and, when available, there was an empty desk between each student. To ensure participation, athletes were reminded that all responses would remain anonymous and that individual or school information would not be available to their parents, coaches, or school officials.

At the end of the two-week time limit, the researcher and co-researcher went to each school and picked up all signed forms and completed surveys.

Data Analysis

All data collected were entered into the Statistical Package for the Social Sciences (SPSS) computer software (version 11.5) by the researcher. A faculty member at Marshall University assisted with the statistical analysis.

Descriptive statistics were obtained for all demographic information, differences in supplement use by grade level, gender, sport and to determine the frequency of supplement use. Inferential statistics could not be performed, as expected, due to the limited number of participants (n=25). So few participants would have skewed the results.

Summary

Participants were chosen for this research with help from each ATC, and the researcher-developed questionnaire was determined to have sufficient content validity. The students were reminded that their answers and names would remain anonymous and unknown to coaches, parents, or other students. Having each copy of the questionnaire on the same color of paper ensured that no school could be identified. The data collection was a step-by-step procedure that was designed in advance by the researcher, in conjunction with each ATC, as a means to obtain the data in a timely manner.

CHAPTER IV

RESULTS and DISCUSSION

The sample group for this study consisted of high school athletes from four local eastern Kentucky high schools. Each high school was given one hundred copies each of the minor's assent form, parent's permission form, and the survey. Upon collection, only 25 surveys were deemed usable by the researcher. Several were not usable due to failure to complete required paperwork sufficiently.

The final sample size (n=25) is much less than expected. Several reasons for the small sample size were unveiled during the survey collection. One was that the surveys were administered too close to the end of the academic year. Students' schedules were too busy to accommodate the researcher's request. Another school commented that poor student response may be due to the school's random drug policy. While participants were ensured anonymity, they may have still been hesitant to participate.

Descriptive Statistics

In regard to gender, the majority of the athletes (60%) were males (n=15) while females (n=10) made up the rest of the respondents.

Table 4.1 Gender

Gender	Frequency	Percent
Male	15	60
Female	10	40
Total	25	100

When viewing grades it is surprising to see that the majority of those who participated in the survey (56%) were in the tenth grade (n=14). In contrast, the smaller participation among the athletes (12%) were those students in the higher grades, eleventh and twelfth, with each having only three participants.

Table 4.2 Grade Level

Grade Level	Frequency	Percent
Ninth Grade	5	20
Tenth Grade	14	56
Eleventh Grade	3	12
Twelfth Grade	3	12
Total	25	100

Sport Participation

The majority of the athletes played football (n=12) followed by basketball (n=6). In this study, no one noted that they participated in golf or wrestling during this school year. As for the number of sports, forty-four percent of the athletes (n=11) played only one sport while the remaining fifty-six percent (n=14) participated in two or three sports during the school year.

Table 4.3 Sports Represented

Sport	Frequency
Football	12
Basketball	6
Baseball	5
Soccer	5
Softball	5
Track	5
Tennis	2
Cheerleading	1
Cross-country	1
Swimming	1
Volleyball	1
Golf	0
Wrestling	0

Table 4.4 Multiple Sport Participation

Number of Sports	Frequency	Percent
1	11	44
2	9	36
3	5	20
Total	25	100

Knowledge

The majority of the students, eighty percent (n=20), had knowledge of the supplements asked on the survey. Only twenty percent (n=5) did not have any knowledge of the supplements.

Supplement Use

Out of the twenty students with supplement knowledge, the supplements with the highest frequency for use were protein powders (n=13) followed by creatine monohydrate (n=9). Protein powder also has the highest continued use of twenty-five percent (n=5). Football players had the highest use of creatine monohydrate and protein powder when compared to all other sports. Moreover football players (n=66.7%) had a higher incidence of using creatine at least once compared with non-football players (n=7.7%). Every football player in this survey had used protein powder at least once (n=83.3%); in contrast only 23.1% of non-football players had used protein powders. Two supplements that were not reported as being used were androstenedione and HMB. Missing data exists for the use of androstenedione, ephedrine/caffeine, and HMB because the students left the question blank.

Table 4.5 Supplement Use by Athletes with Knowledge

Supplement	Have Never Used	Have Tried Only Once	Have Tried 2 or 3 times	Used 4 or more times	Not Used but Plan to Use This school year
Amino Acids	17	1	2	0	0
Androstenedione	19	0	0	0	0
Creatine	10	3	3	3	1
Ephedrine/Caffeine	13	1	2	3	0
HMB	19	0	0	0	0
Protein Powders	7	5	3	5	0

Personal Source of Information

The individuals identified as the main source of information regarding supplements were nutrition store (n=9) and athletic trainer (n=7). Because it was not asked on the survey, it is not clear the nature of the information provided by these individuals. It is not known if it was credible, research based information, which would have useful to obtain on this survey. The “other” category contained a blank for the respondent to identify an additional source of information. All “other” responses were listed as friend.

Table 4.6 Personal Information Source

Personal Source	Frequency
Nutrition Store	9
Parents	8
Athletic Trainer	7
Coaches	6
Other	5
Physician	3
Personal Trainer	0
Sibling	0

Media Sources

This question was in regard to which non-research based publication athletes read to obtain their supplement information. The largest source of information from a media source was Muscle and Fitness Magazine (n=7).

Table 4.7 Media Source

Magazine	Frequency
Muscle and Fitness	7
Flex	4
Men's Health	3
Muscle Mag	2
Iron Man	1
Muscle Media	1
Other	0

Expected Benefits

From the people who have reportedly used supplements, only a few (n=11) had expected benefits from using them. This was an open-ended question and below is a table with the hand written responses. Any supplement not listed in the graph did not have a perceived benefit by study participants responding to this question.

Table 4.8 Perceived Benefits

Supplement	Response
Amino Acids	Increase strength, produce more natural creatine, get healthy
Creatine	Increase strength, gain weight, increase muscle mass
Ephedrine/caffeine	Increase energy
Protein Powders	Gain more muscle, gain weight, maintain weight, recover from workouts,

Beginning Supplement Use

This question was in regard to the person who provided the initial information that led to their use of supplements. Of the people who answered this question (n=14), the highest response to the person getting the athlete to use supplements was self (n=7).

Table 4.9 Beginning Supplement Use

Person	Frequency
Self	7
Other	4
Nutrition Store	3
Parents	3
Athletic Trainer	2
Physician	1
Sibling	1
Coaches	0
Personal Trainer	0

Conclusion

The data was easily collected from the local high schools used in this study. However, the possible sample size was intended to be larger (n=400) rather the ending sample size (n=25). Reasons contributing to this small number are time of year, availability of the students, and a random drug test in one particular school.

Even with the small number of respondents, supplement use is occurring among high school athletes in rural eastern Kentucky. Creatine monohydrate and protein powders had the highest frequency of use with football players ranking top of the list of athletes using supplements.

Of the twenty-five respondents, 20 had knowledge about supplements. Athletic trainers and Muscle and Fitness Magazine ranked highest among personal sources of information and media sources of information respectively. This area of the survey however did not specify the type of information that the athletes were receiving.

The perceived benefits from using particular supplements, was an open-ended question on the survey. The responses encompassed the goal of achieving more strength and muscle.

CHAPTER V

SUMMARY, CONCLUSION, and IMPLICATIONS

Summary

The purpose of this study was to develop a survey and administer it to adolescent athletes in four eastern Kentucky high schools. The survey would help identify the most commonly used supplements for athletic performance and the athlete's knowledge about them.

The research sample came from four local high schools, which received one hundred surveys from the researcher. After two weeks only twenty-five surveys could be used for the sample from a possible four hundred. From this sample size of twenty-five, females (n=10) and males (n=15) made up the respondents. Administering the survey at the end of the academic year and a random drug testing policy in one school can hold some responsibility for the poor return rate.

Anonymity was continuously reminded by the ATCs to those physically completing the survey. While these students had the option to stop at anytime during the survey, the ATC did not set a time limit for completion. This was to allow for total completion to the best of their knowledge and give ample time for answering the open-ended questions. After two weeks the researcher and co-researcher went to each school and physically gathered each completed and signed documents.

Descriptive statistics were obtained for all demographic information, differences in supplement use by grade level, gender, sport and to determine the frequency of supplement use.

Conclusion

The number of supplement users is on the rise in the US (Metzl et al., 2001; McGuine et al., 2001), and eastern Kentucky high school athletes are part of this ever-growing trend. Of the twenty-five respondents, twenty athletes had knowledge regarding nutrition supplements. Protein powder (n=13) and creatine (n=10) had the highest frequency of use among all the supplements while protein powders had the highest continued use (n=5). The athletes that had the highest frequency of supplement use were football players (66.7%).

Implications

The implications of this research are as follows:

1. The quality of information gathered should be used to amend the research instrument and procedures.
2. Study should be conducted on a larger sample from a variety of Kentucky high schools earlier in the academic year to increase the number of respondents.
3. Information gathered should be used to educate athletic trainer, parents, and coaches about the use of supplements among high school athletes in their local area.

The limitations identified in chapter one held true during this study. The results could not determine if the athletes were telling the truth or not. Also, since the sample size only came from schools that were convenient to the researcher, this could be one reason why out of a possible four hundred respondents only twenty-five surveys could be used. Lastly, the research was presented to the IRB after all requirements were completed. Changes were made to the research method per their request and final approval was obtained later than originally anticipated allowing for only one month to hand out, administer, and gather all completed forms from each school. The high schools used for this study ended their academic year middle to late May once again identifying possible causes for a small sample size.

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APPENDICES

APPENDIX A:
QUESTIONNAIRE

The following is a questionnaire regarding the use of over the counter nutrition supplements by high school athletes. Your participation is voluntary and your answers will remain anonymous. Please answer the questions to the best of your ability and you may stop at any time.

<u>Section I</u>

Please place an "X" in the space to the right of the appropriate response.

1.) Male _____ Female _____

2.) Grade:

9th _____ 10th _____ 11th _____ 12th _____

3.) Please mark <u>all</u> sports in which you participate or plan to participate in this school year. If you participate in more than one, then all should be marked.

____Baseball ____Basketball ____Cheerleading ____ Cross Country

____Football ____Golf ____Soccer ____Softball

____Swimming ____Tennis ____Track ____Volleyball

____Wrestling

<u>Section II</u>

The following are questions about over the counter nutrition supplements.

Place an "X" beside the answer that best describes your use of each supplement:

4.) Do you have any knowledge about any of the following supplements: creatine monohydrate, Androstenedione, Beta-hydroxy beta methlybutryate (HMB), Amino acids, Ephedrine/caffeine, and Protein powders.

_____A. Yes (If yes, please continue to question 5.)

_____B. No (If no, you may stop at this time. Thank you for your participation.)

5.) Creatine Monohydrate

_____ A. Have never used
_____ B. Have tried only once
_____ C. Have tried it 2 or 3 times
_____ D. Used 4 or more times (regularly use)
_____ E. Not used but plan to this school year

6.) Androstenedione

_____ A. Have never used
_____ B. Have tried only once
_____ C. Have tried 2 or 3 times
_____ D. Used 4 or more times (regularly use)
_____ E. Not used but plan to this school year

7.) Amino Acids

_____ A. Have never used
_____ B. Have tried only once
_____ C. Have tried 2 or 3 times
_____ D. Used 4 or more times (regularly use)
_____ E. Not used but plan to this school year

8.) Ephedrine/Caffeine

_____ A. Have never used
_____ B. Have used only once
_____ C. Have used 2 or 3 times
_____ D. Used 4 or more times (regularly use)
_____ E. Not used but plan to this school year

9.) Beta-hydroxy Beta-methlybutryate (HMB)

_____ A. Have not used

_____ B. Have used only once

_____ C. Have used 2 or 3 times

_____ D. Used 4 or more times (regularly use)

_____ E. Not used but plan to this school year

10.) Protein Powders

_____ A. Have not used

_____ B. Have used only once

_____ C. Have used 2 or 3 times

_____ D. Used 4 or more times (regularly use)

_____ E. Not used but plan to this school year

Section III

Mark all that apply to you.

11.) If you receive information about nutrition supplements from a person, whom do you receive it from? (Please mark all that apply.)

____Athletic Trainer ____Coaches ____Nutrition Store (GNC)

____Parents ____Personal Trainer (example: YMCA)

____Physician ____Sibling (example: older brother)

Other (Please do not list specific names): ______________________________

____ I do not receive information

12.) If you read publications that contain nutrition supplement advertisements and information about nutrition supplements, which ones do you read? (Please mark all that apply.)

____Iron Man ____Flex ____Men's Health

____Muscle & Fitness ____Muscle Mag ____Muscle Media

Other: ___________________________________

13.) If you get information about nutrition supplements from the Internet, which web sites do you get your information from? (Please list all Internet addresses.)

Section IV

14.) If you use any of these nutrition supplements, list the benefits you hope to gain from them: (i.e. strength, decrease body fat)

Creatine:

Androstenedione:

Amino Acids:

Ephredrine/Caffeine:

HMB:

Protein Powders:

15.) I began using nutrition supplements because of advice given to me by my:

____Athletic Trainer ____Coaches ____Nutrition Store (GNC)

____Parents ____Personal Trainer (example: YMCA)

____Physician ____Self

____ Sibling (example: older brother)

Other (Please do not list specific names): ______________________________

APPENDIX B:
LETTER TO HIGH SCHOOL PRINCIPALS

DATE

2120 Ballard St.
Ashland, KY 41101

Principal Name
Address

Principal Name:

My name is Rob Brandenburg, RD, and I am a graduate student at Marshall University in the department of dietetics. I am working on my master's thesis, which is a study of the use of nutrition supplements by high school athletes in eastern Kentucky. What I am asking is the use of your school to collect my data. I have already spoken with **Athletic Trainer**, who will administer the double-blind questionnaire to the student athletes. This questionnaire is voluntary, requires no names, and the students may stop at any time. I will be conducting this study in three other local schools. The questionnaire will be on white paper with black ink so that no school can or will be identified in any way. Attached is a yes or no sheet that requires your response and signature. If you have any questions or concerns regarding this study below are phone numbers in which you may contact myself or my advisor Kelli Williams, Ph.D. Candidate, RD. Thank you for your time.

Sincerely,

Rob Brandenburg, RD

Contacts for this research project:
Rob Brandenburg, RD (H) 326-1815 (W) 327-4818

Kelli Williams (Primary Investigator) (W) 304-696-4336

Dr. Stephen Cooper IRB Chair (304) 696-7320

APPENDIX C:
PRINCIPAL PERMISSION FORM

______ Yes, I do give Rob Brandenburg permission to conduct his study at **School** Name.

______ No, I do not give Rob Brandenburg permission to conduct his study at **School Name.**

Signature ____

Print Name: ____

Date: _______________________

APPENDIX D:
PARENTAL PERMISSION FORMS

MINOR’S ASSENT FORM
TO PARTICIPATE IN A RESEARCH STUDY ENTITLED:

The Use of Ergogenic Aids among High School Athletes in Eastern Kentucky

Researchers at the Marshall University Department of Dietetics are trying to learn more about what over-the-counter nutrition supplements high school athletes are using in hopes of improving their athletic performance. This is called a research study.

The reason to do this research study is to see if eastern Kentucky high school athletes are using the same supplements as identified in other studies conducted around the United States.

You are asked to be in this research study because you are currently a high school athlete.

The people in charge of this study

Kelli Williams, Ph.D. Candidate, RD

Rob Brandenburg, RD.

Dr. Stephen Cooper IRB Chair

This study will take place here at **School Name**.

This is what will happen during this study: you will be given a questionnaire by your school’s athletic trainer. This questionnaire will not require any personal information and will take about 10 minutes to complete. The questionnaire consists of multiple choice and some fill in the blank questions. You may stop the questionnaire at anytime.

The information gathered in this study would help identify what, if any, over-the-counter nutrition supplements are being used so the researchers may begin the development of educational material for coaches, parents, physicians, and athletic trainers.

Although you do not have to be in this study if you do not want to be, you are encouraged to discuss this with your parents before making your decision.

initials(_____)

You may stop being in the study at any time. If you decide to stop, no one will be angry or upset with you.

Please ask as many questions as you need to make sure you understand the study before you sign this form

---

I have talked to my parents about the study. I have had all of my questions answered. I understand that I can withdraw from this study at any time and no one will be angry or upset with me.

___ **YES**, I want to be in the study. ___ **NO**, I do not want to be in the study.

______________________	______________________	__________
MINOR'S NAME (SIGNATURE)	MINOR'S NAME (PRINT)	DATE

______________________	______________________	__________
PARENT OR GUARDIAN (SIGNATURE)	PARENT OR GUARDIAN (PRINT)	DATE

______________________	______________________	__________
PERSON OBTAINING ASSENT (SIGNATURE)	PERSON OBTAINING ASSENT (PRINT)	DATE

______________________	______________________	__________
INVESTIGATOR (SIGNATURE)	INVESTIGATOR (PRINT)	DATE

PARENTS'S PERMISSION FORM
FOR STUDENT PARTICIPATION IN A RESEARCH STUDY ENTITLED:

The Use of Ergogenic Aids among High School Athletes in Eastern Kentucky

Researchers at the Marshall University Department of Dietetics are trying to learn more about what over-the-counter nutrition supplements high school athletes are using in hopes of improving their athletic performance. This is called a research study.

The reason to do this research study is to see if eastern Kentucky high school athletes are using the same supplements as identified in other studies conducted around the United States.

Your child is asked to be in this research study because he/she are currently a high school athlete.

The people in charge of this study:

Kelli Williams, Ph.D. Candidate, RD

Rob Brandenburg, RD.

Dr. Stephen Cooper IRB Chair

This study will take place here at **School Name**.

This is what will happen during this study: he/she will be given a questionnaire by their school's athletic trainer. This questionnaire will not require any personal information and will take about 10 minutes to complete. The questionnaire consists of multiple choice and some fill in the blank questions. They may stop the questionnaire at anytime.

The information gathered in this study would help identify what, if any, over-the-counter nutrition supplements are being used so the researchers may begin the development of educational material for coaches, parents, physicians, and athletic trainers.

initials(_____)

They may stop being in the study at any time. If they decide to stop, no one will be angry or upset with them.

Please ask as many questions as you need to make sure you understand the study before you sign this form

---

I have talked to my parents about the study. I have had all of my questions answered. I understand that I can withdraw from this study at any time and no one will be angry or upset with me.

___ **YES**, My son/daughter may participate in the study.

___ **NO**, I do not want my son/daughter to participate in the study.

______________________________ ______________________________

PARENT OR GUARDIAN (SIGNATURE) | PARENT OR GUARDIAN (PRINT)

DATE ______________________

Contacts for this study:
Kelli Williams Ph.D. Candidate, RD 304-696-4336
Primary Investigator

Rob Brandenburg, RD 606-326-1815
Co-Investigator

Dr. Stephen Cooper   304-696-7320
Chair Social Science Institutional Review Board

______________________ ______________________ ____________

INVESTIGATOR (SIGNATURE) | INVESTIGATOR (PRINT) | DATE

APPENDIX E:
NCAA BANNED SUBSTANCE LIST

NCAA Banned-Drug Classes
2003-2004

The NCAA list of banned-drug classes is subject to change by the NCAA Executive Committee. Contact NCAA education services or www.ncaa.org/sports_sciences/drugtesting for the current list. The term "related compounds" comprises substances that are included in the class by their pharmacological action and/or chemical structure. No substance belonging to the prohibited class may be used, regardless of whether it is specifically listed as an example.

Many nutritional/dietary supplements contain NCAA banned substances. In addition, the U.S. Food and Drug Administration (FDA) does not strictly regulate the supplement industry; therefore purity and safety of nutritional/dietary supplements cannot be guaranteed. Impure supplements may lead to a positive NCAA drug test. The use of supplements is at the student-athlete's own risk. Student-athletes should contact their institution's team physician or athletic trainer for further information.

Bylaw 31.2.3.1 Banned Drugs

The following is a list of banned-drug classes, with examples of substances under each class:

(a) Stimulants:

amiphenazole
amphetamine
bemigride
benzphetamine
bromantan
Caffeine[1] (guarana)
chlorphentermine
cocaine
cropropamide
crothetamide
diethylpropion
dimethylamphetamine
doxapram
ephedrine (ephedra, ma huang)
ethamivan
ethylamphetamine
fencamfamine
meclofenoxate
methamphetamine
methylene-dioxymethamphetamine (MDMA (ecstasy)
methylphenidate
nikethamide
pemoline
pentetrazol
phendimetrazine
phenmetrazine
phentermine
phenylephrine
phenylpropanolamine (ppa) effective August 2003
picrotoxine
pipradol
prolintane
strychnine
synephrine (citrus aurantium, zhi shi, bitter orange)
and related compounds

(b) Anabolic Agents:

anabolic steroids
androstenediol
androstenedione
boldenone
clostebol
Dehydrochlormethyl-testosterone
dehydroepiandrosterone (DHEA)
dihydrotestosterone (DHT)
dromostanolone
fluoxymesterone
mesterolone
methandienone
methyltestosterone
nandrolone
norandrostenediol
norandrostenedione
norethandrolone
oxandrolone
oxymesterone
oxymetholone
stanozolol
Testosterone[2] and related compounds
other anabolic sgents
clenbuterol
methenolone

(c) Substances Banned for Specific Sports

Rifle:

alcohol
atenolol
metoprolol
nadolol
pindolol
propranolol
timolol
and related compounds

(d) Diuretics:

acetazolamide
bendroflumethiazide
benzthiazide
bumetanide
chlorothiazide
chlorthalidone
ethacrynic acid
flumethiazide
furosemide
hydrochlorothiazide
hydroflumethiazide
methyclothiazide
metolazone
polythiazide
quinethazone
spironolactone
triamterene
trichlormethiazide
and related compounds

(e) Street Drugs:

heroin
marijuana[3]
THC (tetrahydrocannabinol)[3]

(f) Peptide Hormones and Analogues

chorionic gonadotrophin (HCG-human chorionic gonadotrophin)
corticotrophin (ACTH)
growth hormone (HGH, somatotrophin)

All the respective releasing factors of the above-mentioned substances also are banned.

erythropoietin (EPO)
sermorelin

(g) Definitions of positive depends on the following:

[1] for caffeine--if the concentration in urine exceeds 15 micrograms/ml.

[2] for testosterone--if the administration of testosterone or use of any other manipulation has the result of increasing the ratio of the total concentration of testosterone to that of epitestosterone in the urine to greater than 6:1, unless there is evidence that this ratio is due to a physiological or pathological condition.

[3] for marijuana and THC--if the concentration in the urine of THC metabolite exceeds 15 nanograms/ml.