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# A Pilot Study of the Relationship of Calcium Intake and Frequency of Injuries In High School Athletes

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# A Pilot Study Of The Relationship Of Calcium Intake And Frequency Of Injuries In High School Athletes

by

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**Background** Little information is available related to adolescent calcium intake and relationships with injuries they might suffer from sport participation.

**Objectives** To determine calcium intake of high school athletes, to assess their self reported injury rates, and to examine the relationship between the two over a 12 month period of time.

**Setting** Participants received a questionnaire at their school and completed it anywhere they found convenient.

**Participants** Adolescent athletes in the Lincoln Public School system (n=43) that participated in at least one sport in the past year.

**Results** Four age groups participated in the study with sixteen year olds having a significantly higher calcium intake at 1297 mg that of fourteen year olds. A variety of sports were represented with largest number of respondents participating in baseball/or softball at (55%). The next most played sport was basketball at (18%). Median total diet calcium was 1144.5 mg with a mean of 1182 mg $\pm$ 567 mg. For the frequency of injuries that caused a missed practice or game in the past year, ankle injuries were the most common (25%). Knee injuries were the second most common (17%), followed

closely by hand injuries (8%). Mean total diet calcium of athletes with five or more injuries that caused a missed practice or game was significantly higher at 1966 mg ($P<.05$) than athletes mean diet calcium with zero, one, two, and three injuries. Total milk calcium of those who reported three injuries that resulted in broken or fractured bones or dislocated joints was significantly higher ($P<.05$) at 1286 mg of total milk calcium than those who reported having zero, one, or two breaks or fractures.

**Conclusions and implications** Athletes with higher calcium intakes have a higher number of reported injuries. This may be the result of increased vigorous activity which leads to increased calorie and calcium consumption. More importantly, this increased activity leads to an increased chance of injury. The greater calcium intake correlated with greater number of injuries may also be because of third parties advising the athletes who get injured to drink more milk and get more calcium in their diets because they have been injuries already.

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# INTRODUCTION

## Nutrient needs of adolescents

Adolescence is a time when growth increases the bodies demand for energy and nutrients. According to Story and Stang, total nutrient needs are higher during adolescence than at any other time in life (1, 2). The need for protein rises during adolescence (2), and heavy and regular exercise training increases the daily protein requirements in adult athletes (3). There is no precise data on the protein requirements for young athletes, but with the combination of increased training intensity and increased training volume protein turn over would be increased leading to an increase in protein needs for sport participation (4). The American Academy of Pediatrics recommends a daily requirement of approximately 1g/kg of body weight and recommends consumption of up to 2g/kg during intense strength training in older adolescents (5,6). Proteins should provide 15-20 percent of total energy (5). Extra protein needs for young athletes can easily be met in a normal diet that contains milk products and other sources of protein (6).

Excessive physical activity during adolescence may negatively affect growth and sexual development. High levels of physical activity can lead to effects on growth in some adolescents, with nutritional status having an even greater positive or negative effect on growth. Restrictive eating and dieting behaviors in

adolescence will most likely negatively affect growth. Restricting food intake to influence appearance during a time when adequate intake of nutrients is essential for growth can not only affect growth but decrease the intake of nutrients essential for proper bone mineralization. Nutrients needed for this mineralization would include: calcium, vitamin D, iron, magnesium and other nutrients (7). For many sports that young people are involved in weight control is considered advantageous for the athlete. These sports include distance running, cross-country, gymnastics, swimming and wrestling which emphasize that the athletes be thin and compete at a very low weight. Sports like football and basketball emphasize having a large portion of lean body mass and gaining weight (8). When trying to lose weight or gain weight some athletes may turn to unhealthy weight control practices (8). If these young athletes continue, over time to follow these unhealthy eating practices they could be at risk for not getting the proper nutrients that their bodies need to grow and repair. Not getting proper nutrition can hinder athletic performance and increase the risk for injury (8).

**Current calcium intake in high school adolescents**

Adolescents consume an abundance of low nutrient foods and are lacking in fruits, vegetables, dairy foods, whole grains, lean meats and fish. These eating patterns result in an increased intake of excess fats and sugar, and a decrease in vital nutrients like calcium, iron, zinc potassium and a variety of vitamins (9).

"Many adolescent females believe that high-calcium foods are fattening and will get in the way of their athletic goals and so avoid them. Teenagers eat out of the home for much of their day and may choose foods like soft drinks, which not only do not contain calcium but may interfere with its absorption" (10). Several minerals have been found to be deficient in the diets of children. Calcium is one of the minerals found to be deficient and could negatively affect health and performance in young athletes (11). Inadequate intake of calcium during training and competition in youth has been shown to be correlated with stress fractures (4). Calcium deficiency has been found in athletes in strength and weight class sports especially if calorie restrictions are present (12, 13). These types of athletes, because of their nutritional status may be at an increased risk for decreased bone mineral density (BMD), and at an increased risk for stress fractures and decreased performance (14). It is recommended that young athletes get a calcium intake of 1200-1500 mg/day (5, 15). According to data for 1994, 73 percent of calcium in the U.S. food supply is from milk products, 9 percent is from fruits and vegetables, 5 percent is from grain products, and the remaining 12 percent is from all other sources combined (16). Milk provides the greatest amount of calcium in the diets of adolescents at about 300mg/serving (1, 16). Unlike other minerals, the effects of a low-calcium diet are not often obvious without a bone density test and may not affect sports performance until a stress fracture occurs (10).

In a 3-year calcium intervention study in children aged 6 to 14 years of age, both calcium and exercise influenced the rate of bone mineralization, but their effects appeared to be independent (16). From 9 through 18 years of age, calcium retention increased to a peak and then declined. In males, daily calcium intake peaked in the age range of 14 through 18 years (at 1,094 mg) and in females it was highest around ages 9 through 13 years (at 889 mg). The peak calcium accretion rate typically occurs at mean age 13 years for girls and 14.5 years for boys (16). Only 14 percent of teenage girls and 35 percent of teen boys are meeting the former 1989 Recommended Dietary Allowance of 1,200 mg daily (10). According to *What We Eat in America*, NHANES, 2005-2006, males and females consumed 1586mg and 1077mg of calcium daily on average respectively (17).

Female athletes that are most likely to be in a low-calcium status are those who participate in sports that are commonly found in the "female athlete triad. Excessive training and high expectations of a physical appearance that promote under-nutrition contribute to the development of the triad, which consists of disordered eating, amenorrhea and bone loss. The greatest incidence of female athlete triad is in aesthetic and weight dependent sports such as endurance running, gymnastics and figure skating" (10,18). The disordered eating involved in the triad can be as simple as avoiding certain foods to being as serious as anorexia nervosa and bulimia (18). Low calcium intakes and poor nutrition can lead to osteoporosis which is the third part of the triad. This

condition can hinder a female athlete by promoting the formation of stress fractures and other injuries (18).

**Current calcium intake in high school adolescents in Nebraska**

A 2002-2003 survey of Nebraska adolescents found that more than 8 in every 10 Nebraska high school students (85.6%) consumed milk during the seven days preceding the survey, however, half (49.6%) consumed less than one glass per day. Less than 1 in every 5 students (18.4%) consumed milk regularly (an average of 3 or more glasses per day) during the seven days preceding the survey (19). According to the Centers for Disease Control's 2005 Youth Risk Behavior Survey, only 13.1% of females and 23.9% of males drank three or more glasses per day of milk during the seven days before the survey (20). This shows that both males and females in Nebraska are not consuming an adequate amount of milk. In addition it can be estimated that they are also not consuming an adequate amount of calcium since milk and milk products are the leading sources of this nutrient.

**Typical injuries in high school athletes**

Adolescents taking part in competitive sports and training or that have a high level of physical activity are at risk for a number of injuries. These injuries can come about because of too much training and not enough rest (21). According to the American Academy of Pediatrics, an overuse injury is a micro traumatic injury

to bone, muscle, or tendon that has been subjugated to repetitive stress without sufficient time to heal or undergo the natural healing process (21). These injures include neck, shoulder, and low back pain (22). "Given the possible interaction between intensive training and growth during adolescence, some adolescent athletes maybe particularly vulnerable to repetitive micro-traumatic injury. Despite the perceived benefits of early training on bone mass accumulation, intensive training may have detrimental effects on young athletes' growth and it is possible that the effects of training at a young age may not manifest themselves until later in life" (23). Contusions and strains are the most common injuries seen in the ankle, knee, hand, wrist, elbow, shin, calf, head, neck, and clavicle (24). Since adolescents participate in multiple physical activities, participation in several sports makes associations between one sport and musculoskeletal pains inconsequential in the general adolescent population (22). Adolescent athletes are at a more serious risk for injuries because the bones of young athletes cannot handle as much stress as the mature bones of adults (21). To decrease the risk of overuse injuries in adolescents, it is recommended that these athletes limit training in one sport to no more than five days a week, with at least one day off from any organized physical activity. Athletes should also take off two to three months each year for each sport. This time allows injuries to heal (22).

# CHAPTER 2
# LITERATURE REVIEW

## Energy recommendations for high school aged athletes

Petrie, Strover and Horswill (4) noted that "most youth and adolescent athletes who are strongly committed to their sports are not concerned with nutrition especially in the case of energy balance. Athletes usually require a greater calorie intake than do non-athletes" (8). Their actual energy needs are dependent on body composition, weight, height, age, stage of growth, and level of fitness. The duration, intensity and frequency of the activity is also a major factor. Young athletes need to not only eat to meet the energy requirements for daily living, but they also need to meet the requirements of repairing muscle tissue, growing and the energy required for participation in their activities and sports (8).

## Calcium and vitamin D intake in adolescence

Calcium is the most abundant mineral in the human body and makes up between 1.5%-2% of total body weight and 39% of total body minerals. Nearly 99% of all the calcium is found in the bones and teeth, the remaining 1% is in the blood and extracellular tissues (25). Because of accelerated muscular, skeletal, and endocrine development, calcium needs are increased more during puberty and adolescence than during childhood or adulthood. Bone mass is acquired at higher rates and can be four times higher than the rates seen in adulthood and

childhood. For females it is known that around 92% of their bone mass is accrued by the age of 18 (25).

There are several deficiency symptoms due to inadequate calcium intake. These deficiencies can be divided into two broad categories: acute and chronic. Acute calcium deficiencies can come from excessive sweating during strenuous exercise. This can lead to muscle camps but usually sodium, potassium, and magnesium are more important for causing muscle cramps. Chronic deficiency of calcium leads to bone loss (osteoporosis). Calcium intakes for male athletes are usually adequate, unless the total food intake is lowered to facilitate weight loss. In female athletes, calcium intakes are frequently deficient. Athletic amenorrhea in females is usually associated with osteoporosis and a young age (26). Calcium intakes in amenorrheic athletes and groups of athletes that tend to have amenorrhea (dancers, gymnasts, long-distance runners) have shown frequent deficiencies (26). The most commonly occurring problem with calcium intake and healing in sporting activities is bone loss correlated with amenorrhea. Amenorrhea associated with sports is the absence of menstrual cycles, with there being no more than one period in the past six months. Incidence ranges from between 7 to 71% depending on the population being studied. Athletic amenorrhea is associated with bone loss, especially that of the lumbar spine; it has also been associated with lower peak bone mass formation, osteoporosis, stress fractures and scoliosis (26).

"The Continuing Survey of Intakes by Individuals (CSFII) 1994–96 compared mean calcium intake for males and females with recommended levels. Mean calcium intakes for males and females ages nine to 18 were significantly below the 1300 mg/day AI recommendations for calcium. Daily calcium intake from other national studies (NHANES I 1971–74, NFCS 1977–78, NHANES II 1976–80, CSFII 1985–86, NHANES III 1988–91, and CSFII 1989–91) show a decline in calcium intake in both males and females of this age group over a 20 year period" (27). Also, data from the 2001-2002 *What We Eat in America* survey determined that the median calcium intake among adolescent females fell from 865 mg/day in early adolescence to 804 mg/day by late adolescence. For boys, median intakes were somewhat steady at 1140 mg/day (25).

Vitamin D is an important nutrient related to bone health because it interacts with various tissues through the body facilitating bone mineralization in conjunction with calcium. Vitamin D specifically facilitates mineralization of bone osteoid, which prevents rickets (26). Vitamin D deficiency results in impaired intestinal absorption of calcium. Deficiencies of this vitamin have also been associated with changes in collagen proteins. These proteins are necessary for the health of many connective tissues and with their deterioration the health of all musculoskeletal connective tissues is affected (26). Dietary intake is not essential if adequate sunlight exposure is available. More than two hours of daily face exposure to sunlight is required in northern latitudes during the winter to meet the requirements of the body. Dietary sources include animal livers, fish

liver oil, dairy products, egg yolks and fortified foods. Individuals living in northern latitudes who restrict their diets may require a supplement (RDA 400IU) (26).

**Protein intake in adolescence**

The importance of protein intake for all aspects of healing is unquestioned. The concept of increasing protein intake during times of connective tissue healing in younger persons that are not hospitalized has not been examined in sufficient detail to make any sound conclusions about effects on healing. Protein intake of athletes and non-athletes varies among sport and individuals. Nutritional demands of some sports exceed the average needs of the general population and can lead to the development of malnutrition that can exist before and after an injury.

During puberty it is well known that there is an increased demand for energy and protein. When combined with the physiologic energy and protein demands imposed by training, adolescent's who typically have a poor diet make the issue a greater concern. Young athletes need to focus on the amount and quality of protein they are eating each day. They are supporting growth and development, and adaptation and recovery from training and competition (26, 7). Sports where the athlete is at the greatest risk for protein deficiencies are gymnastics, endurance running (marathons, cross-country, tri-athletes), wrestling, and dance. Athletes participating in sports, especially the ones named

previously that are injured should be checked for dietary protein intake. Normal intakes of protein of at least 1g/kg/d should allow healing to take place at a normal rate (26, 7). Another recommendation for protein requirements in various athletic populations is 1.4-2.0g/kg for strength athletes, 1.2-2.0g/kg for endurances athletes, and 1.2-1.6g/kg for team sport athletes (29). According to *What We Eat in America*, NHANES, 2005-2006, males and females consumed 99.1 and 64.2 grams, respectively of protein on average (17).

**Sources of calcium in the diet**

Food and supplemental sources that are excellent sources of calcium are calcium supplements; bone meal; egg shells; multiple vitamin/mineral products with calcium; milk and milk products; dairy products; canned salmon, sardines, or anchovies with bone; tofu (set with calcium); green leafy vegetables, and other fortified foods (26). Milk, yogurt, and cheese are rich sources of calcium and are the major food contributors of this nutrient to people in the United States. Non-dairy sources include vegetables, such as Chinese cabbage, kale, and broccoli. Most grains do not have high amounts of calcium unless they are fortified; however, they contribute calcium to the diet because they do contain small amounts and people consume them frequently (30). Several factors can affect calcium absorption and this can be of equal importance as the amount of intake. Dietary factors that enhance calcium uptake include lysine, arginine, vitamin D, lactose, and glucose polymers. Non-dietary factors that enhance the uptake of

calcium include ultraviolet light exposure, younger age, being male, androgens, and certain antibiotics (penicillin, neomycin) (26). "Milk consumption decreased 36% from 1965 to 1996, accompanied by an increase in soft drink and non-citrus juice consumption in the United States. In one study in 1994, 73% of the calcium available in the food supply was from milk and milk products. A shift in sources of calcium in the food supply toward cheese and lower fat milk was seen from 1970–1994. Other calcium contributors in the food supply were vegetables and legumes (10%), grains (5%), meat, poultry and fish (5%), and other sources (7%). In 1990–92, females ages 11–18 obtained 48% of their calcium from milk and milk products, 16% from mixed dishes, 14% from grain products and 22% from other sources" (27)

**Supplement use among adolescent athletes**

Nutritional supplements are being used nationally by all age groups. One researcher found that 88% of athletes used supplements while another researcher found that among a group of 270 high school athletes, 58% of them had used supplementation (31). Prevalence of supplement use among young athletes is not as clearly documented as with adults. There have been a number of recent studies conducted in the 1990's and 2000's investigating supplement use by young athletes (32). Prevalence of supplement use among child and adolescent athletes ranges from 22.3% to 71%. Athletes involved in multiple-sports (2- or more sports) tend to engage in supplement use more frequently

than athletes involved in only one sport. Supplement use among particular sports, mainly those requiring athletes to “make weight” or the more aesthetic sports is also more prevalent. One study found that wrestlers (59%) were more likely to use supplements than others such as softball, hockey, and golf players (each 50%) with gymnasts not far behind (40%) (32).

The most frequently used supplements among young athletes is in the form of vitamin/mineral supplements with vitamin C, multivitamins, iron, and calcium when compared to the use of other ergogenic aides. To specifically investigate creatine use among young athletes, in a 2001 study middle and high school athletes aged 10 to 18 years were surveyed and it was found that 62% reported using creatine (32).

It is thought by some that the risks associated with vitamin and mineral supplementation are not as severe as the risks involved with using ergogenic aids such as steroids, amphetamines, and human growth hormone, but young athletes could potentially start out using vitamin and mineral supplements, then progress to more dangerous substances (32).

In the child and adolescent athlete literature, the reasons for supplementation are similar to those of adults. “High school athletes have reported growth (48%), illness prevention (44%), illness treatment (37%), enhanced performance (31%), tiredness (28%), and muscle development (28%) as the important reasons for consuming supplements” (32). The reasons for supplement use in males tends to put more emphasis on the athletic

performance enhancing effects of supplements where as females tend to be more concerned with the health benefits. A study conducted in the UK found that female UK junior national track and field athletes reported taking supplements for health issues (33%) and strengthening the immune system (44%) with performance and strength (both 11%) reported as less important. The primary reason males consumed supplements was to improve performance (36%) and males (45%) consumed 'ergogenic aids' (defined as creatine and caffeine) more often than females (11%) (32).

**Milk as an ergogenic aide.**

Milk is now being thought of as an ergogenic aide that can improve sports performance in a variety of ways. Bovine milk, also known as cow's milk is a good source of nutrients including protein, carbohydrates, lipids, vitamins and minerals. Low-fat milk in particular has a nutrient profile which makes it potentially a very good recovery drink. It contains carbohydrates in the form of lactose in amounts similar to commercial sports drinks. Milk contains the proteins casein and whey, which digest slowly and allow a longer time for amino acids to be available in the blood (33).

In one study conducted at the University of Texas Medical Branch in 2004, twenty-four volunteers were given one of three treatments after performing leg extensions. The treatments were either: a placebo, whey, or casein protein. After ingestion of the three treatments, blood levels of amino acids were

measured and it was found that the casein and whey proteins produced amino acid uptake relative to amount ingested. Acute ingestion of both whey and casein after exercise resulted in similar increases in muscle protein net balance, resulting in net muscle protein synthesis despite different patterns of blood amino acid responses (34).

It is clear that ingesting milk can improve muscle protein creation by providing an adequate pool of amino acids in the blood post exercise. Does it matter what kind of milk product is consumed? In another study from the University Texas Medical Branch conducted in 2006, researchers looked not only at how milk consumption post exercise affected blood amino acid levels but different types of milk were compared. Three groups of volunteers ingested one of three milk drinks: 237 g of fat-free milk, 237 g of whole milk, and 393 g of fat-free milk isocaloric with the whole milk. Milk was ingested one hour following a leg resistance exercise routine. It was found that all three milk products increased muscle protein synthesis, but whole milk in particular may have increased utilization of available amino acids for protein synthesis (35).
Some researchers have begun to think acute consumption of milk can be used like a supplement. Researchers from the Exercise Metabolism Research Group, Department of Kinesiology, McMaster University, Hamilton, ON, Canada looked at fat-free milk consumption versus a soy or carbohydrate drink in male weightlifters. They recruited 56 healthy young men who trained 5 days a week for 12 weeks on a rotating split-body resistance exercise program in a parallel 3-

group longitudinal design. Subjects were randomly assigned to consume drinks immediately and again one hour after exercise: fat-free milk; fat-free soy protein that was isocaloric, isonitrogenous, and macronutrient ratio matched to milk; or maltodextrin that was isocaloric with milk and soy which was used as a control. The results showed greater increases in muscle fiber area in the milk group than in both the soy and control groups. The results show that skim milk can provide the nutrients needed for muscle hypertrophy after resistance training better than soy milk or carbohydrate drinks (36). In another study using nine male trained endurance cyclists chocolate milk was studied. The researchers found that chocolate milk, with its high carbohydrate and protein content may be considered an effective alternative to commercial fluid replacement and carbohydrate replacement drinks for recovery from exhausting, glycogen-depleting exercise (37). In yet another study, the effect of drinking milk post exercise was similar to that of a carbohydrate-electrolyte containing beverage (38). Finally, an ongoing study of the impact of drinking milk after heavy weightlifting has found that milk helps exercisers burn more fat (39), and researchers from Southborough University in England recently tested the post-exercise hydration effects of milk against those of water and a sports drink. They found that the milk drinkers remained in a state of full hydration as compared with non protein containing sports drinks (40).

**Use of Food Frequency Questionnaires**

Food Frequency Questionnaires (FFQs) are used as a brief dietary assessment methods because they minimize collection expenses and participant burden when compared to food diaries and other burdensome data collection methodology. Advantages to the FFQ are: it is self-administered, requires a relatively short amount of time to complete, and is analyzed at a reasonable cost. The limitations to the FFQ are that the accuracy of the data relies on the respondent's memory and the foods listed may not include those consumed by the respondent (41). FFQs were developed for analyzing long term diet patterns instead of collecting data for individual days. Some FFQ's are known as semi-quantitative and ask for frequency responses only with a usual serving size listed with each item. The nutrient intakes are figured by multiplying the midpoint of the frequency interval by the nutrients specified in the portion of food given. Investigators reviewing FFQ's methodologies found that the frequency of eating particular foods was a greater determinate of nutrient intakes than quantity and the use of single serving sizes did not produce a large error for individual estimates (42). Some precision is sacrificed with using this method. The FFQ needs to be able to fit with the population being studied and is validated for that population (42).

**Physical activity and bone**

Physical inactivity contributes to osteoporosis risk and although manifest in older people, osteoporosis begins in childhood. One strategy to increase peak bone mass is regular, weight-bearing exercise. Weight-bearing exercise can include aerobics, circuit training, jogging, jumping, volleyball and other sports that generate impact to the skeleton. There is evidence to suggest that the years of childhood and adolescence represent an opportune period during which bone adapts particularly efficiently to such loading. Sports participation during growth has been shown to increase bone mineral density (BMD) in the weight loaded limbs of active subjects by 10-20% (43).

Fractures in healthy children are an important but neglected public health issue; 1.2% to 3.6% of children fracture a bone each year, and the lifetime risk of sustaining a fracture in childhood for boys is 42–64% and for girls is 27–40% (44). There is a concern that childhood fractures may be a marker of low peak bone mass acquisition and hence persistent skeletal fragility. The most rigorously studied determinant of fracture risk in healthy children is bone mass. The evidence from multiple studies strongly suggests that low BMD and low bone size relative to body size are risk factors for fractures in healthy children (44). The peak age of incidence of all childhood fractures is around 14 years of age for boys, and 11 years of age for girls. Overall, boys have a higher fracture rate compared with girls at all ages. There are some studies providing limited

evidence on the association between ethnicity, birth weight, family size, socioeconomic status, dietary calcium intake, or physical activity and fracture incidence in healthy children (44).

Exercise intervention programs aimed at increasing bone mass or strength in pubertal or adolescent children have involved diverse activities of moderate to high impact such as jumping or running. The majority of trials have reported positive skeletal effects from the exercise interventions, the magnitude of which varies according to the skeletal site measured. The evidence suggests that early puberty may be particularly optimal for bone adaptation to loading. It has been estimated that around 30 % of total body adult bone mass is accrued at this age (43).

Resistance exercise may not be the best intervention for promoting bone mineral accrual in pubertal and adolescent girls. Both long and short duration exercise sessions may be beneficial and the longer the intervention, the greater the bone mineral accrual. The majority of studies have used school-based exercise interventions involving 3-20 minutes per day of weight bearing impact activities with three or more sessions per week. The prescription of 3 days of exercise per week may potentially increase the building of bone in children and adolescents (43).

Physical activity may not be protective of injuries to adolescent boys and girls. One study of children who did daily or more episodes of vigorous physical activity had a doubling of fracture risk compared with those children who did less

than four episodes per week. In the study there was no association between birth weight, ethnicity, socioeconomic status (maternal education), family size, dietary intake of calcium, vitamin D, or energy, time spent watching TV, pubertal status, or any anthropometric measure and childhood fracture risk (44). The authors of the study stated that, despite being associated with both higher volumetric BMD and bone size relative to body size, daily and more vigorous physical activity increased fracture risk. This is presumably through increased exposure to injuries: even among those with an estimated volumetric BMD or bone size relative to body size in the highest tertile, daily or more episodes of vigorous physical activity resulted in a tripling of fracture risk. This suggests that the higher bone mass associated with increased physical activity in children does not compensate for increased exposure to injuries (44).

**Injuries in adolescent athletes**

According to the American Academy of Pediatrics, "Sport and recreational activities are the leading cause of nonfatal adolescent injury, representing 40% of all injuries in this age group. They constitute the second leading cause of emergency department visits and hospital admissions in 13- to 19-year-olds" (45). Sports injuries can also be expensive. In a study done in Massachusetts, sports-related injuries ranked second to falls in per capita expenditures for treating injuries to children (46). One problem in finding information regarding sports injuries is that it is hard to find ways to get accurately reported information.

Passive reporting methods, such as reports found at local emergency departments do not accurately report rates associated with specific injuries. The best epidemiologic studies of sports-related injuries use data collected from athletic trainers and other professionals working directly with the athletes in practice and competition. Severity of the injury is usually reported as time lost at least one practice session or one competition (45).

Sports injuries can either be classified as acute or chronic. Acute is a one-time transfer of energy to vulnerable tissues, injuries not usually thought to be related to the behavior of the athlete. Examples of acute injuries include epiphyseal fractures, ruptured intervertebral disks, and low back bone disruption. Damage to the epiphyseal growth plate is of the most concern because it contributes to the normal development of long bones, and problems in this area can result in deformity of the limb. The bulk of epiphyseal injuries are a result of injuries sustained in contact sports like football, hockey, and basketball (45, 47). A chronic injury is caused by repetitive micro-trauma; and these injuries are usually directly related to the behavior of the athlete. Chronic injuries are also known as “overuse” injuries. It is thought that chronic injuries are often due to training errors. It is also thought that some children become injured because they participate in too many activities during one season. Examples of chronic injuries would include stress fractures, musculotendious strains, and osteochondrites dissecans of the knee and elbow (45, 47).

Two studies performed 12 years apart in different areas of the United States documented injury rates for high school athletes. “The sports with the highest number of injuries were football, gymnastics, wrestling, and ice hockey. Soccer and track and field also were also found to produce significant injury rates with a greater proportion of chronic injuries” (45, 48, 49).

Adolescence is a time of increased growth which requires increased nutrient consumption. It has been found that athletes in this age group have an increased need of adequate nutrient intake, especially that of calcium. Young athletes are at risk of injuries when participating in sports and recreational activities. When poor nutrient intake is coupled with sporting activities, injury to the teenage athlete may be increased. For these reasons, this pilot study was conducted in order to determine if there is a link between calcium intake in adolescent athletes and the number of injuries they suffer.

## PURPOSE

The purpose of this pilot study was to examine the intake of calcium containing foods in the diets of high school athletes and compare those intakes to their self reported injury rates. It was hypothesized that those athletes who consumed the most calcium would have the lowest number of injuries.

## OBJECTIVES

1. To determine calcium intake of high school athletes using a food frequency questionnaire.
2. To assess self reported injury rates of high school athletes using a questionnaire.
3. To examine relationships between calcium intake and self reported injuries that occurred over a 12 month period of time.

# METHODS

There is not much information available comparing calcium or dairy food intake with injuries in adolescent athletes. The goal of this pilot-study was to compare calcium intake of high school with self reported injury rates. It was hypothesized that adolescent athletes with greater calcium intake would report fewer injuries. Specific objectives of the study were: to determine calcium intake and injury rates in high school athletes and see if increased calcium consumption decreased the number of reported injuries.

The data for this project was collected based on two questionnaires one which was a food frequency that was used to determine calcium intake and the other was designed to examine injury rate among the teen athletes. The surveys were given to athletes at random through their high school athletic trainer; and approval was obtained from the Institutional Review Board (IRB) at the University of Nebraska-Lincoln (Appendix A-1).

## Subjects

The subjects used in this research project were adolescent males and females enrolled in three Lincoln, Nebraska public high schools; Lincoln North Star, Lincoln Southwest, and Lincoln High School. The grade level of the subjects ranged from ninth through twelfth grade, with ages ranging from

fourteen to eighteen. All subjects were participants in at least one sporting activity.

**Recruitment of subjects**

After IRB approval the researchers recruited subjects by first contacting Lincoln Public Schools (LPS) administrators for permission to conduct research in their schools using email. A copy of the thesis IRB proposal and a review of literature were sent with the request. Once permission was received from the LPS administrators (Appendix A-2), the athletic trainers at five high schools were contacted by email to ask their permission to help with the distribution and collection of questionnaires. A copy of the permission letter from the administrators, the IRB proposal and a review of literature was provided in the email. Three of the five schools responded to the email requests (Lincoln High, Lincoln North Star and Lincoln Southwest).

**Questionnaires**

The questionnaire that was used was developed specifically to assess calcium intake in Asian, Hispanic and White youth living in the United States (27-28). The researchers who developed the FFQ created a list of 80 foods that were thought to supply substantial amounts of calcium. Soda pop, fruit-flavored drinks, coffee, and tea were also included in the list of foods because they replace milk and other high-calcium foods. The food list was converted into a

semi-quantitative FFQ. For each food item, a commonly used portion size was listed along with a question asking how often, on average, the food portion was consumed during the past month. Each food item had between four and seven frequency responses. The questionnaire had a total of 167 questions, 93 of the questions were the calcium food frequency used for this study. The other 74 were demographic and psychometric questions (Appendix A-3). Information gathered from the 93 calcium food frequency questions were the primary focus of the present study. Participant answers were collected on Scantron sheets which had 120 questions on each answer sheet.

To access injury rates, a questionnaire was created (Appendix A-4) from questions found on the American Academy of Pediatrics: Pre-participation Physical Evaluation (Appendix A-5). These questions were designed to gather self reported information from the past year pertaining to injuries and other health related questions.

All participants had to provide a completed parental consent form (Appendix A-6) and a child assent form (Appendix A-7) for their data to be included in the study.

**Data Collection**

The researchers set up times to drop off questionnaires to the athletic trainer's offices. All study related material was packaged into individual large envelopes with a number two pencil. Each participant received an envelope

which contained the two questionnaires, the child ascent form, the parent assent form, the Scantron sheet, a directions sheet and a No 2 pencil. The trainers recruited athletes and directed them to take the questionnaire home, fill them out, and return them to the trainers once completed. The researchers then returned to the schools to pick up the completed questionnaires. Data was collected over a six week time period in February and part of March. Each school received 100-300 surveys depending on how many athletes the athletic trainer thought they could potentially have participate in the study. Each school that participated was offered a $50.00 gift for their school athletic fund. During the first week all the questionnaires were handed out to the trainers. The trainers then had four weeks to get the questionnaires from the athletes. During the sixth week of the study, the researchers then collected all the completed questionnaires back from the trainers. Each study participant had at least four weeks to complete the entire questionnaire.

**Data Analysis**

The completed questionnaire answer sheets were compiled by utilizing the University testing services. The compiled data was put into a Microsoft Excel format where it was then merged into SPSS statistical software. Dr. Carol Boushey, Associate Professor at Purdue University, was consulted to advice in analyzing the data in SPSS. She provided the expertise needed to get the data analyzed using the syntax developed for the questionnaire (28). Paired *t* tests

were used to compare mean calcium values with age, injuries and sport participation. Frequency distributions of injuries, and calcium intakes were compiled. Analysis of calcium data provided three categories of calcium intake. Total dietary calcium was calculated from all foods providing calcium, total dairy calcium was calculated from all dairy foods, and total milk calcium was calculated from only milk containing foods. ANOVA and Chi Square analysis was used to examine the associations between calcium intake, age, injury, and sport participation. It was decided that $p<0.05$ would be the established confidence level.

# Results

## Demographics

A total of 43 athletes completed both questionnaires, provided a completed parental informed consent form, the child ascent form and turned all materials back to their athletic trainers. The demographic information is presented in Table 1. Four grade levels participated in the study with eleventh graders having the greatest representation (42%) while ninth graders had the lowest representation with only (12%). The largest number of participants were sixteen years of age (37%). Older participants were more likely to complete surveys with (81%) being sixteen and older. Gender was hard to determine since (44%) of participants failed to report their gender. Of those who reported their gender, (21%) were males and (35%) were females. A variety of sports were represented with largest number of respondents participating in baseball/or softball at (55%). The next most played sport was basketball at (18%). Only (4%) of participants were in cross country.

| **Table 1: Demographics of high school athletes. (n=43)** | | |
|---|---|---|
| Demographic Data | % | n= |
| Grade Level | | |
| 9th grade | 11.6 | 5 |
| 10th grade | 18.6 | 8 |
| 11th grade | 41.9 | 18 |
| 12th grade | 27.9 | 12 |
| **Total** | | 43 |
| Age (Years) | | |
| 14 | 4.7 | 2 |
| 15 | 13.9 | 6 |
| 16 | 37.2 | 16 |
| 17 | 25.6 | 11 |
| 18 | 18.6 | 8 |
| **Total** | | 43 |
| Gender | | |
| Male | 20.9 | 9 |
| Female | 35 | 15 |
| Unreported | 44..2 | 19 |
| Total | | 43 |
| Sport* | | |
| Baseball/Softball | 55.4 | 31 |
| Basketball | 17.8 | 10 |
| Cross Country | 3.5 | 2 |
| Soccer | 10.7 | 6 |
| Track | 5.4 | 3 |
| Other | 7.2 | 4 |
| Total | | 56 |

*Student athletes competed in more than one sport so total number will be greater than 43

**Calcium intake**

Distributions of calcium intake are presented in Table 2. Median total diet calcium was 1144.5 mg with a mean of 1182 mg ± 567 mg. Maximum total diet calcium intake was 2539 mg with a minimum of 154 mg. Total dairy calcium values were slightly less with a median total dairy calcium of 1041mg and a mean of 1091± 544 mg. Maximum total dairy calcium was 2409 mg and a minimum intake of 128 mg. Total milk calcium had the lowest values of all three measurements. The median total milk calcium was 678 mg with a mean of 692 ± 441 mg. Maximum total milk calcium was 1978 mg with minimum total milk calcium at 0 mg.

**Table 2**
Distributions of calcium intake (mg).

| | Maximum | 75% Quartile | Median | 25% Quartile | Minimum | Mean | Std Dev | n= |
|---|---|---|---|---|---|---|---|---|
| **Total Diet Calcium** | 2539 | 1409 | 1145 | 786 | 154 | 1182 | 567 | 43 |
| **Total Dairy Calcium** | 2409 | 1363 | 1041 | 723 | 128 | 1091 | 544 | 43 |
| **Total Milk Calcium** | 1978 | 1009 | 678 | 340 | 0 | 692 | 441 | 43 |

**Injury data**

Self reported frequency of injuries is represented on Tables 3 and 4. The results of injuries were a missed practice or game in the past year, or fractured bones or dislocated joints, and required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches. Of the three results of injuries, (46%) caused a missed practice or game in the past year, (18%) resulted in broken or fractured bones or dislocated joints and (36%) required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches.

For the frequency of injuries that caused a missed practice or game in the past year, ankle injuries were the most common (25%). Knee injuries were the second most common (17%), followed closely by hand injuries (8%). Thirteen respondents reported having one injury that caused a missed practice or game in the past year (30%). Ten respondents reported having two injuries that caused a missed practice or game in the past year (23%). Only seven respondents had no injury causing a missed practice or game (16%). The frequencies of injuries that resulted in broken or fractured bones or dislocated joints were mostly in the hand at (38%). Foot and toes (19%) and ankle (13%) were the next highest areas which resulted in broken or fractured bones or dislocations. Twenty-two respondents reported having no injuries that resulted in broken or fractured bones or dislocated joints (51%) and only 14 had one injury (33%). Injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a

brace, a cast, or crutches had (19%) occur in both the ankle and the hand for a total of 38% of injuries. The knee was the second highest at (11%) followed by the foot and toes (10%). Twenty participants (47%) reported only one injury requiring X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, while nine reported none (21%).

**Table 3**
Self reported frequency of Injuries by high school athletes.

| | Head | Hip | Thigh | Knee | Calf/Shin | Ankle | Foot/Toes | Neck | Shoulder | Upper Arm | Forearm | Elbow | Hand | Chest | Upper Back | Lower Back | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency of injuries that caused a missed practice or game in the past year. | 5 | 6 | 6 | 14 | 5 | 21 | 2 | 1 | 7 | 0 | 0 | 2 | 8 | 1 | 0 | 4 | 82 |
| Frequency of injuries that resulted in broken or fractured bones or dislocated joints. | 0 | 1 | 0 | 0 | 2 | 4 | 6 | 0 | 1 | 1 | 3 | 2 | 12 | 0 | 0 | 0 | 32 |
| Frequency of injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or cruches. | 2 | 4 | 0 | 7 | 2 | 12 | 6 | 0 | 4 | 1 | 3 | 3 | 12 | 1 | 1 | 5 | 63 |

**Table 4**
Self reported frequency injury totals of high shool student athletes.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|---|
| Frequency of injuries that caused a missed practice or game in the past year. | 7 | 13 | 10 | 6 | 5 | 1 | 1 | 43 |
| Frequency of injuries that resulted in broken or fractured bones or dislocated joints. | 22 | 14 | 3 | 3 | 1 | 0 | 0 | 43 |
| Frequency of injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches. | 9 | 20 | 6 | 3 | 4 | 1 | 0 | 43 |

Table 5 shows the frequency of yes or no answers for a variety of injury questions. When asked if they have ever had a stress fracture, only (28%) responded *yes*. Over half of participants (51%) reported having used a brace or assistive device. When asked about their weight, (77%) were happy with their weight and when asked if they were trying to gain weight, 23% reported they were. At the same time 23% said they were trying to lose weight. When asked if they have ever spoken with a Registered Dietitian only (9%) responded *yes*, yet (23%) had received recommendations to change their eating habits.

| **Table 5: Frequency of injury questions responses. (n=43)** | | |
|---|---|---|
| Question | Yes Response % (n) | No Response % (n) |
| Q 4: Have you ever had a stress fracture? | 27.9% (12) | 72.1% (31) |
| Q5: Have you been told that you have or have you had an x-ray for atlantoaxial (neck) instability? | 0% (0) | 100% (43) |
| Q6: Do you regularly use a brace or assistive device? | 51.1% (22) | 48.9% (21) |
| Q7: Have severe muscle cramps, get nauseous or become ill? | 9.3% (4) | 90.7% (39) |
| Q 8: Are you happy with your weight? | 76.7% (33) | 23.3% (10) |
| Q 9: Are you trying to gain weight? | 23.2% (10) | 76.7% (33) |
| Q 10: Are you trying to lose weight? | 23.2% (10) | 76.7% (33) |
| Q 11: Has anyone recommended to you that you change your weight or eating habits? | 23.2% (10) | 76.7% (33) |
| Q 12: Have you spoken with a professional (Registered Dietitian) about food, weight, and/or nutrition issues? | 9.3% (4) | 90.7% (39) |
| Q 13: Do you limit or carefully control what you eat? | 23.2% (10) | 76.7% (33) |

Mean calcium intakes were compared with participant age in Table 6. The only significant difference (P<.05) was with the mean total diet calcium intake between sixteen and fourteen year olds. The fourteen year olds had a mean intake of 440mg while the sixteen year olds had a mean intake of 1297mg of calcium. Table 7 shows the comparison of mean calcium intakes by the number of reported injuries that caused a missed practice or game in the past year. Mean total diet calcium of athletes with five or more injuries that caused a missed practice or game was significantly higher at 1966 mg (P<.05) than athletes mean diet calcium with zero, one, two, and three injuries. Mean total dairy calcium intake was also significantly higher at 1748 mg in athletes who reported five or more injuries that caused a missed practice or game (p<.05) than those who reported zero, one, two, and three injuries. No significant difference was found between the total milk calcium intakes and number of injuries that caused a missed practice or game. Table 8 shows the comparison between the number of total injuries that resulted in broken or fractured bones or dislocated joints with mean calcium intakes. Total milk calcium of those who reported three injuries that resulted in broken or fractured bones or dislocated joints was significantly different (P<.05) at 1286 mg of total milk calcium than those who reported having zero, one, or two breaks or fractures. Table 9 shows the comparison of mean calcium intakes with reported injuries that resulted in injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches. Those who reported three injuries had significantly higher total diet

calcium intake (P<.05) at 2063 mg than those who reported zero, or one injuries that resulted in injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches. When looking at total dairy calcium, athletes who reported three injuries had significantly different mean dairy calcium intake (P<.05) than those who reported zero, one, and four injuries that resulted in injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches. When looking at total milk calcium, those who reported three injuries had significantly higher total milk calcium intake (P<.05) than those who reported zero, one, and four injuries that resulted in injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches.

**Table 6**

Mean ± st. deviation of calcium intake in milligrams by age .

| AGE (years) | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|
| | n=2 | n=6 | n=16 | n=11 | n=8 |
| **Total Diet Calcium (mgs)** | | | | | |
| Mean* | 440a | 1270 | 1297b | 1234 | 1002 |
| Std Dev | 404 | 177 | 641 | 649 | 403 |
| | | | | | |
| **Total Dairy Calcium (mgs)** | | | | | |
| Mean | 402 | 1192 | 1206 | 1107 | 922 |
| St Dev | 387 | 205 | 611 | 632 | 383 |
| | | | | | |
| **Total Milk Calcium (mgs)** | | | | | |
| Mean | 225 | 844 | 754 | 698 | 561 |
| St Dev | 234 | 282 | 397 | 611 | 350 |

*Means with different superscripts are significantly different at p<0.05

**Table 7**

Mean ± st. deviation of calcium intake in milligrams by frequency of injuries that caused a missed practice or game in the past year.

| Total Injuries | 0 | 1 | 2 | 3 | 4 | 5 and Over |
|---|---|---|---|---|---|---|
| | n=7 | n=13 | n=10 | n=6 | n=5 | n=2 |
| **Total Diet Calcium (mgs)** | | | | | | |
| Mean* | 1003a | 1118a | 1051a | 1309a | 1399 | 1966b |
| Std Dev. | 552 | 583 | 498 | 353 | 716 | 496 |
| **Total Dairy Calcium (mgs)** | | | | | | |
| Mean | 917a | 1041a | 950a | 1183a | 1317 | 1748b |
| St. Dev | 541 | 559 | 451 | 319 | 711 | 474 |
| **Total Milk Calcium (mgs)** | | | | | | |
| Mean | 596 | 634 | 550 | 802 | 934 | 1099 |
| Std. Dev. | 480 | 413 | 356 | 280 | 705 | 384 |

*Means are significantly different based on paired t-test by $p<0.05$

**Table 8**

Mean ± st. deviation of calcium intake in milligrams by frequency of injuries that resulted in broken or fractured bones or dislocated joints.

| **Total Injuries** | **0** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|
| | n=22 | n=14 | n=3 | n=3 | n=1 |
| **Total Diet Calcium (mgs)** | | | | | |
| Mean | 1101 | 1181 | 904 | 1771 | 2039 |
| Std Dev. | 116 | 145 | 315 | 315 | 546 |
| | | | | | |
| **Total Dairy Calcium (mgs)** | | | | | |
| Mean | 1017 | 1079 | 846 | 1648 | 1919 |
| St. Dev | 112 | 140 | 303 | 303 | 526 |
| | | | | | |
| **Total Milk Calcium (mgs)** | | | | | |
| Mean* | 642a | 651a | 480a | 1286b | 1193 |
| Std. Dev. | 89 | 112 | 241 | 241 | 418 |

* Means are significantly different at p<0.05 using paried t-test

**Table 9**

Mean ± st. deviation of calcium intake in milligrams by frequency of injuries that required X-rays, MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or cruches.

| **Total Injuries** | **0** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| | n=9 | n=20 | n=6 | n=3 | n=4 | n=1 |
| **Total Diet Calcium (mgs)** | | | | | | |
| Mean* | 1006a | 990a | 1419 | 2063b | 1324 | 1966 |
| Std Dev. | 165 | 110 | 202 | 286 | 248 | 496 |
| **Total Dairy Calcium (mgs)** | | | | | | |
| Mean | 922a | 911a | 1327 | 1989b | 1175a | 1748 |
| St. Dev | 158 | 106 | 193 | 273 | 237 | 474 |
| **Total Milk Calcium (mgs)** | | | | | | |
| Mean | 499a | 574a | 900 | 1441b | 733a | 1099 |
| Std. Dev. | 128 | 86 | 156 | 221 | 192 | 384 |

*Means are significantly different at $p<0.05$ using paired t-test

Table 10 shows mean calcium intake by sport played. Mean total diet calcium was higher for those who played baseball or softball at 1285 mg. The next highest mean total diet calcium intake was cross country at 1105 mg, followed by soccer at 1048 mg. The lowest mean total diet calcium intake was those who reported playing another sport with 561 mg of intake. Mean total dairy calcium intake was highest for those who played baseball or softball at 1192mg. The next highest mean total dairy calcium intake was cross country at 1060mg, followed by track at 947 mg. The lowest reported mean total dairy calcium intake was with those who reported playing basketball at 501 mg. Mean total milk calcium was highest for those who reported playing baseball or softball at 759 mg. Those who reported playing basketball had a mean milk intake of 749 mg, followed by cross country at 634 mg. The lowest mean milk calcium intake was 161 mg with those who reported playing another sport.

Table 11 shows calcium and protein supplement use among the participants. For calcium supplements, 48% reported using them. The majority did not know what kind of calcium supplement they took at 85.7%. Protein supplement use was slightly higher at 51% reporting they used a protein supplement. Of those who used protein supplements 68.1% did not know what kind they took and 14% reported using “whey” protein.

**Table 10**
Mean calcium intake by sport.

| Sport | Basketball | Soccer | Cross Country | Track | Baseball/Softball | Other |
|---|---|---|---|---|---|---|
| | n=10 | n=6 | n=2 | n=3 | n=31 | n=4 |
| **Total Diet Calcium** | | | | | | |
| Mean | 916 | 1048 | 1105 | 999 | 1285 | 561 |
| Std Dev. | 175 | 233 | 405 | 329 | 98 | 267 |
| | | | | | | |
| **Total Dairy Calcium** | | | | | | |
| Mean | 501 | 920 | 1060 | 947 | 1192 | 516 |
| St. Dev | 137 | 223 | 389 | 317 | 94 | 258 |
| | | | | | | |
| **Total Milk Calcium** | | | | | | |
| Mean | 749 | 616 | 634 | 489 | 759 | 161 |
| Std. Dev. | 75 | 182 | 315 | 256 | 77 | 205 |

**Table 11**
Reported supplement use of high school athletes. (n=43)

| | Calcium Supplement |
|---|---|
| | **Percent (n)=** |
| **Yes** | 48.8% (21) |
| **No** | 51.2% (22) |
| **Total** | 43 |
| | **Calcium Supplement Brand** |
| **One Source-Teer** | 4.7% (1) |
| **Hy-Vee Brand** | 4.7% (1) |
| **Calcium Lactate** | 4.7% (1) |
| **Don't know** | 85.7% (18) |
| **Total** | 21 |
| | **Protein Supplement** |
| **Yes** | 51.2% (22) |
| **No** | 48.8% (21) |
| **Total** | 43 |
| | **Protein Supplement Brand** |
| **Whey** | 13.6% (3) |
| **Weight Gainer** | 4.5% (1) |
| **Max Protein** | 4.5% (1) |
| **Mass Ultimate** | 4.5% (1) |
| **Gourmet Gainer** | 4.5% (1) |
| **Don’t know** | 68.1% (15) |
| **Total** | 22 |

Table 12 shows mean calcium intake by stress fractures, Those athletes who reported having stress fractures had significantly higher calcium intakes ($p<0.05$) than those athletes who did not report stress fractures. Total diet calcium intake was significantly higher in the stress fracture group with 1460 mg. It was also significantly higher in both the total dairy calcium and total milk calcium intakes with 1361 mg and 970 mg respectively.

**Table 12**
Mean ± st. deviation of calcium intake in milligrams by stress fractures.

| **Have you ever had a stress fracture?** | **Yes** | **No** |
|---|---|---|
| | n=12 | n=31 |
| **Total Diet Calcium (mgs)** | | |
| Mean* | 1460a | 1074b |
| Std Dev | 552 | 542 |
| | | |
| **Total Dairy Calcium (mgs)** | | |
| Mean | 1361a | 985b |
| St Dev | 551 | 511 |
| | | |
| **Total Milk Calcium (mgs)** | | |
| Mean | 970a | 583b |
| St Dev | 482 | 393 |

*Means with different superscripts are significantly different at p<0.05

## Discussion

Research has shown that adolescent athletes have an increased need for nutrients as they grow and mature. They also have an increased need for nutrients in order to recover from the effects of sport training and competition. According to Petrie and Stover, there is no precise data on protein requirements of young athletes, but with the combination of increased training intensity and increased training volume protein turnover would be increased leading to an increased need for protein in sports participation as well (4). Of all the nutrients adolescents need, calcium is especially important for bone development, and milk is the most abundant source of this nutrient in children's diets. The institutes of Medicine in 1994 found that 73% of all calcium in the U.S food supply was from milk products (16). A problem that has been identified is that children do not consume the recommended amount of milk per day which in turn leaves them deficient in calcium intake overall. The Centers for Disease found in 2005 that only 13.1% of females and 23.9% of males drank three or more glasses of milk per day (20).

This pilot-study was designed to examine calcium intake in Lincoln, Nebraska high school athletes and compare their calcium intake with their self-reported injuries. The analysis of the data provided some interesting results. The majority of athletes that participated in the study were in the second half of their high school years. This lead to the sample being made up of mostly older high school students. Gathering information on gender was not successful. Only 56% of respondents reported their gender the remainder left the answer blank. It

was surprising that such a large percentage of participants did not answer the gender question. This may have been because that the question on the survey was not easy to see or was not in a prominent place on the survey. Baseball/softball and basketball players had the highest amount of survey participation. This was expected since the surveys were delivered in the spring when these sports are in season. To get a wider variety of sport representation surveys could be delivered at multiple times throughout the year to include more athletes.

Mean and median total diet calcium was found to be below the 1300 mg AI for calcium in this age group. This is similar to other research which has shown that high school students are not meeting recommendations for calcium intake (10). Zanecosky found that many teenagers eat away from their homes much of the time. They also tend to choose foods that are calcium deficient and foods that interfere with calcium absorption, like soft drinks (10). Calcium intake totals from milk had similar results as intake of total diet calcium. Recommendations are for three eight ounce glass servings of milk per day which is about 900 mg of milk calcium per day. This study found that median intake was 677mg or approximately 2.25 servings of milk per day. For young athletes though, the recommendation is as high as1200-1500 mg/day or 4-5 glasses of milk per day (5, 15).

Data that was gathered on injuries was interesting. Injuries that caused the athletes to miss a practice or game were mostly found in the lower body joints like ankles and knees as well as the hands. This is most likely due to the

fact that the majority of the subjects played basketball and baseball/softball where these injuries are common injuries sustained. These areas of the body which were injured are similar to what Adirim and colleagues found. They found that contusions and strains are the most common injuries seen in the ankle, knee, hand, wrist, elbow, shin, calf, neck and clavicle (24).

The ages of the athletes when compared to their calcium intake had very little significance. Only the sixteen year olds had a significantly higher intake than the fourteen year old athletes. This may be because as the athletes get older they become more aware of what they are eating or it may be a statistical error since only two fourteen year olds were surveyed. This result is troubling if this correlation holds true in future research. The Institutes of Medicine (IOM) found that maximum bone accretion is at 13 years for girls and 14.5 years of age for boys (16). Clark and colleagues found that the peak age of all childhood fractures is around 14 years for boys and 11 years of age for girls (44). Comparing the data from the IOM and Clark's research, the peak in fractures is happening before boys or girls ever reach peak bone mass. Clark noted that fractures in childhood are a marker for low peak bone mass and skeletal fragility. Waiting until after the children have reached the age of peak bone mass to begin vigorous sports participation may reduce the incidence of fractures in young athletes.

When looking at calcium intake by frequency of injuries, a very interesting correlation was seen. Those athletes who had the most injuries either resulting in a break, fracture or dislocation or had injuries that caused a missed practice or

game had a significantly higher calcium intake than their peers. In other words, an athlete who consumed more calcium was more likely miss a practice or game from injury or suffer a break, fracture or dislocation. One reason this correlation was found may be because athletes who are more active tend to eat more food, which would give them a better opportunity to consume more calcium. Moderate high impact activities including running and jumping have had positive skeletal effects in children (44). The key word is moderate activity. Moderation is important because research has shown that with increased activity or with increased sports participation injury is more likely. According to Clark and colleagues physical activity may not be protective of injuries to adolescent boys or girls (44). This study may have shown this same result. Those athletes with increased calcium intake are assumed to be more active because they eat more, which causes their mean calcium intake to be higher. It is the increased activity that is putting them at increased risk of injury more than the protective nature of high calcium intake and increased bone mineral density.

Another way to look at the data is that those athletes who have the greatest number of injuries have had someone like a doctor, coach, or parents tell them to drink more milk because they have had a stress fracture or some other sort of injury in the past. Those athletes who reported having stress fractures had significantly higher calcium intakes. If they continue to have injuries throughout the year people's advice to drink more milk may have accounted for the significantly higher calcium intake for those athletes who had more injuries.

Looking at the answers from some of the injury questions it is seen that 76.7% of the respondents said that they are happy with their weight yet, 23.2% said they want to lose weight and 23.2% said that they would like to gain weight. This means that even though a majority of the participants were happy with their weight some of them are still trying to alter their weight either up or down. Another 23.2% said that someone has recommended that they change their weight or eating habits. This shows that even though the athletes are saying that they are happy with their weight a third party is telling them they need to adjust their current weight or eating habits. If this third party is not qualified to provide sound, research based recommendations to the young athletes then they may be doing more harm than good by giving the athletes advice. Only 9.3% of participants reported speaking with a professional (Registered Dietitian) about food, weight or nutrition issues. If this finding holds true in other research then the advice about food and weight is coming from third party providers who most likely are not qualified to be giving this sort of advice to these adolescent athletes. Not only may they be unqualified, but the information they are providing may be hurting the athletes who use it.

# CHAPER III

# CONCLUSIONS

The purpose of this pilot study was to develop a study that could examine the intake of calcium containing foods in the diets of high school athletes and compare those intakes to self reported injury rates.

The results indicate that older adolescents are more likely to have a higher calcium intake than their younger peers. In the group of subjects that were part of the study, a majority of them played basketball and softball/baseball and among these sports the most prevalent injuries were to those of the lower extremity joints, hands and shoulders. With increased calcium intake there was an increased risk of injury. Athletes who had four or more injuries had a significantly higher calcium intake than any athletes with fewer numbers of injuries, yet they still sustained the increased number of injuries. This may be due to the fact that daily or more vigorous physical activity increases fracture risk more than the protective nature of high calcium intake and high bone mineral density. The athletes who have a greater number of injuries also had the greatest amount of calcium intakes. These athletes may have had a third party, coach, MD, family member who have advised them to consume more milk or calcium containing foods since they are sustaining more injuries.

## LIMITATIONS

Several limitations were present in this study. The total number of subjects was relatively small which gave little statistical power to the data. Only a few sports were represented since only sports that were in season during the time in which the study was conducted were available to take the survey. Some data was missing, such as the sex of the subjects due to lack of response from the subjects.

One of the more common limitations to a study of this design is respondent burden. All the responsibility for getting the information accurate is put onto the subjects and with the length of this survey getting accurate answers was most likely difficult.

Limitations of food frequencies as previously mentioned have limitations since they only present a calculated estimate of daily nutrient intake, not the actual amount.

## FUTURE RESEARCH

An area for future research is to use most of this pilot-study design for gathering data on the same population. Some aspects of the methodology procedure should be improved upon to result in more thorough data collection. Collecting additional data such as protein and calorie intake could be beneficial in determining causes of injuries.

Distributing surveys at multiple -times though out the year would allow a wider variety of sports to be included. Removing the first 68 questions from the FFQ would decrease the respondent burden and might make it more likely subjects would complete and turn in their questionnaires. Making sure that the sex of the participants was recorded would be very beneficial in future research.

Gathering additional data about athletic participation including but not limited to; length and number of practices, length and number of games length and number of strength training workout session and length and number of cardiovascular workout sessions. Data correlating the sports played with injuries and nutrients could also be of use in determining which athletes are more likely to be injured related to which nutrient.

Data related to the timing and amount of milk intake throughout the athlete's day would be beneficial in determining milk's effect as an ergogenic aide.

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## Appendix A-1

**Institutional Review Board Approval Letter**

University of Nebraska Lincoln

January 25, 2010

Jeffrey Ebert
Department of Nutrition and Health Sciences
3811 Eagle Ridge Rd #12 Lincoln, NE 68516

Wanda Koszewski
Department of Nutrition and Health Sciences
120C LEV UNL 68583-0806

IRB Number: 20100110358EP
Project ID: 10358
Project Title: Relationship of milk and calcium intake and frequency of injuries of high school athletes

Dear Jeffrey:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46).

Date of EP Review: 12/24/2009

You are authorized to implement this study as of the Date of Final Approval: 01/25/2010. This approval is Valid Until: 01/24/2011.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

- Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
- Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
- Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
- Any breach in confidentiality or compromise in data privacy related to the subject

or others; or
• Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,

Mario Scalora, Ph.D.
Chair for the IRB

## Appendix A-2

**LPS Approval Letter**

# Lincoln Public Schools

5901 O Street • Box 82889 • Lincoln, NE 68501 • (402) 436-1790

RR

10-35
December 11, 2009

Jeff Ebert
3811 Eagle Ridge Rd., #12
Lincoln, NE 68516

RE: Request to Conduct Research in the Lincoln Public Schools

Dear Mr. Ebert:

Your request to conduct a study entitled, “Relationship of milk and calcium intake and frequency of injuries of high school athletes” with student athletes enrolled at a Lincoln Public School high school is approved. Parental consent and youth assent are required for this study. Please use the form and script submitted with your request.

Sincerely,

Leslie E. Lukin

Leslie E. Lukin, Ph.D.
Director of Assessment and Evaluation Services

cc: Mary Bell Avery, Health and Physical Education Curriculum Specialist
John Neal, Director of Secondary Education
Kay Byers, Supervisor of Elementary Personnel Services

Title of Research: Relationship of milk and calcium intake and frequency of injuries of high school athletes

## Appendix A-3

**Food Frequency Questionnaire**

# HOW DO YOU FEEL ABOUT WHAT YOU EAT AND DRINK?

The following are statements about how you feel about what you eat and drink. Fill in the circle on your two attached *green* answer sheets that indicates how much you agree or disagree with the statement. If the statement does not apply to you or you are not familiar with what is being asked, fill the circle corresponding to **Do Not Know**.

Ⓐ Ⓑ Ⓒ Ⓓ ●

**Fill in the bubble with your answer completely.**

**1. Milk tastes good.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**2. Whole milk is too thick.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**3. Skim milk tastes gross.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**4. To taste good, milk needs to be cold.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**5. Milk is high in calories.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**6. I eat cereal with milk.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**7. Milk goes great with spaghetti.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**8. Milk goes great with cookies.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**9. Milk goes great with peanut butter and jelly sandwiches.**

**A)** Strongly Disagree
**B)** Disagree
**C)** Neither Agree or Disagree
**D)** Agree
**E)** Strongly Agree
**F)** Do Not Know

**10. Milk goes great with chocolate cake.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**11. Milk hits the spot.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**12. I like soy milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**13. I love chocolate milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**14. Flavored milk is the only kind of milk I like to drink.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**15. I like to add flavor to my milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**16. My mother makes me drink milk every day.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**17. My dad makes me drink milk every day.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**18. Everyone in my family drinks milk every day.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**19. My mother drinks milk every day.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**20. My dad drinks milk every day.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**21. My family makes me take calcium supplements.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**22. Most of the time there is milk at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**23. There are so many beverages to choose from that milk is usually my last choice.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**24. Most of the time there are fruit drinks at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**25. Most of the time there is soda pop at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**26. I drink whatever I want. It doesn't matter what my friends drink.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**27. I drink milk because my coach says to.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**28. I drink whatever my friends drink.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**29. I am allergic to milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**30. I get a stomachache after drinking milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**31. I drink milk because it is good for me.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**32. I drink milk to help me grow.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**33. I drink milk so I can have strong bones now.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**34. If I drink milk now, my bones will be strong when I am older.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**35. Milk is not healthy.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**36. I am trying to lose weight, so I don't drink milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**37. I know that it is important for people my age to drink milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**38. I have been told that milk will make my stomach hurt after I drink it.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**39. I don't drink milk because it is fattening.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**40. I never drink milk when I go out to eat.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**41. When I am at my grandma's I drink milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**42. Most of the time the milk at school is warm.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**43. I don't drink milk at a fast food restaurant.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**44. Milk at school tastes bad.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**45. I don't drink milk after sports or exercise.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**46. I buy soda pop because it is cheaper than milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**47. My parents limit the amount of milk I drink because it is expensive.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**48. Soda pop and other drinks are easier to take with you than milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**49. Only little kids need milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**50. I always have milk with breakfast.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**51. I always have milk with lunch.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**52. I always have milk with dinner.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**53. I always have milk with snacks.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**54. When it is cold outside, I like to drink hot cocoa.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**55. When it is hot outside, I like to drink milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**56. Now that I am older, I'd rather drink soda pop or coffee instead of milk.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**57. Most of the time there is cereal at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**58. Most of the time there is yogurt at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**59. Most of the time there is ice cream at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**60. Most of the time there are vegetables at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**61. I like green vegetables.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**62. I like coffee drinks like, Lattes, Mochas, and Cappuccinos.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**63. I like to eat seaweed.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**64. I like to eat pudding.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**65. I like stir fry dinners.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**66. I like tofu.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**67. Most of the time there are corn tortillas at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

**68. Most of the time there is cheese at home.**

A) Strongly Disagree
B) Disagree
C) Neither Agree or Disagree
D) Agree
E) Strongly Agree
F) Do Not Know

## ABOUT YOU

**Tell us about yourself. Fill in the bubble that best answers each question.**

**69. What grade are you in?**

**A)** 8th Grade or below
**B)** 9th Grade
**C)** 10th Grade
**D)** 11th Grade
**E)** 12th Grade

**70. How old are you?**

**A)** 13 years old or under
**B)** 14 years old
**C)** 15 years old
**D)** 16 years old
**E)** 17 years old
**F)** 18 years old
**G)** 19 years old or older

**71. Who lives in your home? (Mark all that apply)**

**A)** Mother
**B)** Father
**C)** Sister(s)
**D)** Brother(s)
**E)** Grandmother(s)
**F)** Grandfather(s)
**G)** Aunt(s)
**H)** Uncle(s)
**I)** Cousin(s)
**J)** Dogs, Cats, or other pets
**K)** Other

**72. Gender**

**A)** Male
**B)** Female

**72. Which of the following do you consider yourself to be?**

**A)** American Indian or Alaska Native (for example, Sioux, Arapaho, Apache, Pima, Cherokee, Navajo, Hopi, and others)
**B)** Asian or Asian American (for example, Chinese, Japanese, Laotian, Vietnamese, Thai, Filipino, Hmong, and others)
**C)** Black or African American
**D)** Hispanic or Latino (for example, Mexican, Cuban, Puerto Rican, and others)
**E)** Native Hawaiian or other pacific Islander (for example, Samoan, Tongan, Micronesian, and others)
**F)** White or Caucasian (for example, Italian, German, English, Scandinavian, Greek, Russian and others)
**G)** Other

**73. Which sport(s) do you participate in?**

**A)** Basketball
**B)** Soccer
**C)** Cross Country
**D)** Track (middle and long distance)
**E)** Softball/Baseball
**F)** Other

**74. Which high school do you go to?**

**A) Lincoln High**
**B) North Star**
**C) Lincoln Northeast**
**D) Lincoln Southeast**
**E) Lincoln Southwest**
**F) Lincoln East**
**G) Other**

# WHAT YOU EAT AND DRINK

**The following sections refer to the foods you ate over the past month.**
**If you do not know what a food is, you probably do not eat it.**

*For example,* if you drink one cup or one carton of milk one time per week, then your answer would be:

**Milk (1 cup or 1 carton)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 - 6 cups per week
**E)** 2 – 3 cups per day
**F)** 4 or more cups per day

***** **Fill in the bubble on your separate answer sheet with your answer.** *****

## Beverages

**Fill in one bubble on your separate answer sheet for each food item. The following statements refer to what you ate over the past month.**

**75. Soda pop, any type (1 can or 1 glass)**

**A)** Never or less than once per month
**B)** 1 – 3 cans per month
**C)** 1 can per week
**D)** 2 – 6 cans per week
**E)** 1 can per day
**F)** 2 or more cans per day

**76. Fruit flavored drink such as Hawaiian Punch®, lemonade, Kool-Aid®, or other non-carbonated fruit drink (1 glass or 1 juice box)**

**A)** Never or less than once per month
**B)** 1 – 3 glasses per month
**C)** 1 glass per week
**D)** 2 – 6 glasses per week
**E)** 1 glass per day
**F)** 2 more glasses per day

**77. Orange Juice (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 – 6 servings per week
**E)** 1 serving per day
**F)** 2 or more servings per day

**a. Is the orange juice you drink fortified with calcium?**

**A)** Yes
**B)** No
**C)** Don't know

**78. Café latte, Café Mocha, Cappuccino, or Café Au Lait (1 tall or 1 large)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 – 6 cups per week
**E)** 1 cup per day
**F)** 4 or more cups per day

**79. Coffee or tea (1 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 – 6 cups per week
**E)** 1 cup per day
**F)** 2 or more cups per day

**80. Cocoa (hot chocolate) made with milk (1cup)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 – 6 cups per week
**E)** 1 cups per day
**F)** 2 or more cups per day

## DAIRY PRODUCTS

**Fill in one bubble for each food item. The following statements refer to what you ate over the past month.**

**81. Milk to drink, white or chocolate (1 cup or carton)**

A) Never or less than once per month
B) 1 – 3 cups per month
C) 1 cup per week
D) 2 – 6 cups per week
E) 1 cup per day
F) 4 or more cups per day

**82. Milk on cereal ( 1 bowl)**

A) Never or less than once per month
B) 1 – 3 bowls per month
C) 1 bowl per week
D) 2 – 4 bowls per week
E) 5-7 bowls per week
F) 2 or more bowls per day

**83. Soy milk (1 cup)**

A) Never or less than once per month
B) 1 – 3 cups per month
C) 1 cup per week
D) 2 – 6 cups per week
E) 1 cup per day
F) 4 or more cups per day

**84. Instant breakfast drink such as Carnation Instant Breakfast® (1 packet or 1 glass)**

A) Never or less than once per month
B) 1 – 3 glasses per month
C) 1 glass per week
D) 2 – 6 glasses per week
E) 1 glass per day
F) 2 - 3 glasses per day
G) 4 or more glasses per day

**85. Yogurt, not frozen (1 container)**

A) Never or less than once per month
B) 1 – 3 containers per month
C) 1 container per week
D) 2 – 6 containers per week
E) 1 container per day
F) 2 or more containers per day

**86. Blended yogurt and juice drink or yogurt drink (1 glass or 1 large)**

A) Never or less than once per month
B) 1 – 3 glasses per month
C) 1 glass per week
D) 2 – 6 glasses per week
E) 1 glass per day
F) 2 or more glasses per day

**87. Pudding, custard, or flan (1 snack pack or ½ cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 – 6 servings per week
E) 1 serving per day
F) 2 or more servings per day

**88. Frozen yogurt or ice cream (1/2 cup or 1 scoop or 1 bar)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 – 6 servings per week
E) 1 serving per day
F) 2 or more servings per day

**89. Milk shake, malt, or frappe (1 shake, 1 malt, or 1 frappe)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 – 6 servings per week
E) 1 serving per day
F) 2 or more servings per day

**90. Cheese (1 slice, 1 stick, or 1 inch cube)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 – 6 servings per week
**E)** 1 serving per day
**F)** 2 or more servings per day

**91. Cheese spread orange-colored, such as Cheez Whiz® (2 tablespoons)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

**92. Cottage cheese (½ cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

## COMBINATION FOODS

**Fill in one bubble for each food item. The following statements refer to what you ate over the past month.**

**93. Macaroni and cheese (1 cup)**

A) Never or less than once per month
B) 1 – 3 cups per month
C) 1 cup per week
D) 2 – 4 cups per week
E) 5 or more cups per week

**94. Lasagna with cheese, cheese tortellini, or cheese ravioli (1 cup or 1 serving)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**95. Nachos with cheese (6 – 8 nachos)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**96. Hamburger or hot dog without cheese on a bun (1 hamburger or 1 hot dog)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**97. Hamburger or hot dog with cheese on a bun (1 hamburger or 1 hotdog)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**98. Breakfast sandwich with cheese (1 sandwich)**

A) Never or less than once per month
B) 1 – 3 sandwich per month
C) 1 sandwich per week
D) 2 - 4 sandwich per week
E) 5 or more sandwich per week

**99. Grilled cheese sandwich.**

A) Never or less than once per month
B) 1 – 3 sandwich per month
C) 1 sandwich per week
D) 2 - 4 sandwich per week
E) 5 or more sandwich per week

**100. Pizza (1 slice)**

A) Never or less than once per month
B) 1 – 3 slice per month
C) 1 slice per week
D) 2 - 4 slices per week
E) 5 or more slices per week

**101. Enchilada, beef, chicken, or pork (1 enchilada)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**102. Enchilada: cheese (1 enchilada)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**103. Bean burrito (1 burrito)**

**A)** Never or less than once per month
**B)** 1 – 3 burritos per month
**C)** 1 burrito per week
**D)** 2 - 4 burritos per week
**E)** 5 or more burritos per week

**104. Taco (1 taco)**

**A)** Never or less than once per month
**B)** 1 – 3 tacos per month
**C)** 1 taco per week
**D)** 2 - 4 tacos per week
**E)** 5 or more tacos per week

**105. Tamales (1 tamale)**

**A)** Never or less than once per month
**B)** 1 – 3 tamales per month
**C)** 1 tamale per week
**D)** 2 - 4 tamales per week
**E)** 5 or more tamales per week

**106. Quesadillas (1 quesadilla)**

**A)** Never or less than once per month
**B)** 1 – 3 quesadillas per month
**C)** 1 quesadilla per week
**D)** 2 - 4 quesadillas per week
**E)** 5 or more s quesadillas per week

**107. Chile relleno (1 chile)**

**A)** Never or less than once per month
**B)** 1 – 3 chiles per month
**C)** 1 chile per week
**D)** 2 - 4 chiles per week
**E)** 5 or more s chiles per week

**108. Soup or chowder made with milk (1 cup)**
**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 – 4 cups per week
**E)** 5 or more cups per week

**109. Stir fry vegetables, no meat (1 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 or more cups per week

**110. Stir fry shrimp and vegetables (1 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 or more cups per week

**111. Stir fry beeg, pork, or chicken and vegetables (1 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 cups per month
**C)** 1 cup per week
**D)** 2 or more cups per week

## VEGETABLES, GRAINS, and NUTS

**Fill in one bubble for each food item. The following statements refer to what you ate over the past month.**

**112. Broccoli, cooked (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 - 4 servings per week
**E)** 5 or more servings per week

**113. Broccoli (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 - 4 servings per week
**E)** 5 or more servings per week

**114. Dark green leafy vegetables such as spinach leafy greens, bok choy, or taro leaves (1/2 cup cooked)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 - 4 servings per week
**E)** 5 or more servings per week

**115. Carrots, cooked or raw (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 - 4 servings per week
**E)** 5 or more servings per week

**116. Kimchee or pickles cabbage (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 - 4 servings per week
**E)** 5 or more servings per week

**117. How often do you eat cheese on vegetables?**

**A)** Never or less than once per month
**B)** 1 – 3 times per month
**C)** 1 time per week
**D)** 2 - 4 times per week
**E)** 5 or more times per week

**118. How often do you eat cold cereal? (1 bowl or 1 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 bowls per month
**C)** 1 bowl per week
**D)** 2 - 4 bowls per week
**E)** 5 – 7 bowls per week
**F)** 2 or more bowls per day

**119. What is the name of the cereal you eat most often?**

**120. Bread, toast, or pita (1 slice or 1 pita)**

**A)** Never or less than once per month
**B)** 1 slice per week
**C)** 2 – 4 slices per week
**D)** 5 - 7 slices per week
**E)** 2 – 3 slices per day
**F)** 4 or more bowls per day

**121. Muffin, any type (1 large muffin)**

**A)** Never or less than once per month
**B)** 1 – 3 muffins per month
**C)** 1 muffin per week
**D)** 2 - 4 muffins per week
**E)** 5 or more muffins per week

**122. Pancakes, waffles, or French toast (1 pancake, 1 waffle, or 1 slice)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**123. Bagel (1 bagel)**

A) Never or less than once per month
B) 1 – 3 bagels per month
C) 1 bagel per week
D) 2 - 4 bagels per week
E) 5 or more bagels per week

**124. Hominy or posole (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**125. Atole (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**126. Polenta (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**127. Miso (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**128. Corn tortilla, yellow (1 tortilla)**

A) Never or less than once per month
B) 1 – 3 tortillas per month
C) 1 tortilla per week
D) 2 - 4 tortillas per week
E) 5 or more tortillas per week

**129. Flour tortilla, white (1 tortilla)**

A) Never or less than once per month
B) 1 – 3 tortillas per month
C) 1 tortilla per week
D) 2 - 4 tortillas per week
E) 5 or more tortillas per week

**130. Poi made from taro (1 cup)**

A) Never or less than once per month
B) 1 – 3 cups per month
C) 1 cup per week
D) 2 – 4 cups per week
E) 5 or more cups per week

**131. White rice, cooked (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**132. Mashed potatoes (1 cup)**

A) Never or less than once per month
B) 1 – 3 cups per month
C) 1 cup per week
D) 2 – 4 cups per week
E) 5 or more cups per week

**133. Whole cooked beans such as kidney, pinto, or baked beans (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**134. Adzuki bean foods such as mocha (1 piece or ½ cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**135. Refried beans (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**136. Soybeans, cooked (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**137. Natto or fermented soybean (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**138. Tofu (1/2 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

**139. Almonds (1/3 cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 4 servings per week
E) 5 or more servings per week

## SEAFOOD

**Fill in one bubble for each food item. The following statements refer to what you ate over the past month.**

**140. Shellfish such as shrimp or scallops (1/2 cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

**141. Sardines, smelts, or herring (1 serving)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

**142. Salmon or chum, canned (1 serving)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

**143. Mixed seafood such as poke or sushi (1 serving or ½ cup)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

**144. Small dried fish (1 teaspoon)**

**A)** Never or less than once per month
**B)** 1 – 3 servings per month
**C)** 1 serving per week
**D)** 2 or more servings per week

## OTHER FOODS

**Fill in one bubble for each food item. The following statements refer to what you ate over the past month.**

**145. Cheese and crackers snack packs such as Snackables (1 pack)**

A) Never or less than once per month
B) 1 – 3 packs per month
C) 1 pack per week
D) 2 or more packs per week

**146. Granola bar with chocolate (1 bar)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**147. NutriGrain® or NutriGrain Twist® bar (1 bar)**

A) Never or less than once per month
B) 1 – 3 bar per month
C) 1 - 4 bars per week
D) 5 or more bars per week

**148. Cream pie such as banana, chocolate, pumpkin, or coconut (1 slice)**

A) Never or less than once per month
B) 1 – 3 slices per month
C) 1 slice per week
D) 2 or more bars per week

**149. Cupcakes or cake (1 slice or 1 cupcake)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**150. Chocolate candy bar ( 1 regular size bar, ½ king size bar, or 1 packet)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**151. Chocolates, chocolate kisses, or bite sized candy bars (3 – 5 pieces)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 - 6 servings per week
E) 1 or more servings per day

**152. Oriental snack mix such as Arare (1 ¼ cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**153. Dry seaweed or nori ( 1 large sheet)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 or more servings per week

**154. Oatmeal, instant (1 packet or ½ cup)**

A) Never or less than once per month
B) 1 – 3 servings per month
C) 1 serving per week
D) 2 – 4 servings per week
E) 5 – 7 servings per week
F) 2 or more servings per day

## SUPPLEMENTS

**155. Do you now take vitamin and mineral supplements such as Flintstones® or One-A-Day®?**

**A)** No (Go to question number 155)
**B)** Yes

**a) How many vitamin and mineral supplements do you take per week?**
**A)** 2 or less pills per week
**B)** 3 – 6 pills per week
**C)** 5 – 9 pills per week
**D)** 10 or more pills per week

**b) For how many years have you taken them?**
**A)** 0 – 1 year
**B)** 2 – 4 years
**C)** 5 – 9 years
**D)** 10 or more years

**c) What brand of vitamin and mineral supplement do you take?**
**A)**
**B)** Don't know

**156. Do you now take a calcium supplement?**

**A)** No (go to question 157)
**B)** Yes

**a) How many calcium supplements do you take per week?**
**A)** 2 or less pills per week
**B)** 3 – 6 pills per week
**C)** 5 – 9 pills per week
**D)** 10 or more pills per week

**b) For how many years have you taken them?**
**A)** 0 – 1 year
**B)** 2 – 4 years
**C)** 5 – 9 years
**D)** 10 or more years

**c) What brand of calcium supplement do you take?**
**A)**
**B)** Don't know

**157) Do you now take a vitamin D supplement?**

**A)** No (Go to question number 158)
**B)** Yes

**a) How many vitamin D supplements do you take per week?**
**A)** 2 or less pills per week
**B)** 3 – 6 pills per week
**C)** 5 – 9 pills per week
**D)** 10 or more pills per week

**b) For how many years have you taken them?**
**A)** 0 – 1 year
**B)** 2 – 4 years
**C)** 5 – 9 years
**D)** 10 or more years

**c) What brand of vitamin D supplement do you take?**
**A)**
**B)** Don't know

**158) Do you now take a protein supplement?**

**A)** No (Go to question 159)
**B)** Yes

**a) How many times do you take a protein supplement per week?**
**A)** 2 or less times per week
**B)** 3 – 6 times per week
**C)** 5 – 9 times per week
**D)** 10 or more times per week

**b) For how many years have you taken a protein supplement?**

**A)** 0 – 1 year
**B)** 2 – 4 years
**C)** 5 – 9 years
**D)** 10 or more years

**c) What brand of protein supplement do you take?**

**A)**
**B)** Don't know

**159) Where do you usually eat breakfast?**

**A)** At home
**B)** At school
**C)** Fast food restaurant
**D)** Convenience store
**E)** Don't eat breakfast
**F)** Other

**160) Do you regularly eat breakfast from the school breakfast program?**

**A)** Yes
**B)** No
**C)** Don't know

**161) Do you regularly eat lunch from the school lunch program?**

**A)** Yes
**B)** No
**C)** Don't know

**162) How often do you eat after-school snacks?**

**A)** Never or less than once per month
**B)** less than once per week
**C)** 1 - 2 time per week
**D)** 3 - 4 times per week
**E)** 5 or more times per week

**163) How often do you eat dinner prepared away from home?**

**A)** Never or less than once per month
**B)** less than once per week
**C)** 1 - 2 time per week
**D)** 3 - 4 times per week
**E)** 5 or more times per week

**164) How often do you prepare dinner for yourself and/or others in your household?**

**A)** Never or less than once per month
**B)** less than once per week
**C)** 1 - 2 time per week
**D)** 3 - 4 times per week
**E)** 5 or more times per week

**165) How often do you eat late night snacks prepared away from home?**

**A)** Never or less than once per month
**B)** less than once per week
**C)** 1 - 2 time per week
**D)** 3 - 4 times per week
**E)** 5 or more times per week

**166) How often do you buy food from the school snack bar?**

**A)** Never or less than once per month
**B)** 1 - 2 time per week
**C)** 3 - 4 times per week
**D)** 5 or more times per week
**E)** No snack bar at school

**167) How often do you buy food or drinks from vending machines at your school?**

**A)** Never or less than once per month
**B)** less than once per week
**C)** 1 - 2 time per week
**D)** 3 - 4 times per week
**E)** 5 or more times per week

## Appendix A-4

## Self Reported Injuries Questionnaire

## Physical History

**Please mark your answers on THIS sheet**

**If you answer YES to questions 1-3, circle the affected area of your body. Example: "I strained a tendon in my ankle and could not play for a week" You would circle Ankle.**

**1. Have you ever had an injury, like a sprain, muscle or ligament tear, or tendonitis, that caused you to miss a practice or game? If yes, circle affected area(s) below:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Head | Neck | Shoulder | Upper Arm | Elbow | Forearm | Hand/Fingers | Chest |
| Upper Back | Lower Back | Hip | Thigh | Knee | Calf/Shin | Ankle | Foot/Toes |

**2. Have you had any broken or fractured bones or dislocated joints? If yes, circle affected area(s) below:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Head | Neck | Shoulder | Upper Arm | Elbow | Forearm | Hand/Fingers | Chest |
| Upper Back | Lower Back | Hip | Thigh | Knee | Calf/Shin | Ankle | Foot/Toes |

**3. Have you had a bone or joint injury that required x-rays MRI, CT, surgery, injections, rehabilitation, physical therapy, a brace, a cast, or crutches? If yes, circle affected area(s) below:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Head | Neck | Shoulder | Upper Arm | Elbow | Forearm | Hand/Fingers | Chest |
| Upper Back | Lower Back | Hip | Thigh | Knee | Calf/Shin | Ankle | Foot/Toes |

**4. Have you ever had a stress fracture? Circle your answer.**
A) Yes B) No

**5. Have you been told that you have or have you had an x-ray for atlantoaxial (neck) instability? Circle your answer.**
A) Yes B) No

**6. Do you regularly use a brace or assistive device? Circle your answer.**
A) Yes B) No

**7. When exercising in the heat, do you have severe muscle cramps, get nauseous or become ill? Circle your answer.**
A) Yes B) No

**8. Are you happy with your weight? Circle your answer.**
A) Yes B) No

**9. Are you trying to gain weight? Circle your answer.**
A) Yes B) No

**10. Are you trying to lose weight? Circle your answer.**
A) Yes B) No

**11. Has anyone recommended you change that you weight or eating habits? Circle your answer.**
A) Yes B) No

**12. Have you spoken with a professional (Registered Dietitian) about food, weight, and/or nutrition issues?**
A) Yes B) No

**13. Do you limit or carefully control what you eat? Circle your answer.**
A) Yes B) No

**14. What is the name of the cereal you eat most often?**

**15. If you take a mineral and vitamin supplement, what brand of vitamin and mineral supplement do you take? Write in your answer.**
**A)**

**B)** Don't know

**16. If you take a calcium supplement, what brand of calcium supplement do you take? Write in your answer.**
**A)**

**B)** Don't know

**17. If you take a vitamin D supplement, what brand of vitamin D supplement do you take? Write in your answer.**
**A)**

**B)** Don't know

**18. If you take a protein supplement, what brand of protein supplement do you take? Write in your answer.**
**A)**

**B)** Don't know

## FEMALES ONLY

**19. Have you ever had a menstrual period? Circle your answer.**
A) Yes B) No

**20. How old were you when you had your first menstrual period? Circle your answer.**
A) 12 years or under B) 13 C) 14 D) 15

E) 16 years or older F) Have not had a menstrual period

**21. How many periods have you had in the last 12 months? Circle your answer.**
A) 0 - 1 B) 2 - 4 C) 5 – 6 D) 7 - 8 E) 9 - 11 F) 12

G) More than 12

## Appendix A-5

**American Academy of Pediatrics: Pre-Participation Physical Evaluation**

# PREPARTICIPATION PHYSICAL EVALUATION
# PHYSICAL EXAMINATION FORM

Name _____ Date of birth _____

## PHYSICIAN REMINDERS

1. Consider additional questions on more sensitive issues
   - Do you feel stressed out or under a lot of pressure?
   - Do you ever feel sad, hopeless, depressed, or anxious?
   - Do you feel safe at your home or residence?
   - Have you ever tried cigarettes, chewing tobacco, snuff, or dip?
   - During the past 30 days, did you use chewing tobacco, snuff, or dip?
   - Do you drink alcohol or use any other drugs?
   - Have you ever taken anabolic steroids or used any other performance supplement?
   - Have you ever taken any supplements to help you gain or lose weight or improve your performance?
   - Do you wear a seat belt, use a helmet, and use condoms?
2. Consider reviewing questions on cardiovascular symptoms (questions 5–14).

| EXAMINATION | | |
|---|---|---|
| Height _____ Weight _____ ☐ Male ☐ Female | | |
| BP ____/____ (____/____) Pulse _____ Vision R 20/ _____ L 20/ _____ Corrected ☐ Y ☐ N | | |
| **MEDICAL** | **NORMAL** | **ABNORMAL FINDINGS** |
| Appearance<br>• Marfan stigmata (kyphoscoliosis, high-arched palate, pectus excavatum, arachnodactyly, arm span > height, hyperlaxity, myopia, MVP, aortic insufficiency) | | |
| Eyes/ears/nose/throat<br>• Pupils equal<br>• Hearing | | |
| Lymph nodes | | |
| Heart[a]<br>• Murmurs (auscultation standing, supine, +/- Valsalva)<br>• Location of point of maximal impulse (PMI) | | |
| Pulses<br>• Simultaneous femoral and radial pulses | | |
| Lungs | | |
| Abdomen | | |
| Genitourinary (males only)[b] | | |
| Skin<br>• HSV, lesions suggestive of MRSA, tinea corporis | | |
| Neurologic[c] | | |
| **MUSCULOSKELETAL** | | |
| Neck | | |
| Back | | |
| Shoulder/arm | | |
| Elbow/forearm | | |
| Wrist/hand/fingers | | |
| Hip/thigh | | |
| Knee | | |
| Leg/ankle | | |
| Foot/toes | | |
| Functional<br>• Duck-walk, single leg hop | | |

[a]Consider ECG, echocardiogram, and referral to cardiology for abnormal cardiac history or exam.
[b]Consider GU exam if in private setting. Having third party present is recommended.
[c]Consider cognitive evaluation or baseline neuropsychiatric testing if a history of significant concussion.

☐ Cleared for all sports without restriction

☐ Cleared for all sports without restriction with recommendations for further evaluation or treatment for _____

_____

☐ Not cleared

- ☐ Pending further evaluation
- ☐ For any sports
- ☐ For certain sports _____

Reason _____

Recommendations _____

_____

**I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions arise after the athlete has been cleared for participation, the physician may rescind the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parents/guardians).**

Name of physician (print/type) _____ Date _____

Address _____ Phone _____

Signature of physician _____ MD or DO

## PREPARTICIPATION PHYSICAL EVALUATION
# CLEARANCE FORM

Name _____ Sex ☐ M ☐ F Age _____ Date of birth _____

☐ Cleared for all sports without restriction

☐ Cleared for all sports without restriction with recommendations for further evaluation or treatment for _____

_____

☐ Not cleared

- ☐ Pending further evaluation
- ☐ For any sports
- ☐ For certain sports _____

Reason _____

Recommendations _____

**I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions arise after the athlete has been cleared for participation, the physician may rescind the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parents/guardians).**

Name of physician (print/type) _____ Date _____

Address _____ Phone _____

Signature of physician _____, MD or DO

**EMERGENCY INFORMATION**

Allergies _____

Other information _____

## Appendix A-6

**Parental Informed Consent**

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

PARENTAL INFORMED CONSENT FORM

**RELATIONSHIP OF MILK AND CALCIUM INTAKE AND FREQUENCY OF INJURIES IN HIGH SCHOOL ATHLETES**

You are invited to permit your child to participate in this research study. The following information is provided in order to help you to make an informed decision whether or not to allow your child to participate. If you have any further questions please do not hesitate to ask.

Your child is eligible to participate in this study because your child is a participant in a sport at one of the Lincoln Public Schools. Your child will be asked if he/she is willing to participate.

The purpose of this study is to determine the amount of calcium your child is getting from foods and supplements and information related to injuries they have sustained in the past year. This study will take approximately 30 minutes of your child's time. The study will be conducted at home or in your child's free time. Your child will be asked to fill out two separate surveys. One is a Food Frequency Questionnaire (FFQ) that will assess their calcium intake. The other will assess their injuries over the past year. There are no known risks associated with this research.

The reason why we are doing this study is that it will help me create my Master's thesis, and also it is possible that this study may help provide researches at UNL with a better understanding of how calcium intake influences injuries in high school athletes. Your child's responses will be strictly confidential. There will be no way for us to know which responses belong to anyone participating. We may publish a summary of everybody's responses or present such a summary at a scientific meeting, but your child's identity and responses would be totally confidential.

Your child's rights as a research participant have been explained to you. You may ask questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may call the investigator at any time (402) 699-6427. Please contact the investigator:

- If you want to voice concerns or complaints about the research

Please contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965 for the following reasons:

- You wish to talk to someone other than the research staff to obtain answers to questions about your rights as a research participant
- To voice concerns or complaints about the research
- To provide input concerning the research process
- In the event the study staff could not be reached,

Participation in this study is voluntary. You are free to decide not to enroll your child in this study. You can refuse to participate or withdraw your child at any time without harming their or your relationship with the researchers or the University Nebraska-Lincoln, (or other institutions or organizations), or in any other way receive penalty or loss of benefits to which you are otherwise entitled.



110 Ruth Leverton Hall / P.O. Box 830806 / Lincoln, NE 68583-0806 / (402) 472-3718 / FAX (402) 472-1587


**DOCUMENTATION OF INFORMED CONSENT**

**YOU ARE VOLUNTARILY MAKNG A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THE RESEARCH STUDY. YOUR SIGNITURE CERTIFIES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE HAVING READ AND UNDERSTOOD THE INFORMATION PRESENTED. YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.**

_____
Child's Name

_____ _____
Signature of Parent Date

**IN MY JUDGEMENT THE PARENT/LEGAL GUARDIAN IN VOLUNTARILY AND KNOWINGLY GIVING INFORMED CONSENT AND POSSESS THE LEGAL CAPACITY TO GIVE INFORMED CONSENT TO PARTICIPATE IN THIS RESEARCH STUDY.**

_____ _____
Signature of Investigator Date

**IDENTIFICATION OF INVESTIGATORS**
**PRIMARY INVESTIGATOR**
Jeffrey K Ebert Office: 699-6427

## Appendix A-7

**Child Informed Assent**

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

**CHILD ASSENT FORM**

**RELATIONSHIP OF MILK AND CALCIUM INTAKE AND FREQUENCY OF INJURIES IN HIGH SCHOOL ATHLETES**

We would like to invite you to take part in this study. We are asking you because you are a participant in a sport at one of the Lincoln Public Schools.

In this study we will try to learn more about the amount of calcium you get from food and supplements as well as information related to injuries you have sustained in the past year. To do the study we will ask that you complete a simple survey that will require about thirty to forty minutes of your time. The survey will be given to you by an athletic trainer or other athletic staff to be completed at home or in your free time.

There is no risk associated with this study. The reason why we are doing this study is that it will help me create my Master's thesis, and also it is possible that this study may help provide researches at UNL with a better understanding of how calcium intake influences injuries in high school athletes. Your responses will be strictly confidential. There will be no way for us to know which responses belong to you or someone else. We may publish a summary of everybody's responses or present such a summary at a scientific meeting, but your identity and your responses would be totally confidential.

Your parents will also be asked to give their permission for you to take part in this study. Please talk this over with your parents before you decide whether or not to participate. You do not have to be in this study if you do not want to. If you decide to participate in the study, you can stop at any time. If you choose to participate, once you complete the survey you will return three items to whichever athletic staff provided you these forms. What will be returned is the survey, this form as well as your parents consent form. All three must be together when turned in.

If you have any questions at any time, please ask one of the researchers.

Signature of Subject Date

Signature of Investigator Date

**INVESTIGATOR**
Jeffrey K Ebert
Cell: (402) 699-6427