

Nutrition for Optimal Performance: The Adolescent Elite Athlete

Saline Stingrays

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Objectives



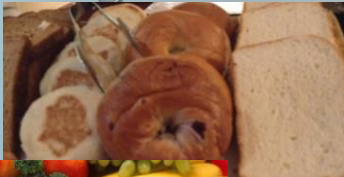
- Describe the unique nutrition needs of a young elite athlete
- Explain what energy sources are in food and brief explanation of how they are used by the body.
- Define optimal energy intake for a young elite athlete.
- Describe where young athletes fall short in energy and nutrients and how to assure intake levels for optimal athletic performance
- Understand the importance of breakfast to optimum performance
- Define and give examples of great training Breakfasts, Lunches, Dinners and Snacks
- Explain the importance of hydration for optimal athletic performance
- Describe ideal timing and composition of pre-workout or competition meal, during workout snacks/fluids and post-exercise recovery meals
- In Other Words --- ***Eat (and drink) Well, Sleep Well, Swim Your Best...²***

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A High Performance Machine Doesn't Just Take More Fuel, It Takes **Better Quality** Fuel



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First: It Take More Fuel Fuel = Energy = Calories **Macronutrients: Carbohydrate**

- Complex Carbohydrates- Starch
 - Bread, Bagels, Rice, Pasta, Potatoes, Crackers, Chips, Beans, Granola Bars, Hot and Cold Cereal, Vegetables
- Simple Carbohydrates- Sugars
 - Dairy, Fruit, Sweet Beverages, Candy
- Mixed:
 - Cake, Cookies, Pastries, Donuts

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First: More Fuel

Fuel = Energy = Calories

Macronutrients: Fats



- Most Fats are in Mixed Foods
- Concentrated Energy: 9 calories/gram vs 4 for carbs and protein
- Solid Fats – Animal Sources
 - Full Fat Dairy, Marbled Meat and Poultry skin, Butter, Lard
- Oils – Plant Sources
 - Olive and Olive Oil, Nuts and Seeds, Peanut Butter, Avocado, Corn Oil, Canola Oil, Coconut Oil
- Other Important Roles besides Energy
 - Hormones, Immune Regulation, Nerve Cells and Brain Health



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First: More Fuel

Fuel = Energy = Calories

Macronutrients: Protein

- Although an Energy Source, More Important Roles
 - Build Tissue (Muscle, Bone, Organs, Immune System Cells)
 - Enzymes and Neurotransmitters (Metabolism, Cell Communication)
 - If other sources of energy inadequate, will use protein!
 - RDA: 0.85 g/kg and Optimal Function: 1.6-2.0 g/kg

Animal Protein – More Complete, More Bioavailable

- Beef, Pork, Chicken, Turkey, Fish, Seafood, Eggs, Dairy

Plant Proteins – Only in Mixed Sources, Less Bioavailable

- Beans (inc Soy), Nuts/Seeds, Grains, Vegetables



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How Much More Fuel?? Let's Look at a average 13 year old Boy, 110#, 61"

- **Sedentary: Little physical activity beyond activities of life and school**
- **Moderately Active: Walks, bikes or plays outdoors 30 minutes a day or 1 hour 3/week**
- **Fit and Active: Participates in Recreational Sports 3-5 times/week**
- **Competitive Athlete: Trains or Competes 1.5-2.0 hrs, 4-5 days/week**

1900 kcal/day

90 gm Protein 19%	74 gm Fat 35%	219 gm Carbohydrate 46%
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2050 kcal/day

90 gm Protein 18%	76 gm Fat 33%	251 gm Carbohydrate 49%
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2200 kcal/day

95 gm Protein 17%	78 gm Fat 32%	280 gm Carbohydrate 51%
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2400 kcal/day

100 gm Protein 17%	80 gm Fat 30%	320 gm Carbohydrate 53%
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How Does the Body Store and Use Energy?

1. **Glucose in Blood Stream: 70 Calories 12 Minutes Intense Exercise**
2. **Glycogen from Liver and Muscle:**
Average Person or Trained Athlete on Calorie Deficit: 1300 Calories 3.5 Hours Moderately Intense Exercise
Trained Athlete After Carbohydrate Loading: 2400 Calories 6.5 Hours of Moderately Intense Exercise
3. **Fatty Acids (fats): in Blood Stream and Muscle (variable): 250 Calories 90 Minutes**
60% of energy during sleep and rest, about 30-40% of workouts in a trained athlete
4. **Fatty Acids in Fat (Adipose Tissue), Long-Term Storage: ~3500 Calories/Pound**
Only used after a sustained calorie deficit of 1-2 days, Glycogen Emptied
5. **Muscle Tissue and Blood Proteins (Immune Cells)**
Last resort survival in malnutrition. Extremely lean individuals who train for endurance sports and under-consume calories will begin to waste muscle and deplete their immune system.

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How Does the Body Store and Use Energy?

- **A Marathon: 2200 calories**

- Original blood glucose used up in first 30 minutes
- Blood/muscle fats and glycogen in about 3.5 to 7.0 hours depending on fitness level and Nutrition Status!
- When stored glycogen is gone, the body must try to draw from fat stores, a difficult task. Sometimes called "the wall" or Bonking

The most important thing for YOU is to eat enough TOTAL CALORIES.



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Where do Young Elite Athletes Fall Short?

- **Inadequate Energy and Athletic Performance:**

- One 2013 study found competitive 15 and 16 yo swimmers consumed **AN AVERAGE of over 900 kcal/day** less than they burned!
Another 2013 study of female elite soccer players **averaged 500 calories under.**
- Loss of Muscle instead of gain
- Depletion of glycogen and fat stores in muscle that sustain workouts and competition
- Weakened Immune system makes you vulnerable to illness and infections
- Fatigue increases risk of injury

**Swimmers need LOTS of calories. About 22 Calories/lb or
Girls: About 2200 kcal/day Boys: 2400 kcal/day (13 yo)**

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Where do Young Elite Athletes Fall Short?

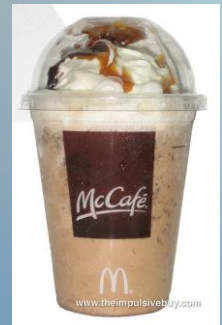
- **Dehydration: Not enough water intake**
 - 1% loss of fluid causes 11% decline in performance
 - Poor mental focus and clarity, confusion
 - Muscle cramps
 - Fatigue
 - Slow Reaction Time
- **Sports Drinks not Necessary, often impair performance**
 - Only needed if > 90 minute workouts
 - Causes blood sugar spikes and reactive hypoglycemia in many athletes

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Comments on Sugar and Beverage Choices

- **Sweetened beverages are the ultimate “empty calories”**
- **Sugar is not bad in and of itself. It’s that we are not doing moderation well as a nation.**
 - On the average, about 15% of Americans calories come from refined added sugars, over half in beverages
- **364 calories/d = 23 teaspoons = about ½ cup sugar**
- **1 McDonald’s Caramel Frappe: 256 calories of sugar**
- Excess sugar consumption is associated fatty liver and metabolic syndrome that predisposes to diabetes and cardiovascular disease, even in the absence of excess weight.
- High blood sugar → High Insulin → Low Blood Sugar → Hungry again Fast!
- **Diet Soda is even worse. Aspartame (Nutrisweet, Equal), Sucralose (Spenda)**
 - Studies have shown that these promote obesity as much as sweet soda.
 - Damage liver and brain cells
 - Induce inflammation



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Comments on Sugar and Beverage Choices



- As an Athlete, you can have up to 10% of your calories as added sugar. 😊
- **Bottom Line:**
 - Drink MOSTLY water.
 - Up to half of your fruit in a day can be juice
 - (8 ounces of juice/day),
 - Enjoy your added sugar in mixed foods.

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Where do Young Elite Athletes Fall Short?

Calcium

- 45% of bone mass is acquired during adolescence
- Only ~600 mg of calcium can be absorbed in a single meal
- Dairy (milk, yogurt, cheese) is a primary source, but also Nuts, Seeds, Beans and Green Leafy Vegetables (bok choy, spinach, collard), sardines and fortified cereals, soy and almond milk

Magnesium

- Magnesium competes with Calcium for absorption so must be co-supplemented
- Magnesium is nearly universally deficient, not just in athletes
- Magnesium is a critical cofactor for ATP synthesis – cellular energy carrier
- Calcium to Magnesium 2:1 ratio

Vitamin D: Recent HOT research shows Athletic Performance benefits

- Supplementation during winter training increases muscle mass and bone density in training swimmers and divers
- Optimal vitamin D status associated with fewer respiratory infections and fewer injuries in endurance athletes
- Three 2013 studies found about 50% of young athletes are deficient in vitamin D
- Adolescents: 30 IU/lb or 3300 IU/day of vitamin D3 for 110# swimmer

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Where Do Young Elite Athletes Fall Short?

• Iron

- Iron carries oxygen to tissues to burn glucose for energy
- Low Iron “anemia” causes fatigue and muscle weakness
- Muscle and tissue growth is rapid during adolescence, requires iron
- Girls lose a lot of iron when with menses
- Red Meat is the Shining Star for bioavailable iron
- 2013 Study found **89% of adolescent female elite soccer players had iron deficiency anemia!**

• Protein

- In addition to previously mentioned roles of protein, low protein consumption is associated with higher fat mass and disordered eating in female adolescent swimmers. (**44% of the subjects had disordered eating patterns**)
- Shoot for **3.5 to 5 ounces of protein in most meals**, except right before or during workouts.

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Where Do Young Elite Athletes Fall Short?

• Essential Fatty Acids- Omega 3 Fish Oil for DHA and EPA

- Enhanced Immune Function and Reduced Inflammation
- Evidence of benefits in mood and cognition.
- Reduced muscle and joint pain and swelling.
- Improved blood flow.
- Take high quality fish oil supplements with evening meal with plenty of fat to aid absorption.
- 2-4 grams/day
- Keep in refrigerator to prevent oxidation. Rancid fish oil is worse than no fish oil at all.



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Where Do Young Elite Athletes Fall Short?

Nutrients from High Quality Carbohydrates:

Colorful Fruits and Vegetables, Beans, Whole Grains



- **Vitamin A: Several studies listed inadequate vitamin A intake in adolescent athletes**
 - Red, orange and yellow vegetables are rich in vitamin A and the precursors, beta carotenes.
 - Carrots, sweet potatoes, colored bell peppers, spinach, collards and other greens, beef, winter squash
- **Folate: Again, common inadequacy in adolescent athletes**
 - Leafy green vegetables (romaine, spring mix and spinach), broccoli, beans and lentils, spinach, asparagus, tropical fruit, citrus fruit

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Where Do Young Elite Athletes Fall Short?

- **Fiber: Not enough whole foods, too much refined foods**
 - Stabilizes blood sugar, important natural detoxification aid, and feeds healthy gut bacteria
 - Beans are the densest in fiber of any food. Whole grain breads and cereals, whole fruits and vegetables (not juice), nuts and seeds
- **Probiotics:**
 - Benefits include regularity, enhanced immune function, synthesis of nutrients, especially vitamin K, increased bioavailability and improved digestion of nutrients, and competing against unhealthy bacteria and yeast.
 - Yogurt!, kefir, pickled and fermented foods
 - After antibiotics – special need for probiotics



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Two Important Risks Associated with Intense Training in Elite Athletes

- **Inflammation, Oxidative Stress and Depleted Immune System**
 - Protein!
 - Omega 3 Fatty Acids
 - Vitamin D
 - Lots of Colorful Fruits and Vegetables: Antioxidants
 - A Multiple Vitamin Mineral: Insurance Policy!
 - Sleep: All repair, recovery and regeneration of immune system is during sleep.
- **Depression**
 - Balance: Take 2 recovery days a week, Downtime with friends and School also important
 - Adequate Protein (amino acids for neurotransmitter synthesis)
 - Omega 3 Fatty Acids



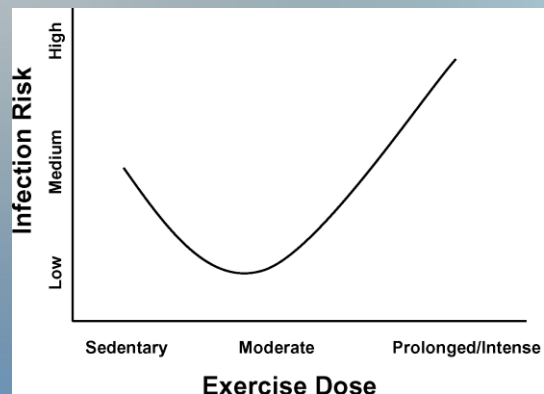
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The J-Curve, Upper Respiratory Infections and the Elite Athlete

Intense Exercise pushes the limits of the body.

- Marathon runners 6 times risk of Upper Respiratory Tract Infections URTI (cold, flu, pneumonia) of trained athletes who did not run.
- 20 Miles/week ½ risk of 60 Miles/week
Or 3.5 hours/week vs 10+ hours/week water time for swimmers



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Breakfast: The Meal of Champions



- **Most adolescents don't do a good breakfast**
 - Not enough calories and not enough protein (if any)
- **Breakfast is absolutely essential to optimum athletic performance (and school performance!)**
 - "Breaking the fast" turns on hormones, metabolism, and brain
 - 30 to 40% of glycogen is used overnight
- **Should contain 25 to 30% of day's calories and protein**
 - 25 to 30 g protein and 600 calories
- **If you train in the morning, eat half of your breakfast before and half after.**
- **Fruit is an important part of breakfast: Quick energy and antioxidants**

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Some Great & Fast Breakfasts

- **Breakfast Parfait:** 1 cup vanilla Greek Yogurt, ½ cup granola, ½ cup almonds, 1 cup blueberries
- **Mona's Power Smoothie:** 1 cup Plain Yogurt, 1 scoop whey protein powder (20 g scoop) 2 Tablespoons ground flax seed, ½ banana, ½ cup mixed frozen berries, ½ tsp stevia and Vitamin D drops
- **Breakfast 3:** Whole grain English Muffin or Toaster Waffles with 3 Tablespoons peanut butter and 1 Tablespoon "all fruit" jam, one hard boiled egg, 8 ounce glass of orange juice
- **Breakfast 4:** 1 cup cooked oatmeal prepared with milk, ½ cup chopped walnuts, 1 cup applesauce with a sprinkle of cinnamon and a breakfast sausage patty
- **Breakfast 5: Super Oatmeal Breakfast Cookies:** Make Quaker Oatmeal Cookies with an extra cup of chopped nuts and raisins, or try sunflower seeds! Enjoy 2 with peanut butter in the middle and a big glass of ice cold milk and a cup of grapes.
- **Breakfast 6: Super Scramble:** Sauté 1 TBS chopped onion, 1/2 cup chopped spinach or swiss chard. Add 1 slice of ham or turkey, chopped. Add 1 egg and scramble. Top with one ounce of cheese. Serve with a whole grain tortilla and a cup of fruit salad.

Don't forget about 16 ounces of water for the first half of your day! Bring with you to school and drink throughout the day.

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“Two Lunches” for the Young Elite Athlete

- **Novel “Two Lunch” idea.**

- Better to have 4 smaller meals than 2 or 3 big meals in a day.
- Who isn’t starving or tired at 3:00 on a busy day anyway!
- Pack two lunches (or enough for 2 lunches) and eat twice.
- OR if you eat lunch in the school cafeteria (a GREAT idea, you get HOT and Fresh food), pack a lunch also.
- Perfect for the weird School Lunch schedules that have kids eating at 11:00 am or not until 1!

- **Composition and Tips:**

- 500 calories each: 20 g protein, 3 servings of veges and one serving fruit total
- 1 ½ -2 sandwiches or....

- **Second Lunch:**

- Second lunch ideas: PB&J, baggie of trail mix and banana, cheese sticks, crackers and apple slices, Cottage Cheese and a fruit cup, Granola Bar and a Yogurt

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Great Lunches for the Young Elite Athletes - “Pack 2”

Pick 3 or 4 for
each lunch, or
total of 7-8.

Dairy	Meat/beans	Vegetables 1 cup or 2 cups of lettuce	Fruit 8 ounces,	Starch	Nuts and Seeds: ¼ cup or 2 TBS of nut butter
Yogurt	2 slices of lunch meat	carrot and celery sticks	A large apple	2 slices of bread	Peanut Butter
Cottage Cheese	Packet of tuna or tuna salad	Sliced Cucumber	A banana	18 Crackers	Trail Mix
Milk	Hard Boiled egg,	Salad bar with chopped veges	1 cup of strawberries or grapes	Corn Chips Or Sun Chips	Sunflower Seeds or pepitos
Sliced Cheese	Hummus	Sauteed veges	An Orange or 2 Cuties	1 Bagel,	Walnuts, pistachios or pecans
Cheese Sticks	1 cup black beans or refried beans	Vegetable soup	Raisins (also in trail mix) or other dried fruit	2 small or 1 large tortilla	Mixed Nuts
Cream Cheese	Chicken Salad from leftover Dinner	Marinated Cold Vegetable Salad	Fruit Cups	Graham Crackers	Try Almond or sunflower seed butter!
Spreadable Cheese		Cherry Tomatoes	Applesauce Cups	2 cup Bag of popcorn	A Sweet and Salty Nut Bar
			Slices of Pear	Bag of low sugar breakfast cereal	
			Juice Box	2 Rice Cakes	

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Pre-Workout or Competition Meal/Snack



- **Water:**
 - Drink 12 ounces water over the 3-4 hours before workout or competition
- **Food:**
 - Objectives: Energy for competition, Stable blood sugar, Prevent hunger
 - Composition: **Small meal, mixed but mostly carbohydrates**
 - Timing: **1 ½-2 hours prior to workout** or competition
 - Peanut butter sandwich
 - Turkey sandwich
 - Bowl of Soup and Crackers
 - Slice of thin crust pizza
 - Bowl of cereal with milk or a yogurt
 - Banana and a granola bar
 - Practical Application: Part of "2nd Lunch"

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Fuel and Hydration During Training and Competition

- During a workout or competition, you only need two things:

Water and Easy to digest Carbohydrates Only

Note: No protein, fiber or fat now. These keep everything in the stomach too long. Unless it is extremely hot, no sports drinks or 2 parts water to 1 part sports drink.

- **Water: How Much and When? About 8 ounces every 20 minutes**
 - Bring a water bottle that holds 36 ounces for a 1 ½ hour workout. Finish it by the end.
- **Carbohydrate: salty crackers, pretzels, bagels, baggy of dry breakfast cereal and bananas are perfect. They replace sodium and potassium, are low in fat, fiber, protein and sugar, so they absorb quickly, but not too quickly.**

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Post Workout or Competition: The Recovery Meal

- **Consume a recovery beverage immediately after workout 3:1 carbs to protein**
 - Chocolate or strawberry flavored milk
 - 8 ounces of fruit juice and a cheese stick
 - Water and a fruit yogurt
 - Can do a Gatorade G series here
- **Eat a mixed and balanced meal 1 – 2 hours after finishing workout - Dinner**
 - 3 to 4 ounces of protein
 - Large serving of vegetables 1+ cups with olive oil
 - 1 to 1 ½ cups Whole grain pasta, potatoes, etc

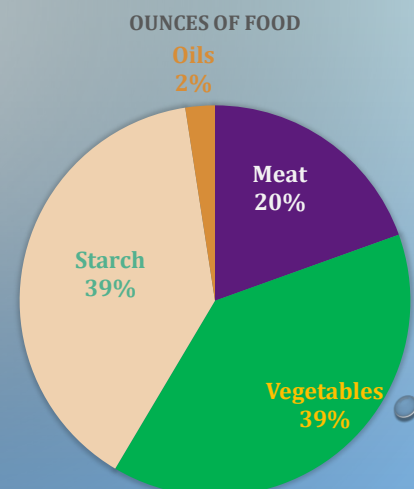


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Great Dinners for the Elite Athlete

- **Dinner will generally be an off day meal or post-workout meal.**
 - 600 – 700 Calories
 - Make up for high carbohydrate fuel earlier in the day with slightly higher Protein, Fiber and Fat.
 - 3 to 5 ounces Meat
 - 7 to 9 ounces of Vegetables (1 ½ to 2 ½ cups cooked)
 - 1 to 1 ½ cups mashed potatoes, rice, pasta, etc
 - 1 Tablespoon of Olive Oil or Cooking oil



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Great Dinners for the Elite Athlete

- Spaghetti and Meatballs, Large Chopped Salad with Romaine, Tomatoes, Cucumbers, Red Peppers
- Salmon or Tilapia, Brown Rice pilaf, Steamed California Mix Vegetables
- Roasted Chicken, Red Skin Potatoes and Green Beans
- Turkey Meatloaf, Mashed Potatoes, Peas and Carrots
- Oven Barbequed Chicken Drum Sticks, Oven Sweet potato wedges, Cole Slaw
- Chicken, Cheese and Pinto Bean Enchiladas with Guacamole and Salsa, Sautéed Onions and Sweet Peppers

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Summary

- **Elite Swimmers need a lot more calories and rarely get enough for optimum athletic performance.**
- **Carbohydrate is a primary fuel, fat is a secondary fuel.**
- **Protein is essential to optimum performance.**
- **Breakfast is essential to optimum performance.**
- **Adequate sleep and water are essential to optimum performance.**
- **Elite athletes are at risk for impaired immunity, increased inflammation and depression during extended periods of intense training. Adequate protein, antioxidants, and omega 3 fatty acids are essential protection against these.**
- **Have a few “naughty” calories here and there but for the most part, make them count with healthy foods.**

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**Thank You
and Best of Luck
this Swim Season**



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