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Presents:

THE BEST IN SPORTS NUTRITION:

Words from the Experts
(From Conference to Practice)
Merry Christmas!

Dear Santa,
For this year I’m requesting, a fat bank account, and a small body.
P.S. This year, please don’t mix them up, like you did last year!

There was a Lacrosse and a Baseball coach who went deep into the frozen woods searching for a Christmas tree.

After hours of subzero temperatures a few close calls with hungry wolves, one coach turned to the other and said,

"I'm chopping down the next tree I see. I don't care whether it's decorated or not!"
Sound familiar?

Normal Track & Field Ideology:

Distance:

I had an easy 8 mile run today!

Sprinters:

I ran 2 miles! It was so far!

Throwers

I had to run a lap around the track... I can't breathe!
Look familiar?
(“track/field & cross country feet”)

[Image of flip-flops on feet]
EMPOWER YOUR ATHLETES!

“When they KNOW BETTER, they’ll DO BETTER!”

• The Gluteal Line:
  - EMPOWER YOUR ATHLETES
  - What & How much to Eat/Drink
  - When to Eat/Drink
  - Ergogenic Aids
  - Should we measure & what should we measure?
  - Ultimately the things that WORK FOR THE ATHLETE (improve performance)
Do the best you can until you know better. Then when you know better, do better.

Maya Angelou
WHAT YOUR ATHLETES KNOW AND DON’T KNOW ABOUT SPORTS NUTRITION AFTER HIGH SCHOOL:

* U. S. Dept. of Education recommends 50 hours of Nutrition Education per year.
  * Elementary School= 3 hours/year
  * Middle School= 6 hours/year
  * High School= 3 hours/year

* THE KICKER: “Knowledge of High School students only lasts a year after learning the nutrition information…unless actively reminded or used.”
Current Research tells us:

- U. S. Air Force Academy Female Athletes—Nutrition Knowledge Test = 62%
- 61% of a group of freshmen athletes believed that Protein is the main source of energy.
- 71% believe that water is better than sports drinks.
- 65% believe that vitamin/mineral supplements increase energy levels.
The Transtheoretical Model: (this is how their little minds work…)

- **Precontemplation Stage** - most are simply uninformed (They don’t know what they don’t know.)
- **Contemplation Stage** - changing vs not changing
- **Preparation Stage** - they have a plan of action, take baby steps, make small changes.
- **Action Stage** - actually putting the changes into place.
- **Maintenance Stage** - upkeep, and making minor improvements as needed.
WHAT AND HOW MUCH TO EAT & DRINK:
(Nutrient Dense vs Calorie Dense)

Carbohydrates (CHO) ~ 55% - 65%
(Key Fuel Source)

- Complex CHOs include:
  * Starchy vegetables like peas, corn, lima beans and potatoes
  * Dried beans, lentils and peas such as pinto beans, kidney beans, & peas
  * Grains like oats, barley and rice, therefore, pasta, breads and crackers

- Simple CHOs include:
  * Fruits, milk products, and sugary processed foods
Importance of Carbohydrates

• **Key fuel source** for exercise, especially during prolonged continuous or high-intensity exercise

• **Limited storage:** Glycogen in liver/muscles

• **Inadequate stores result in:**
  – Fatigue (staleness)
  – Reduced ability to train hard
  – Impaired competition performance
  – Reduction in immune system function
  – Increased risk of injury
How Much CHO?

- **Sprinters & Throwers** = 6 - 10 grams/kg of body weight
  (In reality: Males = 3.3-5.4 g / kg   Females = 2.9-3.4 g / kg)
  * Moderate days = 6-8 g / kg
  * High Intensity days = 8-10 g / kg

- **Endurance Athletes (Mid Distance & Distance)** = 5 - 12 grams/kg of body weight
  (In reality: Males = 5.3-11.5 g / kg   Females = 4.4-6.4 g / kg)
  * Moderate days = 5-7 g / kg
  * High Intensity days = 7-12 g / kg

**WHY?**

Because they believe the myth that CHOs are BAD, they make you FAT

CHOs are GOOD, they give you ENERGY, they make you BETTER.
## Carbohydrate Needs

<table>
<thead>
<tr>
<th>Situation</th>
<th>Total Daily Carbohydrate Needs</th>
<th>126-lb (57-kg) Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-intensity/skill-based activities</td>
<td>1.4-2.3 g per lb body wt (3-5 g per kg)</td>
<td>179-294 g of carbohydrate per day</td>
</tr>
<tr>
<td>Moderate exercise program (~1 hr/day)</td>
<td>2.3-3.1 g per lb body wt (5-7 g per kg)</td>
<td>294-400 g of carbohydrate per day</td>
</tr>
<tr>
<td>Endurance Program (moderate-to-high intensity 1-3 hrs/day)</td>
<td>2.7-4.5 g per lb body wt (6-10 g per kg)</td>
<td>346-580 g of carbohydrate per day</td>
</tr>
<tr>
<td>Extreme commitment (moderate-to-high intensity &gt;4-5 hrs/day)</td>
<td>3.6-5.5 g per lb body wt (8-12 g per kg)</td>
<td>463-710 g of carbohydrate per day</td>
</tr>
</tbody>
</table>
Carbohydrate Needs

Banana/Apple = 15-45g
Bagel = 30-60g
Pasta (1 cup) = 35-45g
Potato or Sweet Potato = 30-45g

<table>
<thead>
<tr>
<th>Situation</th>
<th>Total Daily Carbohydrate Needs</th>
<th>175-lb (80-kg) Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-intensity/skill-based activities</td>
<td>1.4-2.3 g per lb body wt (3-5 g per kg)</td>
<td>245-403 g of carbohydrate per day</td>
</tr>
<tr>
<td>Regular training</td>
<td>2.3-3.6 g per lb body wt (5-8 g per kg)</td>
<td>403-630 g of carbohydrate per day</td>
</tr>
</tbody>
</table>

How Much PRO?

Q: Why did the vegetarians stop running cross country?

A: They didn't like meets!

Recommendation:

- The General Population = 0.8 g / kg
- Strength Athletes = 1.6 – 2.0 g / kg
- Endurance Athletes = 1.2 – 1.4 g / kg

(A serving of beef or poultry = 25 g of PRO vs a serving of grains or veggies = 2 g PRO)
### Protein in Your Diet

**Function:** Tissue growth and repair

Spread out your protein throughout the day

* Your body can only absorb up to 30 grams of protein at one time

<table>
<thead>
<tr>
<th>Sample daily intake for about 100 g of protein per day</th>
<th>Grams of protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cup cereal, 1 with milk</td>
<td>11</td>
</tr>
<tr>
<td>Clif Bar</td>
<td>10</td>
</tr>
<tr>
<td>Sandwich, 3 oz turkey</td>
<td>24</td>
</tr>
<tr>
<td>½ cup baby carrots</td>
<td>1</td>
</tr>
<tr>
<td>1 cup low-fat milk</td>
<td>8</td>
</tr>
<tr>
<td>8 oz low-fat yogurt</td>
<td>8</td>
</tr>
<tr>
<td>3 oz chicken breast</td>
<td>25</td>
</tr>
<tr>
<td>1 cup brown rice</td>
<td>6</td>
</tr>
<tr>
<td>1 egg</td>
<td>7</td>
</tr>
</tbody>
</table>

| Total grams of protein                                | 100 grams       |
## Protein & Performance

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Daily Protein Needs</th>
<th>126-lb (57-kg) Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elite female endurance athletes</td>
<td>0.62 g per lb body weight (1.36 g per kg)</td>
<td>80 g of protein per day</td>
</tr>
<tr>
<td>Moderate-intensity endurance athletes (4-5 days/wk for 45-60 min)</td>
<td>0.55 g per lb body weight (1.2 g per kg)</td>
<td>70 g of protein per day</td>
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<tr>
<td>Recreational endurance athletes (4-5 days/wk for 30 min)</td>
<td>0.36–0.45 g per lb body weight (0.8-1.0 g per kg)</td>
<td>47–59 g of protein per day</td>
</tr>
<tr>
<td>Resistance athletes (early training)</td>
<td>0.68-0.77 g per lb body weight (1.5-1.7 g per kg)</td>
<td>88-100 g of protein per day</td>
</tr>
<tr>
<td>Resistance athletes (steady state)</td>
<td>0.45-0.55 g per lb body weight (1.0-1.2 g per kg)</td>
<td>59-70 g of protein per day</td>
</tr>
<tr>
<td>Group</td>
<td>Total Daily Protein Needs</td>
<td>175-lb (80-kg) Athlete</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Track &amp; Field Athletes</td>
<td>0.55–0.8 g per lb body weight (1.2–1.7 g per kg)</td>
<td>96-140 g of protein per day</td>
</tr>
<tr>
<td>Resistance athletes (early training)</td>
<td>0.68-0.77 g per lb body weight (1.5-1.7 g per kg)</td>
<td>119-135 g of protein per day</td>
</tr>
<tr>
<td>Resistance athletes (steady state)</td>
<td>0.45-0.55 g per lb body weight (1.0-1.2 g per kg)</td>
<td>79-96 g of protein per day</td>
</tr>
</tbody>
</table>

WHAT DOES THAT REALLY LOOK LIKE?  
Empower your athletes!!

1) Convert Height to “cm” and Weight to “kg”
   Inches x 2.5 = Centimeters
   Pounds / 2.2 = Kilograms

2) Calculate an Athlete’s Resting Metabolic Rate:

   * Google- “Calculate RMR”+ Add 10%.

   * Athlete’s RMR (kcal/d) =
     -857 + 9.0 (Wt in kg) + 11.7 (Ht in cm)
Easy Days
(50-63 % of Max HR)

• Activity Level: 1.375 X RMR = ________ calories/day (OFF DAYS or VERY EASY DAYS)

Your body weight in Kg = ________ X (5 – 12 grams) = ________ g/day

AMOUNTS OF CARBOHYDRATES (CHO): ________ g/day x 4 = ________ calories / day

Your body weight in Kg = ________ X (1.2 – 2.0 grams) = ________ g/day

AMOUNTS OF PROTEINS (PRO): ________ g/day x 4 = ________ calories / day
Moderate Activity Days
(64 – 76 % of Max HR)

- Activity Level: $1.55 \times \text{RMR} = \text{__________ calories/day (MOST OF YOUR TRAINING DAYS)}$

Your body weight in Kg = ________ X (5 – 12 grams) = ________ g/day

AMOUNTS OF CARBOHYDRATES (CHO): ________ g/day x 4 = ________ calories / day

Your body weight in Kg = ________ X (1.2 – 2.0 grams) = ________ g/day

AMOUNTS OF PROTEINS (PRO): ________ g/day x 4 = ________ calories / day
High Intensity Days
(77-93 % of Max HR)

• Activity Level: 1.725 X RMR = _________ calories/day (VERY INTENSE/HARD DAYS)

Your body weight in Kg = _______ X (5 – 12 grams) = _________ g/day

AMOUNTS OF CARBOHYDRATES (CHO): _______ g/day x 4 = _______ calories / day

Your body weight in Kg = _______ X (1.2 – 2.0 grams) = _________ g/day

AMOUNTS OF PROTEINS (PRO): _________ g/day x 4 = _________ calories / day
Daily Requirements
(Female example; RMR= 1432, Weight=126 lbs /57 kg)

Activity Level: 1.375 = 1,969 calories/day
Activity Level: 1.55 = 2,220 calories/day
Activity Level: 1.725 = 2,470 calories/day

Activity Level: 1.55 = 2,220 calories/day
(training day for a 126 lb./ 57 kg multi-event athlete)

- CHO: 399 g / day or 1596 calories/day
- Protein: 102 g/ day or 408 calories/day
- Fat: 24 g /day or 216 calories/day
Snack
Lunch
Snack
Dinner

Broccoli

Red drink with lime

Grilled fish

Quinoa salad
Snack
Daily Requirements
(Male example; RMR= 2,420, Weight=200 lbs / 91 kg)

Activity Level: 1.375 = 3,328 calories/day
Activity Level: 1.55 = 3,751 calories/day
Activity Level: 1.725 = 4,148 calories/day

Activity Level: 1.55 = 3,751 calories/day
(training day for a 200 lb./ 91 kg Sprinter / Thrower)

- CHO: 728 g / day or 2912 calories/day
- Protein: 163 g / day or 652 calories/day
- Fat: 21 g /day or 187 calories/day
Snack
Lunch

- Odwalla Vanilla Protein Smoothie
- Chili with cheese
- Whole wheat bread
- Roast beef
- Green salad
- Oranges
Snack
Dinner

Salmon
Rice and Wild Rice Salad
Fruit Drink
Salad
Snack
Healthy Snack Ideas

Try to aim for 100-300 calorie snacks:

- Low-fat yogurt
- Fresh Veggies w/ Hummus
- String Cheese
- Fig Newtons
- Whole grain pretzels/crackers
- Fruit/Dried fruit
- Apple/Banana w/ Peanut Butter
- Low-fat granola bars
- Cereal and milk topped with banana
- Oatmeal
- Trail mix (in moderation)
- Air-popped popcorn (sprinkle with cinnamon or parmesan cheese)
WHEN TO EAT & DRINK:
(Nutrient Timing)

Daily Nutrient Timing:

Breakfast= 70 % CHO = High
20% PRO = Low

Lunch= 60 % CHO = Medium
30 % PRO = Medium

Dinner= 30 % CHO = Low
60 % PRO = High
Intuitive Eating:

**Belly Hunger** vs **Head Hunger**

- **Belly Hunger** = true hunger, your stomach is grumbling, this is when your body truly **needs** nourishment (biological hunger).

- **Head Hunger** = when you see, smell or think about food, a craving for food/drink when you are **not truly** hungry (emotional & habitual hunger).
Before an Intense Workout or Competition:

- 3 – 4 hours before = CHO: 1-2 g / kg
  PRO: 0.15 – 0.25 g / kg

- 2 hours before = Water and/or Sports Drink
  17 – 20 ounces

- 10 to 20 minutes before = 10 ounces of water
“THE WINDOW OF OPPORTUNITY”

(Recovery: Within 30 Minutes Post Workout or Competition)

“Although many factors have an impact on performance, an athlete’s ability to **recovery** and **adapt** to training and competition represents a defining predictive factor of success.”

“**Recovery** needs to be integrated on a daily basis & thought of as equally important as the training itself.”

“In the period immediately following exercise, a substantial increase in rates of muscle **PRO synthesis** occurs in trained athlete.”

“If delayed by 2 hours, there is a **decrease of 50% in production of glycogen.**”
Research Says:

1) CHO only

2) CHO and PRO (4 to 1 ratio)
   
   (38 % greater rate of Glycogen Synthesis than CHO only)

* 35 – 50 grams of CHO and 6 – 15 grams of PRO *
NEWEST SECRET WEAPON:

3) CHO and CAFFEINE

CHO = 1 gram / kg of body weight
CAFFEINE = 4 mg / kg of body weight
The Body’s Capacity For Fatigue
ERGOGENIC AIDS:

**Definition** = substances, devices, or practices that enhance an individual’s energy use, production, or recovery. (45% of collegiate athletes consume one or more dietary supplements.)

1.) **Mechanical Aids**: equipment, spikes, racing suits, nasal strips
2.) **Pharmacological Aids**: steroid hormones
3.) **Physiological Aids**: blood doping, massage, physiotherapy
4.) **Psychological Aids**: hypnosis, visualization, imagery
5.) **Nutritional Aids**: dietary supplements
Should Athletes Supplement Their Diet?

• 60 % of all Endurance Athletes are deficient in this mineral ________.

Answer = IRON
IRON and BLOOD:

- So what if I’m low?
  - Examples:
    - 5:00 Miler will run a 5:09.9 (3% decrease)
    - 4:20 Miler will run a 4:27
    - 19:00 5K = 19:34.2
Got Iron?

• Chances are good that you’re low in iron if you are:
  
  – A female, teenager, an athlete (esp. those who strike the foot and jar organs of the body repeatedly) live at moderate to high altitude or a vegetarian.

• **CBC (Complete Blood Count):**
  
  – **Hemoglobin**- (amount of RBC in a blood sample) = 11.0 – 16.0 gm/dL.
  – **Hematocrit Levels**- (% of RBC in a blood sample) = 38% - 46%.
  – **Serum Ferritin Levels**- (a protein marker in blood) = >50 ng/ml.
Should Athletes Supplement Their Diet?

- This mineral is needed in every nerve cell transmission, every muscle contraction and for bone and teeth formation

Answer = CALCIUM
Calcium needs for Athletes:
(1300 mg/day)

Selected Food Sources of Calcium

<table>
<thead>
<tr>
<th>Food</th>
<th>Milligrams/serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli, 1 cup</td>
<td>91 mg</td>
</tr>
<tr>
<td>Mozzarella, part skim, 1.5 ounces</td>
<td>333 mg</td>
</tr>
<tr>
<td>Yogurt, fruit, low fat, 8 ounces</td>
<td>384 mg</td>
</tr>
<tr>
<td>Cheddar cheese, 1.5 ounces</td>
<td>307 mg</td>
</tr>
<tr>
<td>Dark Leafy Greens</td>
<td>100 mg</td>
</tr>
<tr>
<td>Soymilk or Almond Milk, calcium-fortified, 8 ounces</td>
<td>299 mg</td>
</tr>
<tr>
<td>Milk, reduced-fat (2% milk fat), 8 ounces</td>
<td>293 mg</td>
</tr>
<tr>
<td>Calcium Supplement</td>
<td>630 mg</td>
</tr>
</tbody>
</table>
Which one has more Calcium?

**Yogurt vs Almonds**

Amount of Calcium= 384 mg vs 378 mg

Total # of Calories= 230 cal. vs 529 cal
Osteoporosis
(porous bones)
CAFFEINE - Central nervous system stimulant, makes you feel more energetic, opens the vessels for better circulation.

- **Pros** = Helps you burn fat and protect carbohydrate stores, makes you feel energized, helps with mental sharpness, decreases perceived exertion.

- **Cons** = Diuretic effects. A banned substance by the NCAA if amount too high in urine.

- **Dosage** = 3-9 mg/kg of body weight, or 1-3 mugs of coffee one hour prior to work out or competition.
CREATINE - Found in muscles and used for short term (30 to 90 seconds) of energy production.

- **Pros** = Improve high-intensity exercise performance, increases strength, increases lean body mass, and aids with recovery.
- **Cons** = Some athletes are non-responders. Side effects are weight gain, diarrhea, muscle cramps, and dehydration. Can damage kidneys.
- **Dosage** = Take 5 grams 4 times per day for 6 days followed by 3 grams per day.
WE NEED ENERGY!!

ATP-PCr System!

PCR

ADP

HAVE ENERGY!

But it is limited...

MUSCLES

Cr

ADP

ATP
Effects of Sodium Bicarbonate

Pros

• Delays fatigue
• Maintain level of performance
• Improve time to exhaustion by 42%

800m sprint time improved by 3 seconds!

Cons

• Can cause harm to the stomach when taken in large amounts
• Nausea
• Stomach cramping
• Diarrhea
How Much?

- 300mg sodium bicarbonate per kg of body weight with 500ml of water.

How much for a 130lb (59kg) athlete?

17,700mg
60-90 minutes prior
BEET ROOT JUICE-

- **Pros =** Increases nitrate levels, can run faster, perceived exertion is lower.
  - Increased levels of nitric oxide (NO). Increases blood flow & vasodilator to allow more oxygen flow.
  - Overall times that were 3% faster, and 5% faster during the last mile.
- **Cons =** Be prepared for red urine and stools as well as possible gastrointestinal distress.
- **Dosage =** 500 ml or 2 cups of beet juice (~3-5 beets), or 300 ml of concentrated beet juice each day may lead to a 15% increase in the time taken to exhaustion. Drink it 2--3 hours before the gun goes off.
- **70 ml (2 ounces) concentrated shot (400 mg of beet juice)** ($3.50)
**RITALIN (aka; methylphenidate)** - Stimulates the central nervous system. Used for weight loss, can be ingested via tablet, or crushed into powder and snorted and injected.

- **Pros** = your metabolic rate is increased, your body burns more calories and you lose your appetite.
- **Cons** = illegal substance without an Rx. Side effects: nervousness, vomiting, nausea, increased heart rate & blood pressure & body temperature, psychotic episodes, skin rash and digestive problems. Gateway drug, as seen with Kurt Cobain.
“IF YOU CAN MEASURE IT, YOU CAN MANAGE IT.”

* Height (inches to cm)
* Weight (pounds to kg)
* Body Composition and Bone Mineral Density
* Resting Metabolic Rate (RMR)
* Dietary Analysis ([www.nutritiondata.com](http://www.nutritiondata.com), [www.myfitnesspal.com](http://www.myfitnesspal.com))
* Urine Color Test (daily)
* Blood Work for Iron & Calcium Levels
* Eating Disorder Questionnaire ([www.femaleathletetriad.org](http://www.femaleathletetriad.org)) The Female Athlete Triad Coalition
SUMMARY
(The Take Away)

• When they know better, they’ll do better.
• When they don’t use it, they’ll lose it.
• If you can measure it you can manage it.
• Empower your Athletes with:
  – What to Eat/Drink
  – How Much to Eat/Drink
  – Show them what their food looks like
  – When to Eat/Drink
  – Which Ergogenic Aids are worth it.
SUMMARY (The Take Away)

“Small changes can add up to big improvements.”

1.) Calculate your own personal amounts of CHO and PRO & match needs with activity levels.

2.) Eat Breakfast EVERYDAY!

3.) Get 8 to 10 hours of sleep every night.

4.) Give up Fast Food, eat Real Food.

5.) Give up Alcohol.

6.) Get a Recovery Drink within 30 minutes.

7.) Have blood work done and fix the deficiencies.
REFERENCES

• **Beals.** 2013. Nutrition & the Female Athlete (From Research to Practice)
• **Bernardot.** 2006. Advanced Sports Nutrition
• **Clark.** 2013. Sports Nutrition Guidebook
• **Fitzgerald.** 2013. Racing Weight
• **Kerksick.** 2012. Nutrient Timing (Metabolic Optimizations for Health, Performance, and Recreation)
Thank You
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