



Keeping it Real: Sports Nutrition in Action
 Session 613 Saturday 7:30 to 9:20
 PRESENTED BY
 Nancy Clark MS RD CSSD

Goal of this session:

To address the nutrition questions and confusion of both fitness exercisers and athletes alike.

Topics include:

- Carbohydrates, low carb sports diets
- Gluten-free diets, Paleo
- Protein needs, protein supplements
- Dietary fat, coconut oil
- Sports drinks, electrolytes
- Caffeine, energy drinks
- Vitamins: food vs supplements
- How to build a well balanced sports diet

Time for questions and discussion



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Sports nutrition can be so confusing...

Advertising leads people to believe commercial products are far better than food.



Nutrition supplements are a big business...

“Nutritional Supplements Flexing Muscles As Growth Industry”

“One of the **fastest growing industries** in the world is the nutritional supplement group, or more broadly known as Vitamins, Minerals and Supplements (VMS).

2012: Generated about \$32 billion in revenue

2021: projected to **double and top \$60 billion**

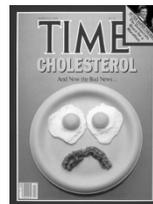
Forbes SPORTSMONEY section

Sports supplement industry is booming

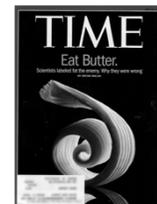
Category	Sales 2013	Niche	Examples
Bodybuilding	+25%	Boost performance Build muscle Recover faster Burn fat	Ignition Paleo Protein Recovery Accelerator Shred
Endurance	+64%	Hydrate Refuel	Nuun Chia Energy gel
Weight management	+11%	Lose weight Tone muscle	Slim Secrets' Low Carb Fit Balls

Food Business News 7/9/14

Journalists add to the confusion



1984



2014

Trendy terms trigger confusion

“Good” vs “Bad” Foods

Too judgmental; eating should not be a source of guilt or shame

“Clean” foods

Is food that comes in wrappers actually dirty?

“No sugar”

No fruit? No milk or plain yogurt? No HFCS? No refined white sugar?

“Simple ingredients”

Salt, sugar, white flour are simple ingredients...

What can you do to help your clients eat better?

- Listen not only to *what* your clients are saying but *how* they are saying it.
- Problem solve with them. Encourage them to experiment with different fueling patterns
- Recommend they do not start a diet they do not want to maintain for the rest of their lives

Dietary improvements happen when the benefits are bigger than the costs

Benefits

- Eat healthier diet and have more energy all day
- Perform better; perhaps achieve personal best
- Weight management becomes easier

Costs

- Planning food takes time and energy
- Fewer “pig outs” on “yummy junk food”...



Source of confusion



“Carbohydrates are evil...”

“I stay away from bread. It has too many carbs...”

“I’m on the Paleo Diet; I don’t eat wheat or other grain foods.”

“I don’t eat pasta dinners any more. I have a big salad instead.”

“No more orange juice ... too much sugar!!!”

Many athletes don’t even know what “carbs” are...

Are you concerned about—

- Refined white flour in bread and pasta?
- Natural sugars in fruit juice or bananas?
- High Fructose Corn Syrup in soft drinks?
- Refined sugar and candy?
- All forms of fruits, vegetables & grains?



Many athletes don’t even know how to define a “low carb” diet.

What is the definition of a “low carb” diet?

No grains and starchy foods?

<20-50 g carbs per day?

<130 g carbs/day

<45% of total calories?



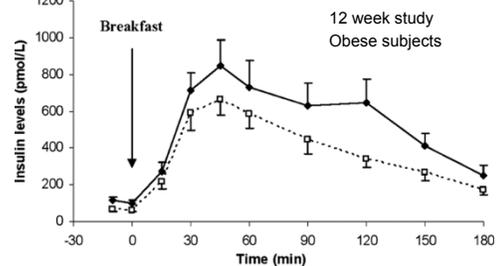
The *carbs are evil* message is **NOT** targeted towards athletes...

- 66% of Americans are overfat, underfit and at high risk for heart disease, diabetes, cancer, etc.
- 80% of Americans exercise less than 30 minutes/day



Unfit people may need to monitor carbs
Exercise actually helps regulate blood glucose

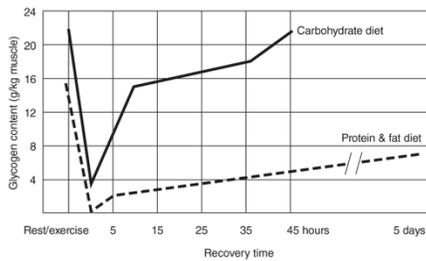
Pre- post study plasma insulin levels after breakfast



©2010 by Endocrine Society

Martins C et al. J Clin Endocrin Metab 2010;95:1609-1616

Carbohydrates refuel depleted muscle glycogen



Reprinted by permission, Diet & Supplements, 4th Edition

Chart: Nancy Clark's Sports Nutrition Guidebook, 5th Edition

A problem—

Sample "Low Carb" Training Diet

	Sample menu	Cals	g Carb
Breakfast	Spinach-cheese omelet	400	1
	Turkey bacon	200	--
Snack	Almonds	200	8
Lunch	Grilled chicken on a salad	300	5
	Oil + Vinegar Dressing	300	--
Snack	Protein bar	200	16
Dinner	Salmon (6 oz cooked)	350	--
	Pile of broccoli (3 cups cooked)	150	30
Total	<i>11% of total calories</i>	2,100	60 g

Carbs are actually performance enhancing

Current Recommendations (IOC and AND Evidence Analysis Library)

Amount of exercise	Gram carb/lb body wt	Gram carb/kg
Moderate exercise (~1 hour/day)	2.5 to 3	5-7
Endurance exercise (1-3 h/day)	2.5 to 4.5	6-10
Extreme exercise (>4-5 h/day)	3.5 to 5.5	8-12

For a 150 lb athlete: 375 to 975 g carbs/day (1,400 to 3,800 carb-calories/day)

Lack of carbs hurts ice hockey performance

- During a hockey game, muscle glycogen declines 38-88%.

A motion analysis of elite ice hockey teams showed:

- Players with high (60%) carb diet skated 30% more distance and faster than the players who ate standard diet (40% carb).

In the final period:

- The high carb group skated 11% more distance.
- The low carb group skated 14% less than in first period.



Lack of carbs hurts ice hockey performance

The researchers conclude:

- 1) low muscle glycogen can jeopardize performance at the end of the game
- 2) three days between games (with training on two of those days) + a low carb diet does not replace glycogen (players with high carb diet had 45% more glycogen)
- 3) the differences in performance between the groups was most evident in the last period of the game.

Akermark, *Int'l J Sports Nutr* 6:272-84, 1996

Fueling before and during exercise improves endurance performance!

10 men completed treadmill runs (70% VO₂ max) to exhaustion

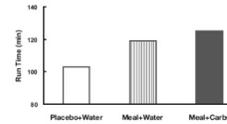


Image courtesy www.gssiweb.com SSE#108 Williams

Trial #1. No calories pre-ex + water during Run-time: 102 min

Trial #2. Carb meal 3 h pre-ex + water during Run-time: 112 min

Trial #3. Carb meal pre-ex + sports drink during Run-time: 125 min

Nancy Clark, MS, RD

Chryssanthopoulos *Int J Sport Nutr Exerc Metab* 2002 12(2):157-71

Adequate carbs improve marathon times

Non-elite runners paired on their predicted marathon run time

Divided into two groups (14 runners per group):

- No pre-planned nutrition 3:49 marathon time (34 yo)
- Scientificallly-based nutr plan 3:38 marathon time (42 yo)

Planned feeding: two gels + 7 oz. water 10-15 min pre-race
one gel at 40 minutes after the start, then
one gel every 20 minutes plus 24 ounces water /hour

Each hour: 3 caffeinated gels = 240 calories per hour

Similar GI complaints in each group (few complaints and not different)

Hansen *Int'l J Sports Nutr Exerc Metab*, 2014

If carbs are evil, why do the Kenyans perform so well?

— Kenyans won ~40% of all major international middle and long-distance running competitions between 1987-1997



Are they doing something right at the dinner table...?

Typical Kenyan Diet



Basic diet: Bread, rice, potato, porridge, ugali (corn meal)
Beef (only 3-4 oz, 4/week), kidney beans; cabbage
Tea with whole milk and sugar (Sugar=20% of total calories)
No vitamin supplements

77% Carb (4.5 g Carb/lb) **10% Protein** (0.6 g Pro/lb) **13% Fat** (whole milk)

Average Kenyan runner: 5' 9" 129 lbs 6-10% body fat

- Enjoys 3 meals + 2 snacks per day
- Refuels within 1 hour after running at 6:00 a.m. and again at 5:00 p.m.

Source: Owen Anderson, coach of 26 elite Kenyan runners

How do athletes who limit "carbs" fuel their muscles?



One large bagel (60 g carb - 300 cals) =

16 strawberries + 1 cup blueberries + 1 medium banana



Sandwich + 100-calorie bag pretzels (62 g carb) =

24 cherry tomatoes + 2 (7") cucumbers + 2 (8") carrots +
2 large peppers + 5 cups greens

2 cups pasta (84 g carb; 1/4 lb uncooked) =

2 c cooked kale + 8 spears broccoli + 3 cups cooked zucchini
sautéed with 1 large onion

Grains can be helpful for athletes who train hard!

Hard exercise + low carb diet = needless fatigue

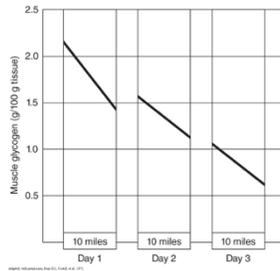
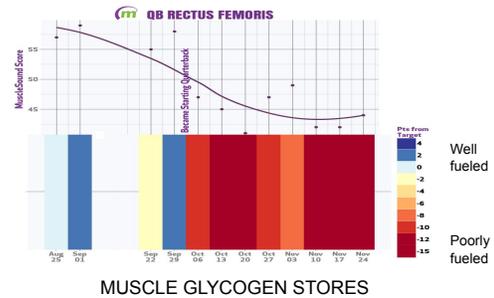


Chart: Nancy Clark's Sports Nutrition Guidebook, 5th Edition

Measuring Glycogen Stores

Starting Quarterback Aug-Nov

Image courtesy of MuscleSound



MUSCLE GLYCOGEN STORES

Depletion of Muscle Glycogen Stores

Football team trends Aug - Nov

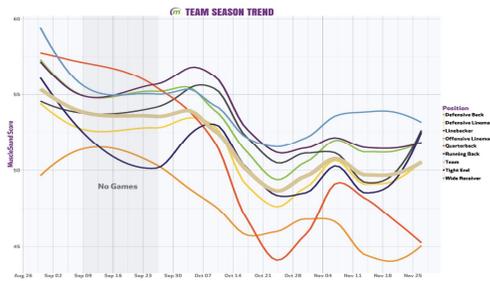


Image courtesy of MuscleSound

Glycogen stores can tell us who fuels wisely -- and who doesn't!

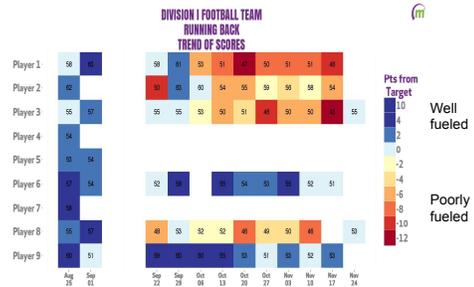


Image courtesy of MuscleSound

Paleo dieter

“But I feel so much better when I don't eat grains...”

Question: What were you eating before?

Answer: The S.A.D. Diet (Standard American Diet)



Each person is an experiment of one

Gluten-free athletes can get adequate carbs

Popular gluten-free sports foods include:

- Rice, (sweet) potato, corn, starchy vegetables, beans, (GF) oats
- Banana, raisins, dates, dried pineapple, all fruits
- Energy bars: Lara, KIND, Clif Builder's, Odwalla, PURE Bar, First Endurance Bar, Hammer Bar, Wings of Nature Bar...
- Hammer gel, Honey Stinger Waffles, Gu, Chomps...



www.glutenfreediet.ca



Are GI issues caused by FODMAPS?

Fermentable Oligo- Di- Mono-Saccharides And Polyols

- Create gas, bloating, constipation, diarrhea
- Contribute to intestinal distress



Some common FODMAP trigger-foods:

Wheat • lentils, beans • inulin, sorbitol

Onion, garlic, broccoli, cauliflower, mushrooms cabbage

Apples, avocado, blueberries, raspberries, strawberries, cherries, peaches, watermelon

Source of Confusion

What about training the body to burn more fat, less carbs?

- To date, peer-reviewed research does not support fat as the best fuel to *enhance performance* for hard exercise.
- Displacing carbs with protein & fat can hurt your ability to sprint and do high intensity exercise
- Training depleted a few times a week might offer benefits for highly competitive athletes.
- High fat/high protein diet may not be the healthiest... TBD!

What's the right balance of protein and carbs?



How much protein does your body require?

	g Pro/kg	g Pro/lb
Current RDA	0.8	0.4
Athletic adult	1.0-1.5	0.5-0.75
Growing teen athlete	1.5-2.0	0.7-1.0
Adult building muscle mass	1.5-2.0	0.7-1.0
Adult restricting calories	1.7-2.0	0.8-1.0

What is your definition of a "high protein" diet?

- > 15% of total calories?
- > 1.7 g protein / kg body wt? (ACSM Position Stand)
- >50 g protein/day? (Daily Value, based on 2,000 calories)
- A self-reported slab of beef + salad?



Most athletes eat a "high protein" diet without protein supplements

Sample "high protein" base menu

	Protein-rich food	Protein (g)	Calories
Breakfast	6 egg whites	20	90
Snack	1 cup cottage cheese	30	200
Lunch	4 oz deli turkey	25	120
Snack	8 oz. Greek yogurt	20	140
Dinner	8 oz salmon	60	350
Total		160	900

150 lb. athlete might require 80 - 115 g Pro/day

High School Sophomore

"I want to gain weight ... I want to be massive."

- 5' 8" (still growing) 155 lbs His goal 175+
- Lifts weights 2 hours per day
- Spends \$80+ per month on protein supplements
- Asks about the best protein supplement...

HS Sophomore who wants to be massive

- B. Skips breakfast
- L. Not much; doesn't like school lunch
- Sn. Sometimes a protein shake pre-workout (if time)
- D. Big meal made by his mother
- PM. Protein shake or protein bar

Teaching points: Bulking up

- **First, optimize your diet.** Add 500-1,500 cal/day.
- **Be consistent.** Don't skip meals; fuel at the right time.
- **Consume adequate protein, extra carbs.**
- **Finish growing.** Don't tamper with your healthy body.
- **Honor genetics.** Apple doesn't fall too far from the tree.

Q. Why do you want to be massive?... Sports? Girls?



Protein: Food vs Supplements



Food	g Pro/serv	Cost / g Pro
Roast beef, 4 oz deli	32	\$0.09
Tuna, 5-oz can	26	\$0.08
Egg whites, 3	10	\$0.06
Dry milk, 1/4 cup	8	\$0.03
Nesquik, 14-oz bottle	16	\$0.11
Muscle Milk, 11-oz	20	\$0.15
Clif Builder, 1 bar	20	\$0.12

Does too much protein damage kidneys?

Theoretically, high protein diet + dehydration = stressed kidneys

STUDY:

- Fourteen healthy men; 26 y.o.; resistance-trained x 9 years
- Subjects consumed for 6 months:
 - Normal eating phase: 2.5 g protein/kg/day
 - High protein phase: 3 g protein/kg/day
- No harmful effects on blood lipids or liver and kidney function

Antonio, J et al. *J Nutr Metab* Oct 2016.

Case Study: Athlete with one kidney

College student wanting to bulk up

Protein intake > 300 gms / day (4 gms/kg)

Blood tests: Renal stress and damage

Prescribed diet: 0.8 gm Pro/kg (70 gm Pro), 4,000 cal

16 oz. milk 4 oz. meats 800 cal grains

1000 cal juice 600 cal fruit 200 cal veggies

Liberal fats, sugar

Problem with high protein diets

If eat too much protein—

- Displaces carbs ...
- Can be high in saturated fat, cholesterol
- Bad for the environment
- Expensive and a waste of money

300 calories of chicken breast = \$2.00

300 calories of pasta = \$0.30

What about amino acids...?



How to get Essential Amino Acids

Protein source	Isoleucine grams	Leucine* grams
Met-Rx Whey Protein, 1 scoop	1.4	2.3
Chocolate milk, 20 oz	1.5	2.5
Tuna, 6 oz can	2.0	3.5
Cottage cheese, 1 cup	1.6	2.9
Chicken breast, 6 oz.	2.4	3.2

*2.5 to 3.0 g leucine per meal triggers muscle protein synthesis



Protein & Fat do *not* replenish depleted glycogen stores

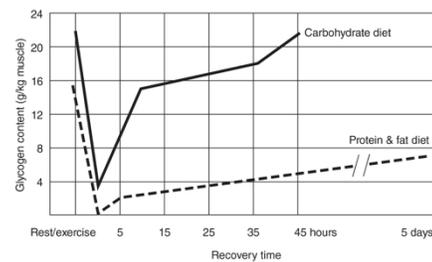


Chart: Nancy Clark's Sports Nutrition Guidebook, 5th Edition

Fat: A valuable part of a sports diet

Fat is needed to absorb vitamins A, D, E, K

Female runners with irregular menses

- restricted fat and calorie intake (2,400 cals)
- had sub-normal vitamin E levels

Regularly menstruating runners

- ate more fat and calories (2,900)
- normal vitamin E levels



Tomten. Serum vitamin E concentration and osmotic fragility in female long distance runners *J Sports Sci* 2009; 27(1):69-76

Too little dietary fat hurts performance

Trained runners ate 16% or 31% fat diet for 1 month

- self-selected diets were supposed to be equal calories but the runners ate 19% more calories with moderate-fat diet
- the extra calories ≠ excessive; no change in % body fat
- had 14% more endurance with more fat & more fuel

Conclusion: Runners can perform better with (healthful) dietary fat—as long as they eat enough carbs and calories



Horvath, *J Am Coll Nutr* 2000; 19 (1): 52-60

What about coconut oil...?



“There are no clinical trials to support the claims made by the coconut industry, yet there is substantial evidence to suggest the opposite is true.”

Linda van Horn, PhD RD
Amer. Heart Assoc. Dietary Guidelines Advisory Comm.

- Why do we want to trade in olive oil (with proven health benefits) with a saturated fat (with proven health damage)?
- The people who promote coconut oil tend to be connected with the coconut oil industry or coconut-containing foods.

What about coconut water...?



Per 8 ounces	Sodium mg	Potassium mg	Calories	Cost/oz.
Coconut water (VitaCoco)	30	485	45	\$0.16
Gatorade	110	30	50	\$0.04
Powerade	65	35	75	\$0.04
Orange juice, diluted 50%	---	450	55	\$0.06
Chicken broth	450	5	15	\$0.09

What about sports drinks, in general?

- Marketed to everyone—not just endurance athletes
- Many fitness exercisers mis-use them
- Associated with weight gain in teens



Field, A. et al. Association of sports drinks with weight gain among adolescents and young adults *Obesity* July 2014

What about sodium ...?

Consuming additional salt—

- During fitness training: *not necessary*
- During moderate exercise: *typically not necessary*
- During ultra-distance events: *wise choice*

*Early symptoms of hyponatremia:
bloating • nausea • headache
confusion • disorientation*

In hot weather, add pre-exercise sodium

Trained cyclists drank beverage with ~ 150 or 1,000 mg sodium 105 - 45 minutes before they exercised

Rode to exhaustion in 90° heat with no fluids



With high sodium, they rode 20 minutes longer: 99 vs 79 minutes

1,000 mg sodium = 1/2 can chicken broth
2 packets salt on boiled potato
~a half-gallon of Gatorade

Sims, Rehrer *J Appl Physiol* 2007

Sodium losses during exercise

One pound of sweat loss contains: 450 - 700 mg. sodium

Losses in 1 hour hard exercise in heat: 900 - 2,800 mg.

Sodium content of the body: 97,000 mg (42 tsp salt)

	Sodium (mg)	Sodium (mg)
Gatorade, 8 oz.	110	Cheese stick, 1 oz 200
Endurolytes Extreme, 1 pill	120	Jerky, 1 oz 400
G'ade Endurance, 8 oz.	200	Salt, 1/4 teaspoon 600
SaltStick, 1 capsule	215	Chicken Broth, 1 can 1,860





Chocolate milk to replace sodium

11 dehydrated subjects drank ~2 quarts (150% of sweat losses)

Beverage	Sodium Intake (mg)	Cumulative urine loss 5 h post-ex (mL)
Milk, 2% fat	~1,000	610
PowerAde	~440	1,200
Water	—	1,180

Milk: • emptied slower • limited influx of fluid into the system
• well tolerated • provided protein for recovery

Shirreffs *Br J Nutr*, July 2007

What about caffeine... ?



...Isn't coffee bad for you?

Caffeine and exercise

Pro: May make exercise seem easier and enhance performance (for both regular caffeine consumers and non-consumers alike)

Con: May cause nervousness, upset stomach.

Each person responds differently.
Know your body!

Caffeine—not dehydrating

- No diuretic effect in caffeine-tolerant athletes in moderate (250-300 mg) doses
- Does not increase heat stress
- OK to drink caffeinated beverages in hot weather
- 59 coffee drinkers consumed 1.5 mg caf/lb (~12 oz mug)
- Performed **86 vs 75** minutes in heat

Roti, *Armstrong Med Sci Sports Exerc* 36(5):S18, 2004

What about energy drinks....?



Caffeine in popular beverages

Starbucks, grande (16 oz)	400 mg. Caffeine	
Coffee, av. 12 oz mug	150	
Red Bull, 8 oz can	80	
Coke, 12 ounce can	35	
Clif Shot, Mocha	50	
NoDoz Max, 1 tablet	200	

Position Stand on Energy Drinks & Energy Shots

Int'l Society of Sports Nutrition, Jan 2013 (available online)

- The primary ergogenic ingredients appear to be carbs and caffeine; their benefits have been well established.
- The other ingredients require further study to demonstrate safety and potential benefits.
- More than one serving a day may lead to adverse events and harmful side effects.

Energy drinks blamed in death of a 16-year old athlete by heart attack

She had been drinking energy drinks instead of water all day at the beach. She complained she didn't feel well, had a heart attack and died.



Concerns about Energy Drinks

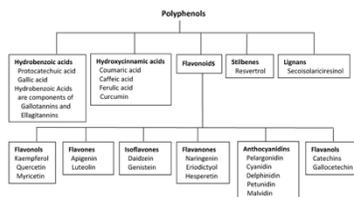
- Commonly used as a mixer with alcohol
- Caffeine in energy drinks keeps one from getting drowsy
- Wide-awake drunks are at high risk for car accidents
- Mixing stimulant (Red Bull) + depressant (alcohol) = increased risk of abnormal heart rhythms
- Risk of caffeine overdose in caffeine-abstainers
 - Tachycardia, vomiting, arrhythmias, seizures, death

What about vitamin & mineral pills...?

No amount of supplements will compensate for a lousy diet!



Food offers more than just vitamins



Some components in a plant-based diet fight inflammation

Eat fruits, vegetables, whole grains, seeds and nuts!

Hardman, E. Diet components can suppress inflammation and reduce cancer.
Nutr Res Pract June 2014

Do athletes need extra vitamins & minerals?

A review of 90 studies examining vitamin and mineral status in athletes' blood suggests—

- Athletes & non-athletes had similar vitamin status
- Exception: Athletes had lower serum ferritin
- Stronger vitamin status ≠ better performance (apart from anemia)
- **CONCLUSION:** Athletes generally *eat* extra vitamins!



Fogelholm. *IJ Sports Nutr* 5:267, 1995



For vitamins: Eat healthful foods!

The more you exercise—

- the more food you can eat.
- the more vitamins you can get.

Nutrients of particular concern: Iron, calcium, vitamin D

Vitamins are re-used, not used up.



The Power of Fruits & Veggies



- Tart cherry juice
 - Reduced pain and inflammation in women with arthritis
 - Improves sleep (melatonin) - helpful for traveling athletes?
- PomWonderful pomegranate juice
 - Polyphenols reduce DOMS; 1/day x 8 days pre-damaging exercise
- Beets, spinach, nitrate-rich foods
 - Improves oxygen utilization; reduces blood pressure
 - Consume 2.5 hours pre-event
 - Cyclists improved 4 km and 16 km Time Trial by almost 3%

ACSM presentations, 2012

Beetroot Juice Improves Performance in Well-Trained Rowers



Six days of beetroot juice (500 mL in 2 doses)—

—Improved rowing in 6 repeats of a 500-meter erg test

Greatest benefit in bouts 4 through 6 (the end of the event)

Average improvement: 0.4% (enough to win!)

*Consuming 500 ml beetroot juice 2 hours pre-exercise
increases plasma nitrite by 138%*



Bond. IJSN 2012, 22:251-256

Vitamin D - “The sunshine vitamin”

- Indoor athletes at risk for low D:
 - basketball players, figure skaters, gymnasts, ballerinas, wrestlers
- Low serum D in 40% (8 of 20) of distance runners in Louisiana
- D’s potential benefits to athletes is reduced risk of—

stress fractures	total body inflammation
infectious illness	impaired muscle function

Oran & Pritchett, Vitamin D and the Athlete, *Nutrients* 5(6), 2013



What about antioxidants like vitamins C and E?

Too many anti-oxidants become pro-oxidants

- may hinder training adaptations

Natural sources of antioxidants:

Tart cherry juice, PomWonderful juice, grape juice, blueberries...

What about “eating clean” ...?

- Are processed foods actually “dirty”?
- Should you *always* choose the healthiest foods?
- Is “eating clean” a form of an eating disorder...?



DON'T JUST EAT; EAT RIGHT-

Breads, cereals, whole grains

Foundation of every meal—for carbohydrates, fiber, B-vitamins

At each meal choose foods made from—

Wheat **Rice**
Oats **Corn**



Whole grains should be at least half your choices

DON'T JUST EAT; EAT RIGHT-

Fruits & vegetables

3 large or 6 small daily for fiber, carbs, phytochemicals, C, A

Enjoy colors of the rainbow:

Oranges **Blueberries** **Kiwi**
Bananas **Peaches** **Watermelon**



Best vegetable choices are colorful:

Broccoli **Spinach** **Carrots**
Pepper **Tomato** **Squash**



DON'T JUST EAT; EAT RIGHT-

Calcium-rich foods

3 - 4 servings daily

1 cup Milk or Yogurt (lowfat)
1.5 oz. Cheese
2 cups Cottage cheese



Non-dairy sources

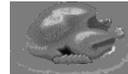
1 cup Calcium-enriched orange juice
8 oz. Tofu, soy milk
3 cups Broccoli, kale, leafy green vegetables
3-4 oz. Salmon or sardines with bones

DON'T JUST EAT; EAT RIGHT-

Protein-rich foods

Small amount at each meal for protein, iron, zinc

Chicken, turkey, fish
Lean beef, pork, lamb
Milk, yogurt, cheese*
Eggs



Nuts, peanut butter
Lentils, beans, tofu



*Poor sources of iron and zinc

Please respect the power of food on performance and health



“You know, Nancy, too many athletes show up for training but don't show up for meals. They might as well not show up for training.”

BC Hockey Coach

If I'd known I was going to live this long, I would have taken better care of myself...”

Mickey Mantle

Everyone always wins with good nutrition!



www.nancyclarkrd.com

Thanks for your time and attention

Questions?

Comments?



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