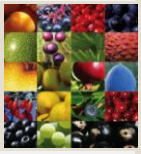

PERFORMANCE NUTRITION FOR ENDURANCE CYCLING

Trionne Moore
BA, RHN, IOC Dipl. In Sport Nutrition
Lead Nutritionist, Canadian Sport Institute Ontario
tmoore@csiontario.ca

Recovery Nutrition

Individualizing Hydration

Fueling During Effort

Natural Foods for Riding

Outline

To switch from a catabolic state to an anabolic state as quickly as possible using the proper nutrient substrates.

"At no other time during the course of the day can nutrition make such a major difference in the overall training program."
–Antonio et. al., Essentials of Sports Nutrition and Supplements, 2008

Recovery Nutrition - Purpose

30 minutes or less

Timing

REPLENISH GLYCOGEN

Carbohydrates

~1g / kg BM

Protein

1 packet plain instant oatmeal	22g
1 banana	25g
1 pear	25g
1 cup mashed	33g
1 cup mashed sweet potato	44g
1 rice cake (7g) + 1 tbsp. almond butter (3g)	10g
6 oz. banana/tapioca baby food	30g
1 Ryvita crackers (9g) + 1 tbsp hummus (3g)	12g
1 cup applesauce (unsweetened)	27g
1 large whole wheat pita	35g
1 cup cooked brown rice pasta	43g
1 Elevate Me bar	35g
1 cup watermelon	11g
1 cup brown rice milk (plain, unsw.)	24g

CHO Content

REPLENISH GLYCOGEN
PROTEIN TISSUE REPAIR

Protein

10 – 25* grams

*more is fine for endurance recovery, as long as it doesn't displace CHO intake

Carbohydrate

Foods
- Greek yoghourt
- Plain yoghourt (cow, goat)
- Raw nuts/seed
- Nut butters
- Pumpkin seeds / Pumpkin seed butter
- Ricotta cheese
- Cottage cheese
- Hard cheese
- Eggs
- Chicken, turkey

Powders
- Whey**
- Amino Acids (leucine, BCAA's, glutamine, EAA's)
- Vegan (pea, hemp, brown rice)
- Goat's whey
- Casein

Protein

	CHO	PRO
1 cup Kefir (plain) + 2 tbsp. honey + 4 tbsp. chia seeds	64	16
½ cup cottage cheese + 213ml "Prunes & Oats" PC organic baby food	53	15
1 cup Astro (2%) organic yoghourt plain + ¼ cup raw pumpkin seeds + 2 tbsp. raw honey + 1 cup berries	73	21
3 pkg. "Sesame Snaps"	60	9
Tuna (3oz) + 1.5 cups cooked brown rice	90	30
Pumpkin seed butter (2 tbsp.) & Jam (2 tbsp.) sandwich (2 slices bread)	68	10
3 hard-boiled eggs + 10 prunes	63	21
Smoothie: 1 cup brown rice milk (plain) + 1 cup fruit + 1 scoop protein powder + ½ avocado + 1 tbsp. raw honey	65	26
1 Elevate Me bar	36	15

Recovery Snacks

"Consuming CHO and protein during the early phases of recovery has been shown to positively affect subsequent exercise performance and could be of specific benefit for athletes involved in multiple training or competition sessions on the same or consecutive days." Beelen et al. 2010

REPLENISH GLYCOGEN
PROTEIN TISSUE REPAIR
RESTORE FLUIDS & ELECTROLYTES

Fluids

1.5 litres per kg BM lost

Electrolytes

Sodium & Chloride

Potassium

"..[for] rapid and complete recovery from dehydration [one] should drink **~1.5 L of fluid for each kilogram of body weight lost."**
Shirreffs & Maughan (1998)

"The additional volume is needed to compensate for the increased urine production accompanying the rapid consumption of large volumes of fluid."
Shirreffs & Maughan (1998)

"...when possible, fluids should be consumed over time (and with sufficient electrolytes) rather than being ingested in large boluses to maximize fluid retention."
Kovacs et al. (2002); Wong et al. (1998)

Recovery Hydration

- Water + pinch of sea salt (sodium, chloride)
- Any kind of melon (potassium)
- Pure coconut water (potassium) + salt
- Electrolyte sports drink (sodium, chloride, potassium)
- Freshly squeezed vegetable/fruit juice + pinch of salt (sodium, chloride, potassium)
- Tomato juice (sodium, chloride, potassium)
- Chicken or vegetable broth soup (sodium, chloride)

Fluids & Electrolytes

REPLENISH GLYCOGEN
PROTEIN TISSUE REPAIR
RESTORE FLUIDS & ELECTROLYTES
REDUCE MUSCLE & IMMUNE STRESS

Carbohydrates
Protein
Fluids & Electrolytes
based largely on
Natural Nutrients

Type of Activity	Per kg BM /day
Low intensity or skill-based activities: Moderate training program for athletes with large BM or energy restriction	**3-5g**
Moderate exercise program (i.e., ~1 hour per day)	**5-7g**
Endurance program (e.g., 1-3 h/d moderate to high intensity exercise)	**7-10g**
Extreme commitment (i.e., >4-5 h/d moderate to high intensity)	**8-12g**

Caveat: Guidelines are ball park figures. Fine tune with individual consideration of total energy needs, specific training needs, and feedback from training performance. Since 2004, ranges have been increased, matching fuel to needs (therefore, change categories all of the time).

2010 IOC Guidelines for Everyday Training

Have 20g of protein every 3 hours of waking time (Moore et al., 2012)

Co-ingest some protein *during* prolonged exercise (<0.2 g/kg/h) to improve recovery

Ingest ~20g of high quality protein immediately after exercise to maximize muscle protein synthesis and augment glycogen repletion

Whey and casein are good protein supplementation sources

Co-ingest protein to accelerate glycogen repletion when CHO intake is <1.0g/kg/h). This is especially relevant when performance is needed to be maintained within 24 hours.

1.2 to 2.0g per kg BM per DAY

Summary – Use of Protein

Not before you consider:

- Lactose tolerance (long-term effects)
  - Digestive upset, gas, bloating
- Tolerance to milk proteins (alpha-S1-casein)
  - (gastric upset, ear infections, asthma, mucous, stuffy noses...)
- Sugars: high fructose corn syrup
- Easily habit-forming (may lead to unwanted fat gain)
- Poor source of natural nutrients
- Studies have compared it to protein-free treatments

Pritchett et al., 2009
Gilson et al., 2010
Ferguson-Stegall et al., 2011
Lunn et al., 2011, 2012
Spaccarotella & Andzel, 2011

Chocolate Milk?

Individualizing hydration

Current (2007) ACSM Guidelines:

"The goal of drinking during exercise is to prevent excessive (>2% body weight loss from water deficit) dehydration and excessive changes in electrolyte balance to avert compromised performance. Because there is considerable variability in sweating rate and sweat electrolyte content between individuals, **customized fluid replacement programs are recommended."**

AMERICAN COLLEGE of SPORTS MEDICINE

Exercise and Fluid Replacement

POSITION STAND

This pronouncement was written for the American College of Sports Medicine by Michael N. Sawka, FACSM (chair), Lindsay M. Burke, FACSM, E. Randy Eichner, FACSM, Ronald J. Maughan, FACSM, Scott J. Montain, FACSM, Nina S. Stachenfeld, FACSM.

eat rates, voluntary fluid intake and levels of dehydration in various sports. Values are mean, plus (range) or [95% reference range].

	Sweat rate ($L \cdot h^{-1}$)		Voluntary fluid intake ($L \cdot h^{-1}$)		Dehydration (% BM) (= change in BM)	
Condition	Mean	Range	Mean	Range	Mean	Range
Training (males)	0.29	[0.23–0.35]	0.14	[0.09–0.20]	0.26	[0.19–0.34]
Competition (males)	0.79	[0.69–0.88]	0.38	[0.30–0.47]	0.35	[0.23–0.46]
Summer training (females)	0.72	[0.45–0.99]	0.44	[0.25–0.63]	0.7	[+0.3–1.7]
Summer competition (females)	0.98	[0.45–1.49]	0.52	[0.33–0.71]	0.9	[0.1–1.9]
Training (males & females)	0.37		0.38		0	(+1.0–1.4 kg)
Summer training (males)	1.98	(0.99–2.92)	0.96	(0.41–1.49)	1.7	(0.5–3.2)
Summer training (females)	1.39	(0.74–2.34)	0.78	(0.29–1.39)	1.2	(0–1.8)
Summer training (males)	1.37	[0.9–1.84]	0.80	[0.35–1.25]	1.0	[0–2.0]
Summer competition (males)	1.6	[1.23–1.97]	1.08	[0.46–1.70]	0.9	[0.2–1.6]
Summer training (males)	1.46	[0.99–1.93]	0.65	(0.16–1.15)	1.59	[0.4–2.8]
Winter training (males)	1.13	(0.71–1.77)	0.28	(0.03–0.63)	1.62	[0.87–2.55]
Summer training (males)	2.14	[1.1–3.18]	1.42	[0.57–2.54]	1.7 kg (1.5%)	[0.1–3.5 kg]
Summer competition (males)	1.6	[0.62–2.58]	~1.1		1.3	[+0.3–2.9]
Summer competition (females)		[0.56–1.34]	~0.9		0.7	[+0.9–2.3]
Summer competition (cramp-prone males)	2.60	[1.79–3.41]	1.6	[0.80–2.40]		
Competition (males)	2.37	[1.49–3.25]	0.98		1.28 kg	[0.1–2.4 kg]
1] Winter competition (males)	1.49	[0.75–2.23]	0.15	[0.03–0.27]	2.42	[1.30–3.6]
2] Summer training (males)	1.77	[0.99–2.55]	0.57	[0–1.3]	~1.8	
Temperate competition (males & females)						
Swim leg					1 kg	(+0.5–2.0 kg)
Bike leg	0.81	(0.47–1.08)	0.89	(0.60–1.31)	+0.5 kg	(+3.0–1.0 kg)

temperate climate (20-21deg C)
- 1-2% dehydration, <90 min exercise. NO effect on performance
- 2% dehydration, >90min, IMPAIRs performance

hot climate (31-32deg C)
- 2%, >60 min, SIGNIFICANTLY affects performance

Hyperthermia and **dehydration** implicated in **fatigue**
Dehydration = less tolerance of hyperthermia

Performance decreases are greater with similar rates of dehydration in warm environments.

Ambient temperature

TABLE 4. Predicted sweating rates ($L \cdot h^{-1}$) for running 8.5 to 15 $km \cdot h^{-1}$ in cool/temperate (T_{db} = 18°C) and warm weather (T_{db} = 28°C).

Body Weight (kg)	Climate	8.5 $km \cdot h^{-1}$ (~5.3 mph)	10 $km \cdot h^{-1}$ (~6.3 mph)	12.5 $km \cdot h^{-1}$ (~7.9 mph)	15 $km \cdot h^{-1}$ (~9.5 mph)
50	Cool/temperate	0.43	0.53	0.69	0.86
	Warm	0.52	0.62	0.79	0.96
70	Cool/temperate	0.65	0.79	1.02	1.25
	Warm	0.75	0.89	1.12	1.36
90	Cool/temperate	0.86	1.04	1.34	1.64
	Warm	0.97	1.15	1.46	1.76

Suggested Starting Point for Endurance Training (euhydrated): 0.4 to 0.8 L per hour

- higher rates for faster, heavier individuals competing in warm environments
- lower rates for the slower, lighter persons competing in cooler environments

Endurance Exercise (3 to 4 hour effort)

Commence euhydrated

30 to 40 minute effort

Days Before: Maintain euhydration

4 hours before: ~5–7 mL per kg BM

2 hours before: ~3-5 mL per kg BM, slowly

Within the hour: small frequent sips, adjust to comfort and needs

By hydrating several hours prior to exercise there is sufficient time for urine output to return towards normal before starting the event.

Include sodium (+ chloride) and potassium:
- 460 to 1150 mg sodium per Litre of fluids
- small amounts of salted snacks or sodium-containing foods (to stimulate thirst and retain the consumed fluids)
- Salt food lightly at meals day before and day of
- Include high potassium foods (i.e., fruit, coconut water)

ACSM 2007 – Pre-exercise - Fluids

Fueling During Effort

Fluids & Exercise, ACSM 2007
Carbohydrate consumption can be beneficial to sustain exercise intensity during high-intensity exercise events of **~1 hour or longer**, as well as less intense exercise events sustained for longer periods.

IOC Consensus Statement on Sports Nutrition, 2010
"Ingestions of even small amounts of CHO during exercise can enhance cognitive and physical performance in competition **lasting one hour**. As the duration of the event increases, so does the amount of CHO needed to optimize performance."

Carbohydrates

Consumption of beverages containing electrolytes and carbohydrates can help sustain fluid-electrolyte balance and exercise performance.

Exercise and Fluid Replacement, 2007, ACSM

Electrolytes & Carbohydrates

What to Use:
- 4-8% carbohydrates (4g to 8g of sugars per 100ml)
- Should include electrolytes
- Gels and bars can be used with appropriate water content
- Mixed sugar sources (glucose/fructose; maltodextrin/fructose; g+f+s)
- Up to 90g CHO per hour using mixed sources (Jeukendrop 2011; IOC, 2010)
- Can contain a small amount of amino acids / protein powder (ACSM 2009)

When to Use:
- ≥60 minutes of medium to high intensity (ACSM 2007, IOC 2010)
- Pre-workout (especially for nervous stomachs)

Sports Drinks

Artificial Sweeteners

Aspartame, "Equal", "Nutrasweet"

Pregnant women to avoid

Sucralose, "Splenda"

Journal of Toxicology and Environmental Health Part A 2008;71(21):1415-29
Headache. 2006 Sep;46(8):1303-4.

Acesulfame Potassium /Acesulfame K

Int J Occup Environ Health. 2010 Apr-Jun;16(2):112

Jeukendrop, Asker (2011) Recommendations

NO RELATIONSHIP BETWEEN BODY MASS AND EXOGENOUS CHO OXIDATION Jeukendrop 2010 in press

Event	CHO req'd for optimal perf and minmzg neg enrgy balalnce	Recommended intake	CHO type	Glu	Glu + Fruc
<45min	No CHO req'd				
45-75min	Very small amts	Mouth rinse	Most forms of CHO	•	●
1-2h	Small amts	up to 30g/h	Most forms of CHO	•	●
2-3h	Moderate amts	Up to 60g/h	CHOs that are rapidly oxidized (glucose, MD)	○	●
>2.5h	Large amts	Up to 90g/h	Only multiple transportable CHO		●

Fueling up

IOC Consensus Statement on Sports Nutrition 2010

"During high-intensity training, particularly of long duration, athletes should aim to achieve CHO intakes that meet the needs of their training programs and also adequately replace carbohydrate stores during recovery between training sessions and competitions. For events lasting **an hour or more**, the athlete should aim to begin competition with body carbohydrate stores sufficient to meet their needs by **consuming carbohydrate-rich foods in the hours and days beforehand.** "

Carbohydrate Loading

- CHO loading does work for endurance and team sports
- Evidence for shorter events is less clear, but low glycogen will impair performance
- Low-CHO diet impairs performance in most types of exercise
- High-CHO diet can improve performance
- Where competitions are frequent, CHO loading may be used in major events
- Optimum preparation strategy is not clear – it may vary between individuals depending on the event, training status, normal diet, individual genotype….

2010 IOC Acute Fueling Strategies

These guidelines promote a high CHO availability to promote optimal performance in competition or key training sessions		
General Fueling up	Preparation for events <90 min exercise	7-12 g/kg per 24h (as for daily fuel needs)
Carbohydrate loading	Preparation for events >90 min of sustained/intermittent exercise	36-48 hrs @ 10-12 g/kg BM per 24 h
Speedy refueling	<8 hours recovery between 2 fuel demanding sessions	1-1.2 g/kg/h for first 4 hours, then resume daily fuel needs
Pre-event fueling	Before exercise >60 minutes	1-4g/kg consumed 1-4 hrs before exercise

Natural Foods for Riding

- Kern et al. (2007) "Raisins appear to be a cost-effective source of carbohydrate for pre-exercise feeding in comparison to sports gel for short-term exercise bouts."
- Rietschier et al. (2011) "…SDRs [sun-dried raisins] are a natural, pleasant, cost-effective CHO alternative to commercial SJBs [sports jelly beans] that can be used during moderate- to high-intensity endurance exercise."
- Too et al. (2012) "Raisins and chews promoted higher carbohydrate oxidation and improved running performance compared to water only. Running performance was similar between the raisins and chews, with no significant GI differences."

Raisins (3 big tablespoons)
100-kcal
24 g CHO (glucose and fructose in 1:1 ratio)
1.6 g fiber
0.8 g protein
8 mg sodium
238 mg potassium

Clif Shot Blocks (3 pieces)
100-kcal
24 g CHO (brown rice syrup (45% maltose, 3% glucose, and 52% maltotriose) and cane juice (50% glucose and 50% fructose)
70 mg sodium
20 mg potassium

Raisins vs. Sports Chews/Gels

Illian et al. (2011). **Omega 3 Chia seed loading as a means of carbohydrate loading.** J Strength Cond Res. **Abstract** The purpose of this study was to determine if Omega 3 Chia seed loading is a viable option for enhancing sports performance in events lasting >90 minutes and allow athletes to decrease their dietary intake of sugar while increasing their intake of Omega 3 fatty acids. It has been well documented that a high dietary carbohydrate (CHO) intake for several days before competition is known to increase muscle glycogen stores resulting in performance improvements in events lasting >90 minutes. This study compared performance testing results between 2 different CHO-loading treatments. The traditional CHO-loading treatment served as the control (100% cals from Gatorade). The Omega 3 Chia drink (50% of calories from Greens Plus Omega 3 Chia seeds, 50% Gatorade) served as the Omega 3 Chia loading drink. Both CHO-loading treatments were based on the subject's body weight and were thus isocaloric. Six highly trained male subjects V(02)max 47.8-84.2 ml · kg(-1); mean (SD) of V(02)max 70.3 ml · kg(-1) (13.3) performed a 1-hour run at ~65% of their V(02)max on a treadmill, followed by a 10k time trial on a track. There were 2 trials in a crossover counterbalanced repeated-measures design with a 2-week washout between testing sessions to allow the participants to recover from the intense exercise and any effects of the treatment. There was no statistical difference ($p = 0.83$) between Omega 3 Chia loading (mean 10k time = 37 minutes 49 seconds) and CHO loading (mean = 37 minutes 43 seconds).

...Omega 3 Chia loading appears a viable option for enhancing performance for endurance events lasting >90 minutes and allows athletes to decrease their dietary intake of sugar while increasing their intake of Omega 3 fatty acids but offered no performance advantages.

Chia seeds

"Born To Run" by Christopher McDougall tells the story of the mysterious Tarahumara tribe. The **Rarámuri** or **Tarahumara** are a Native American people of northwestern Mexico who are renowned for their long-distance running ability. Their drink of choice is chia fresca and the ingredients are chia seeds in water mixed with sugar and lime. Isolated by the most savage terrain in North America, the reclusive Tarahumara Indians of Mexico's deadly Copper Canyons are custodians of a lost art. For centuries they have practiced techniques that allow them to run hundreds of miles without rest and chase down anything from a deer to an Olympic marathoner while enjoying every mile of it. Their superhuman talent is matched by uncanny health and serenity, leaving the Tarahumara immune to the diseases and strife that plague modern existence.

Tarahumara Running Tribe

http://www.pponline.co.uk/encyc/sports-nutrition-is-coca-cola-an-effective-sports-drink-713

Caffeine

- Optimal dose for enhancing athletic performance appears to be **~200mg of caffeine (~3mg/kg BM).** This also appears to be the optimal dose for cognitive function . Graham & Spriet 1995
- Even smaller doses are effective at improving performance late in prolonged exercise (~1-2mg/kg bm).
- Caffeine exerts a greater ergogenic effect when consumed in an anhydrous state as compared to coffee. Goldstein et al., 2010; Graham et al., 1998)
- Can be added to sports drinks Kovacs et al, 1998, Conger et al 2011
- No hydration concerns Armstrong, 2007; Van Niewenhoven et al. 2000; Gonzalez-Alonso et al., 1992; Brouns et al., 1998; Maughan & Griffin, 2003

Nitrates

Lansley et al. (2011) - These results suggest that acute dietary nitrate supplementation with 0.5 L BR improves cycling economy, as demonstrated by a higher PO for the same o2, and enhances both 4 km and 16.1 km cycling TT performance.

Wilkerson et al. (2012) - In conclusion, acute dietary supplementation with beetroot juice did not significantly improve 50-mile TT performance in well-trained cyclists. It is possible that the better training status of the cyclists in this study might reduce the physiological and performance response to NO3 - supplementation compared with the moderately trained cyclists tested in earlier studies

Christensen et al. (2012) - In contrast to observations in moderately trained subjects intake of BR juice had no effect on VO2 kinetics and performance (120 endurance + sprints) in elite cyclists.

Cermak et al. (2012) - Six days of nitrate supplementation reduced VO2 during submaximal exercise and improved time-trial performance in trained cyclists (60 min of submaximal cycling followed by a 10-km time trial).

Cermak et al. (In Press) - Ingestion of a single bolus of concentrated (140 mL) beetroot juice (8.7 mmol NO3-) does not improve subsequent 1 h time trial performance in well-trained cyclists.

- Protocols are still being studied/developed
- 6mmol in ½ litre of beet root juice or concentrated beetroot juice shots (6mmol)
- Has an acute effect
- Should take 2-3 hours before commencement
- Chronic supplementation of up to 15 days beforehand has been studied and may be positive
- Not much positive effect on endurance exercise among elite athletes

Juicing for Nitrates?

Celery
Arugula
Watercress
Radishes
Beets
Spinach
Chinese cabbage
Endive
Kohlrabi
Leeks
Parsley

WADA
www.wada-ama.org

WADA provides guidelines on use of substances, but it ***does not*** certify supplements. When products say "WADA Certified", this does not mean anything.

CANADIAN CENTRE FOR ETHICS IN SPORT
www.cces.ca 1.800.672.7775 Substanceinquiries@cces.ca

The CCES is a Canadian service that provides up-to-date advice and information on WADA regulations and policies. Feel free to contact them with any substance-related questions.

GLOBAL DRUG REFERENCE ONLINE
Verify the status of a **medication** or **over-the-counter (OTC) medication** any time by using the following resource: Global DRO at www.globaldro.com. *Be as specific as possible* when doing your search. As an example: *Advil Cold & Sinus* is prohibited, but *Advil Extra Strength* is not prohibited. This website may also be used: http://www.cces.ca/en/checkmeds.

21074

2 large apples
2 cups strawberries, greens removed
1 tsp cinnamon
¼ cup purified water

Core and dice apples. Add diced apples, strawberries, ¼ cup of purified water and cinnamon in a blender and process about 30 seconds, or until smooth. Dehydrate for 6-8 hours (using a dehydrator). Flip fruit and continue drying another 4-6 hours.

All-Natural Fruit Roll-Ups

21074

2 cup quick oats
4 soft bananas
1 cup raw pumpkin seeds
1 cup raisins
1 cup chia seeds
2 tbsp. cinnamon
Raw honey (to taste)

Combine all ingredients until well-mixed. Place parchment paper on baking sheet/dish. Make big or small cookie patties (it will bake the way you shape it), or lay it in one big flat mass. Bake at preheated 400deg for 20-25 minutes. They freeze really well.

Banana-Oat Mounds

1 medium sweet potato, peeled
2 egg whites
1 tbsp unsweetened cocoa powder
1 tbsp almond butter
Dash of cinnamon

Peel and cube the yams. Place in boiling water for 7-10 minutes until soft. Combine all ingredients in a food processor and blend until smooth. The consistency should be a little runnier than normal cookie dough. Place on a baking sheet and bake on 350 for 10 minutes and 300 for 20 minutes. I generally make about 8 cookies. Allow to cool.

Chocolate Sweet Potato Cookies

Wash and scrub small red potatoes or colorful fingerling potatoes.

Toss the potatoes with just enough chicken or beef stock to moisten their skins and a light sprinkling of coarse salt.

Roast the potatoes in the oven until they are soft all the way through.

Allow the potatoes to cool, then chill them in the refrigerator until you're ready to pack them.

Mini-Potato Snacks

Banana-Almond-Blueberry Pancakes

2 bananas
2 egg
1 tbsp. coconut flour
1-2 tbsp. almond butter
Fresh or frozen blueberries (if washed, strain out water)
1/4 cup nuts of choice (walnuts, macadamia, almonds are good), chopped
Coconut oil (unrefined)
Dash of sea salt (optional)

Mash bananas in a bowl. Add the eggs, coconut flour, almond butter, blueberries, and nuts and salt, and whisk until well blended. Heat a large skillet over medium heat along with a small pat of coconut oil. Pour small discs of batter onto the hot pan (around 3-4" around). They'll be easier to flip if you keep them from the edges of the pan. Flip when batter loses its "tackiness" around the edges. Cook other side slowly over medium heat until fully cooked. Reapply oil to the pan after each round of pancakes.

Corn Muffin Heaven

2 eggs
1/3 cup melted organic butter or coconut oil
1.5 cups milk (rice, cow, goat)
1 package (20oz, 567g) Bob's Red Mill GF Cornbread Mix

Add:
Grated or diced cheese (cow, goat, feta….)
Cubes of roasted turkey or chicken
Shredded zucchini

Preheat oven to 375°F. Mix all ingredients in a bowl, and blend manually (or on "low" using a hand mixer). Pour into greased muffin baking pan and bake for 20 minutes or until golden brown.

Resources

BOOKS
The Feed Zone Cookbook, Thomas/Lim
Sports Nutrition: From Lab to Kitchen, Jeukendrup
Athlete's Plate, Kelinson

WEBSITES
http://www.paleoplan.com/recipes/
www.jamieoliver.com

RESEARCH
www.pubmed.com

Thank you.

Trionne Moore
BA, RHN, IOC Dipl. In Sport Nutrition
Lead Nutritionist, Canadian Sport Institute Ontario

CANADIAN SPORT INSTITUTE
INSTITUT SPORT CANADIEN