Nutrition, Health, and Athletics:

What does "eating right" mean for me?

WATER SKI AND WSWBC WAKEBOARD BC

EST 1986

By Jed Leech and Robert McDermit

Health

"Consume a variety of foods balanced by a moderate intake of each food"

Caloric Intake

Calories (cal): The amount of energy in food

These are often listed on food products as **C**al (capital "C"), which is equal to 1000 **c**al (lowercase "c"), or 1 kcal. Food labels and recommendations are typically based on a 2000 kcal/day diet. However, most individuals need more; thus, it is important you calculate your own caloric requirements.

Your Total Energy Expenditure (TEE) is the amount of calories you require for a given weight and physical activity level:

Calculating TEE:

$$TEE = RMR + 0.1 \times RMR + PA \times RMR$$

Calculating Resting Metabolic Rate (RMR):

Males

$$RMR = 66.5 + (13.8 \times Weight\ (kg)) + \left(5.0 \times Height\ (cm)\right) - (6.8 \times Age)$$

Females

$$RMR = 655.1 + (9.6 \times Weight\ (kg)) + \left(1.85 \times Height\ (cm)\right) - (4.7 \times Age)$$

*Correct mass to TARGET weight, not current weight (see **Meeting Weight Goals**).
** Note: 1kg=2.2 lbs

Calculating Physical Activity

Physical Activity Level	PA Value for TEE Calculation
Minimal (quiet sitting, office job)	0.3
Light (walking to school, house chores)	0.4 to 0.6
Moderate (1 hour of moderate-vigorous activity, sweating/breathing heavily)	0.7 to 0.8
Intense (2-3 hours of moderate to vigorous activity)	0.9-1.0

An alternative to calculating is to track your caloric intake for 2 weeks during weight stable conditions to determine your baseline caloric intake.

Meeting Weight Goals

Energy Balance

Energy Balance = Energy intake (calories consumed in diet) - Energy Output (calories burned throughout day)

When MORE calories are CONSUMED than burned, weight GAIN results.

When MORE calories are BURNED than consumed, weight LOSS results.

When calories burned EQUALs calories consumed, a stable weight is maintained.

* Note: People who were previously obese will need to eat less and exercise more than their never-obese peers to lose weight.

*Refer to **Satiety**

Caloric Restriction. Caloric restriction describes eating 30-60% less than you would if you had all the food and were feeding at will. This has been shown to extend lifespan, delay age associated diseases, reduce the risk of diabetes, and reduce the risk of cardiovascular disease. However, if you eat too few calories there are also adverse effects including osteoporosis and infertility (Mercken, Carboneau, Krzysik-Walker, de Cabo, 2012).

Exercise Recommendations (Donelly, Blair, Jakicic, Manore, Rankin, & Smith, 2009)

To prevent weight gain
150-250 min/wk of physical activity equalling a caloric expenditure of 1200-2000 kcal/wk

For weight loss

<150 min/wk will lead to minimal to no weight loss

150-225 min/wk leads to moderate weight loss (2-3kg/wk)

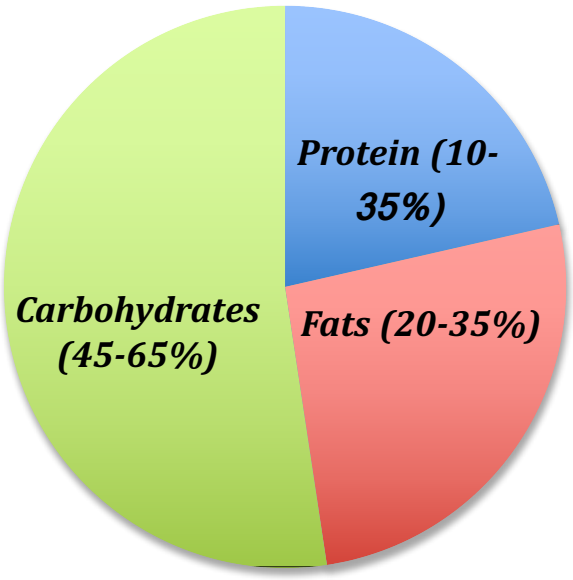
Weight loss goals should not exceed 1-2 lbs per week, with a daily caloric deficit of no more than 500-1000 kcal (unless directly supervised by a medical doctor). To ensure sufficient nutrient intake, the minimum recommended caloric intake is 1200 kcal. Losing more than 1-2 lbs a week primarily consists of water, bacteria, and lean tissue loss.

CR is more important than exercise in creating a caloric deficit. However, together they are more effective than either alone. For sustained changes in metabolism, both caloric restriction and exercise is required.

Macronutrients

Macronutrients are the main nutrients your body requires in large amounts. The three macronutrients are (a) Carbohydrates, (b) Protein, and (c) Lipids (aka fats).

The Acceptable Macronutrient Distribution Ranges (AMDR) describe the proportion of your caloric intake that should come from each macronutrient (Health Canada, 2010).



A. Carbohydrates:

Carbohydrates (carbs) are the backbone to every meal. However, not all carbohydrates are equal. A big distinction is between simple and complex carbs.

- Simple: *sugar, candy, fruit juice, soda pop, white bread*
- Complex: *vegetables, whole grains*

An ideal diet limits simple carbs, which leads to energy spikes and crashes (think red bull). Complex carb sources are preferred because they have more nutrients and provide more constant energy throughout the day. While fruits contain both simple and complex carbs, they have lots of nutrients and fibre, making them function more like complex carbs.

EAT MORE COMPLEX CARBS
EAT FEWER SIMPLE CARBS

Overconsumption (Johnson et al., 2009)

Too many sugars are related to:

- *More fats in the blood*
- *Diabetes*
- *High blood pressure*
- *Heart disease*
- *Kidney disease*
- *Obesity*
- *And much more*

Just like protein, excess carbs ot any source are converted to fat. Under-consuming carbs, however, can lead to protein (muscle) breakdown as well.

Fructose.

Fructose is a simple carb that is greatly over-consumed. This is an issue because our body usually turns this into fat instead of storing it as glycogen in the muscle.

So does this mean fruit is bad? No! The high fibre content slows down digestions and absorption. Fruits also contain lots of other nutrients that we need!

One of the biggest sources is High Fructose Corn Syrup (HFCS). This is found in most processed foods and contains, like its name suggests, lots of fructose (simple carb). Soda drinks are one of the biggest culprits. HFCS is strongly related to obesity (Bray, Nielson, & Popkin, 2004).

Fibre.

Fibre is arguably the most underrated nutrient and it is often under consumed. The average person should aim to consume 12-13g per day. Adequate fibre intake has many benefits:

- *Reduced risk of Colon Cancer*
- *Reduced risk of Heart Disease*
- *Reduced risk of Type 2 Diabetes*
- *Increases lifespan*
- *Enhances weight loss*
- *Prevents haemorrhoids, constipation, and diverticulosis*

Where can I get fibre?

- *Vegetables*
- *Fruits (especially oranges, bananas, apples, apricots)*
- *Whole wheats*
- *Almonds*

Fun fact! Successful “myfitnesspal” users (those who successfully meet or maintain their weight goals) tend to eat 29% more fiber! (Myfitnesspal, 2016).

Note: If you lack fibre don't add all at once, slowly progress. If you don't, you may experience some bowel problems

EAT MORE FIBRE
EAT FEWER PROCESSED FOODS

B. Protein:

Protein is vital for muscle growth, a healthy immune system, and repairing tissues. While it is important to consume enough protein, most North Americans are actually overconsuming protein, which leads to negative effects.

Calculating daily recommended protein consumption:

Age	Daily Recommended Protein Consumption (g/kg of body weight)
Child (0-6 months)	1.5
Late Childhood (6 months-13 years)	1
Young Adulthood (14-18 years)	.9
Adult (19-64)	.8
Older Adults (65+)	1.2

Example calculation
The following calculation is based on a 70kg (154lb) adult:

$$70kg \times 0.8\frac{g}{kg} = 56g\ of\ protein\ per\ day$$

Meat Sources. While meat is a great source of protein, most North Americans over consume meat. Unfortunately, this comes with negative consequences (Pan et al., 2012). Moderation is key! Try to make the most of lean meats (chicken, turkey, fish, etc) that contain less fat.

Pros:	Cons
• Good source of Iron	• High in fat
• Contains all required Amino Acids	• Over consumed in North America
	• Few other nutrients
	• Slow to digest (*3-4 hours*)
	• Expensive
	• Increased disease risk

Vegetarian Sources. Vegetarians may require more protein - up to 1.7 g/kg/day. Additionally, while animal sources contain all 20 amino acids, vegetarian protein sources do not. Vegetarian protein sources must therefore be combined with complementary proteins.

Vegetarian Proteins:

Pros:	Cons
• Live longer with less disease (Huan et al., 2013; Orlich et al., 2012)	• Incomplete proteins (*Except quina and hemp seeds)*
• Rich source of vitamins and minerals	• May need more food to get the same amount of protein
• Cheapest protein sources	
• Less processed	
• Low contamination risk	

Example of complementary foods:

- *Legumes with grains, nuts, seeds, or dairy*
- *Grains with dairy*
- *Dairy with nuts, seeds, or legumes*

These can be combined in a number of common meals:

- *Beans and rice or tortillas*
- *Peanut butter sandwich*
- *Macaroni and cheese*
- *Tofu with rice (or any grain)*
- *Hummus with pita bread*
- *Grilled cheese sandwich*
- *Yogurt with nuts*
- *Lentil soup*

Overconsumption. Most Canadians consume 1.5-2 times the recommended protein intake. Excess protein is not stored as protein (turned into fat), and the rate of muscle protein building is limited. Eating more protein than these recommendations does not lead to health benefits or muscle growth. Over-consuming protein (>3g/kg/day) can have adverse health effects including kidney disease, cardiovascular disease, and diabetes (Delimaris, 2013).

EAT VEGATARIAN PROTEIN
EAT LEAN MEATS
EAT LESS TOTAL MEAT PROTEIN

Frequency of Consumption. To make sure all the protein you eat is used, eat up to 10g every 3 hours and 20-25g after exercise to build muscle! Older athletes should eat 20g every 3 hours and 40g after exercise.

LIMIT PROTEIN INTAKE TO 10g PROTEIN EVERY 3 HOURS
(More after exercise)

Milk: Good or Bad? Milk is basically liquid meat.

Pros:	Cons
• Easily absorbed protein • Contains all required Amino Acids • Cheaper than meat • No association with any disease • Lots of calcium	• High in fat • More expensive than vegetarian protein (vegetables and grains)

Lots of North Americans consume whey protein powder. This is one of the same proteins found in milk.

Fun Fact! Fruit Juice consumption in children is going up while milk consumption is going down (Dennison, 1996). This is an issue, as kids who consume more fruit juice have (Shefferly, Scharf, & DeBoer, 2016):

- *Shorter stature*
- *Greater BMI*

C. Lipids (Fat):

Fats get a lot of flack; however, they are an important part of our diet! There are two main types of fats:

- Saturated, think solid form (*butter*)
- Unsaturated, think liquid form (*oils*)

Another form of fats is trans fat. Don't eat these! Trans fats can damage blood vessels. If you see "hydrogenated" on the packaging, this means that it likely contains trans fats.

Omega Fats: Good and Bad. Society tends to view omega fats as good. However, there are two very different types:

Good Omega (Omega 3)	Bad Omega (Omega 6)
• Under-consumed	• Over-consumed
• Found in fish and flaxseed	• Found in packaged foods and oils
• Anti-inflammatory	• Pro-inflammatory
• No link to plaque build-up in arteries	• Linked to plaque build-up in arteries
• Doesn't increase blood cholesterol	• Increases blood cholesterol

Most people consume too much Omega 6 and not enough Omega 3. This is linked to:

- *Heart Disease*
- *Cancers*
- *Osteoporosis*
- *Inflammatory and Autoimmune Diseases*

(Simopoulos, 2006)

Fats can also vary in their length: they can be short or long. Try to eat more short fats. These can be found in milk, palm oil, and coconut oil. Short fats have a number of benefits (Lawrence, 2013):

- *Anti-viral*
- *Anti-microbial*
- *Anti-tumour*
- *Prevents tooth decay*
- *Prevents Tooth plaque*
- *Lower heart disease risk*

EAT MORE OMEGA 3
EAT LESS OMEGA 6
AVOID TRANS FATS

Clogging the Arteries.

Atherosclerosis is becoming a major issue in North America. This is when our arteries get clogged, potentially leading to a heart attack. Two of the things that clog our arteries are fat and cholesterol. However, not all cholesterol is bad. Good cholesterol helps remove fat from the arteries. Bad cholesterol moves fat into the bloodstream. While many people think saturated fats increase bad cholesterol, there is little evidence to support this. Don't go out of your way to avoid saturated fats! Likewise, red meat doesn't lead to Atherosclerosis, but processed meat does. Another reason to avoid processed meat!

AVOID "BAD CHOLESTEROL"
(FOUND IN PROCESSED MEAT)

Fat Free Foods.

"Fat free" or "reduced fat" foods mean that fat has been replaced with carbs, usually simple sugars, most of which are converted to fat anyways. There is no evidence that eating these foods improves fat levels in the blood.

Fat Fad Diets.

Fad diets come and go, and are usually not effective. Any diet advertising rapid weight loss is typically not recommended. This is because the weight you lose comes from both fat and muscle. This weight is almost always soon gained back as fat; the muscle does not return so easily.

The first five pounds of weight lost during a diet is usually water and bacteria; both of which we need. Keep this in mind when watching diet ads.

For example:

Diet	Description	Why Not?
The Keto Diet	High fat, low CHO	• Lacks vitamins and minerals, especially Vitamin A & C • Leads to high blood lipid levels, coronary artery disease, gastrointestinal disorders, kidney stones • Leads to low muscle glycogen and performance impairments • More muscle loss than fat loss • Psychologically stressful, leading to bad moods

(Hall et al., 2016)

If you want to lose weight, avoid fad diets. However, studies have shown low fat diets can lead to successful weight loss (Hall et al., 2015).

Remember, individuals are different. Just because a certain diet worked for someone doesn't mean it will work for you.

Micronutrients

Micronutrients are required in smaller amounts for normal growth and development. To ensure you're meeting the micronutrient requirements, consume a *variety* of nutrient dense foods, such as fruits and vegetables.

Most people consuming a western diet don't eat enough plants (fruits and vegetables), and are often lacking nutrients (Statistics Canada, 2007). Eating more plants is strongly related to living longer and with fewer diseases, including cardiovascular disease and cancer. It also is associated with improved psychological well-being (Orlich, 2007).

EAT A *VARIETY* OF FRUITS AND VEGETABLES

"Filling" Foods

Ever had a meal and felt starving a few hours later? Some foods are digested faster than others, and leave you hungry soon after eating them. Others are digested more slowly, and will leave you feeling "full" for longer.

Slowly Digested (Filling)	Quickly Digested (not filling)
• Solid Foods • High fibre foods (vegetables, fruits, whole grains)	• Liquids (smoothies etc) • Processed foods
• Protein with good quality fats (Avocado, almonds, etc)	• Common "snack foods" (candy, chocolate, Soda pop)

(Mackie, Rafiee, Malcolm, Salt, & van Aken, 2013; Porikos & Hadamen, 1986)

A diet rich in “filling” foods helps you feel more “full” from fewer calories. This is especially important to know if you’re trying to lose weight!

SOLID, HIGH FIBER FOODS WITH GOOD QUALITY FATS KEEP YOU FULL LONGER

Cooking

Advantages. Nutrients in cooked food are more available than in raw foods!

Disadvantages. Cooking at high temperatures (300^{o}C+) creates chemicals that can become cancer-causing once ingested (NCI, 2015). These harmful chemicals adhere to food with any cooking method that involves cooking on an open flame (Ex: pan-frying, deep-frying, and grilling). Many processed foods are made this way so beware!

Solution. Lightly steaming is an excellent way to increase your foods nutrient availability without ingesting these harmful cancer-causing chemicals. Lightly steaming avoids the direct contact with a hot surface while braking down the material within food that makes is harder to digest. Microwaving vegetables in water is an excellent example of how to cook your food without the negative consequences.

Fun Fact! The type of food you eat alters your DNA. These alterations can persist for at least three generations (Youngson & Whitelaw, 2008). This means that what your grandparents ate influences your mom’s genes, which influences your genes. The type of food you eat today impacts your genetics tomorrow!

LIGHTLY STEAM VEGETABLES IN THE MICROWAVE
MINIMIZE CONTACT/ HIGH TEMPERATURE COOKING

Organic Food: Worth the extra dollar?

Organic food is grown without synthetic pesticides. Some pesticides cannot be washed off, and are harmful to our genes and the environment (Krol, Arsenault, Pylypiw & Mattina, 2000). These pesticides are higher in non-organic foods.

Products labelled “organic” have at least 95% organic ingredients. A product labelled “made with organic ingredients” means 70% or more of ingredients are organic (CFIA, 2016).

If you’re not buying organic, try to buy fruits and vegetables that can be peeled, rather than fruits with lots of cracks for pesticides to hide.

General Recommendations

The Canadian Diet:

Overconsuming	Under consuming
• **Protein**	• **Fibre**
• **Fat**	• **Fruits**
• **Meat**	• **Vegetables**
• **Sugar**	
• **"Other Foods" (salad dressing, beer, soda pop, syrup, sauces)**	

(Statistics Canada, 2007)

Timing

- Eat *at least* three meals a day, preferably more.
- Eat more in the morning, and less progressively throughout the day (Asher & Sassone-Corsi, 2015)
    - Eat at least ½ of your daily protein before noon
    - Eating more calories in the evening (late dinners and night snacking) puts you at greater risk of obesity and diabetes

EAT EARLY, EAT OFTEN

Supplementation

Most nutrient requirements can be met simply by consuming a healthy diet including variety of foods (Dieticians of Canada, 2013). It is almost impossible to dangerously overconsume nutrients from food. However, it is possible through taking supplements.

People who lead healthier lives are more likely to take supplements. Ironically, they are the ones who need it the least!

Vitamin D. Although some doctors still prescribe it, current research suggests Vitamin D does not need to be supplemented, even in the winter (NIH, 2016).

Iron. Is the most common nutrient deficiency, and is the most common cause of anemia (NIH, 2016).

Vitamin B-12. Vitamin B-12 deficiency can also cause anemia. Vit B12 is only found in animal sources and fortified food. Vegetarians and older adults may need to supplement.

MOST INDIVIDUALS DO NOT NEED SUPPLEMENTS

That being said, there are some cases where supplements may be necessary:

Demographic	Supplement
• Small individuals trying to lose weight	• General supplements
• Women of child-bearing age	• Vit B9 (Folic acid)
• Pregnant/Lactating women	• General supplement
• Elderly	• Vit B6, Vit B12, Vit D
• Vegetarians	• Vit B12
• Individuals with diseases/disorders affecting absorption	• Disease-specific

Optimizing Performance

How, when, and what you eat affects your performance.

What you eat

The amount of oxygen available determines whether we are using more fat or carbs for energy:

- *Low intensity exercise*: Mostly using fats as energy.
- *Moderate-to-Vigorous intensity exercise*: Mostly using carbs as energy

This doesn't mean that moderate-to-vigorous exercise is bad for losing weight. We replace our depleted carbs after intense exercise by converted fat to carbs.

Hydration (ACSM, 2011)

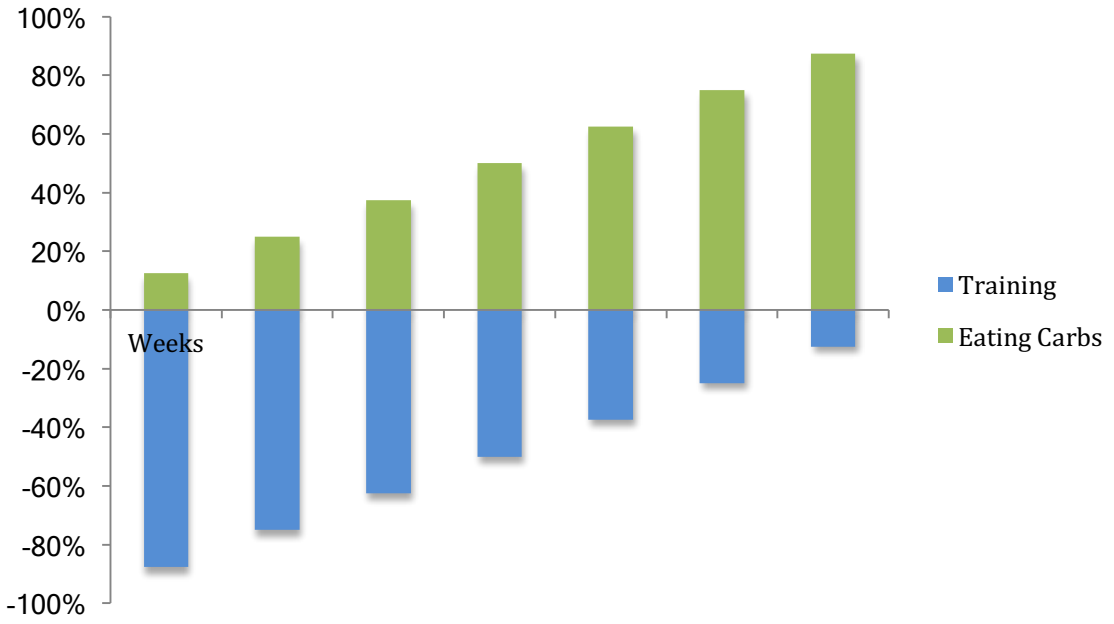
Hydration Drink	Carbs	Sodium	Potassium
Optimal	50-100 g/L	3.6-5.4 g/L	0.36-0.90 g/L
Gatorade	64 g/L	0.42 g/L	0.1 g/L
Powerade	58 g/L	0.42 g/L	0.1 g/L

This means that to optimize an average Gatorade bottle (591 mL), you should add three small packs of table sugar (2.25 g) and 0.15 - 0.47g of potassium. This should last you approximately 2 hours.

Note: This isn't something you want to try on competition day. Everybody is unique so make sure it works for you before competition.

Carb loading

As competition day approaches, reduce your training to rest your body and start eating more carbs to fuel up (see graph below)! On the last few days before your competition you should be eating approximately 8-10 g/kg of carbs (Jeukendup & Gleeson, 2010).



AS COMPETITION APPROACHES:
TRAIN LESS, EAT MORE CARBS

Protein supplementation

Whether or not athletes need more protein is debated. If you're an athlete and choose to eat more protein than the general population, this should not exceed 1.8g/kg (unless you're an older adult or ultra-endurance athlete)

Most athletes consume more food and calories than the general population (say 5000kcals). By consuming more food, you're most likely already consuming enough protein without supplementing with protein powder. Remember, excess protein consumption can have negative effects on health so eating more than the recommendations is not recommended.

Many people trying to get bigger, faster, and stronger will talk about using amino acid supplements. There is *little evidence* to say these improve your health, physique, or fitness (Williams, 2015). By consuming excessive amounts of only one amino acid, you may become lacking in others. Since you need all 20 amino acids to build proteins, this doesn't help make you bigger or stronger. Plus they are expensive.

Although most athletes are getting enough daily protein, certain athletes are at risk of protein under-consumption (Davis, 1992; Jeukendup & Gleeson, 2010):

- *Female runners*
- *Male wrestlers*
- *Gymnasts*
- *Female dancers*
- *Vegetarian athletes in general*

When you eat

Macronutrients are absorbed and digested at different rates (Mulligan, 2017):

- Fats: 3-4 hours
- Proteins: 45-90 minutes
- Carbs: Instantaneously

This means that different macronutrients should be consumed at different times to maximize performance (Jeukenup & Gleeson, 2010):

Time	What to eat	How much
Days before event	Normal diet	Increase carbohydrate intake as you approach event (see graph)
3-5 hours before event	Large Meal	4-5g carbs per kg bodyweight
1 hour before event	Complex Carbs (Fruit!) *NOT simple sugars, fat or protein*	1-1.5 g carbs per kg bodyeight
During event	Carbs (glucose + fructose)	1.2g/minute (see **Hydration**)
After Event (ASAP!)	Protein Carbs (Fruit, chocolate milk)	10-25g Protein 1.2-1.4 g carbs per kg bodyweight

* Simple sugars cause an insulin spike, taking sugar out of your blood. This is removing sugar your muscles need to perform!
* Fat and protein take longer to be digested and absorbed, so they are just adding weight during competition

Note: After exercise, you have an hour window to consume protein and two hours to consume carbs; the protein triggers muscle growth and the carbs restock your muscles' energy stores (Bohe, Low, Wolde, & Rennie, 2003; Ivy, 1988). A great example of a post exercise snack is chocolate milk!

It is important not to skip "pre-event" meals. Trying to run early in the morning before breakfast, for example, is not recommended. To make the most of

DON'T EXERCISE WITHOUT FUELING UP FIRST!
AFTER EXERCISE, THE SOONER YOU EAT THE BETTER!

your training, shift it later in the day.

Performance supplements:

Unlike prescription drugs, nutritional supplements have little regulation and are not tested very much. As a result, many are contaminated and have substitutes not listed on the label. Even worse, 15% of supplements contain unlisted, banned substances that can cause a positive doping test (Rosenbloom & Murray, 2015).

If you decide to purchase supplements..

- Buy from companies that do not sell steroids/prohormones, as this reduces the risk of contamination by 50%
- Buy brands that use good manufacturing practices:
  - http://www.hc-sc.gc.ca/dhp-mps/compli-conform/gmp-bpf/docs/gui-0001-eng.php
- Buy certified products from companies that are certified to contain no banned substances:

Note: Most athletes overestimate the amount of competitors that use supplements and therefore feel justified to do so as well. Keep this in mind: not as many of your competitors use supplements as you may think.

EAT MORE GREENS!
EAT HIGH FIBRE FOODS
EAT LESS PROCESSED FOODS
EAT LESS MEAT

Fun Facts & Pro tips!

- If you want to accurately measure your food, weigh food instead of measuring volume.
- Alcohol has 7 Cal/g and limits absorption of other food
- More tropical Fruits and vegetables have less fibre. Consider that when you eat a mango over an apple!
- All but 10% of the calories you consume on cheat days (5000-1000 kcal) do NOT leave your body (Mulligan, 2017). You live with your cheat days!
- People typically underreport food consumption by 12-20% (Archer, Hand, & Blair, 2013). Don't! Be honest with yourself - you're only cheating yourself.
- Eating out can make it hard to track consumption. Be aware!
- Diet tracking mobile app ownership is not associated with lower weight, energy intake, or improved weight loss behaviours (Myfitnesspal, 2016); you need to actually use it!
- Victoria, BC is the least obese place in Canada (PHAC, 2011)!
- Only 15% of the population meets the physical activity recommendations (Colley, Garriguet, Janssen, Craig, & Clarke, 2011).
- Fast food is generally high in meat, salt, and sugar, all of which most Canadians are already overconsuming (Statistics Canada, 2007).

PLEASE NOTE:
Authors Jed Leech and Robert McDermit are third year kinesiology students at the University of Victoria, not certified dieticians. As such, we are not certified to prescribe diet plans and will not be held accountable for your diet choices. Our aim has been to objectively summarize, simplify, and report current research. All information was obtained from peer-reviewed, scholarly scientific articles (see **References**) and covered in EPHE 455: Advanced Nutrition by Greg Mulligan of UVIC. We hope that this has demystified, at least to some extent, the constantly changing, jargon- filled complexity of current nutrition research.

Please email jedleech@outlook.com with any questions or concerns.

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