

Athletic Science 20

Module 1: Nutrition for
Recreation and Sport

Outcomes

- Explain the role of food and nutrients in relation to physical performance (recreationally and athletically)
- Demonstrate strategies for achieving optimal nutrition for recreational and athletic activity in a variety of case studies
- Demonstrate effective strategies for hydration during recreational and athletic activity

Outcomes

- Plan meals and snacks for a variety of activities
- Interpret nutritional information and misinformation
- Justify considerations for the appropriate role of coaches and rec. leaders in relation to nutrition
- What does a nutritionist do? Sport nutritionist?

Canada Food Guide and Performance

- Why should an athlete follow the Canada Food Guide?
 - Is it good enough for athletes?
 - What are the pros and cons for athletes following this guide?
 - List 5 reasons why an athlete (rec or high performance) would have optimal nutritional levels if they followed this guide.

Calories are not bad

- Define “calorie”:
- Compare the caloric values of:
 - Carbohydrates
 - Proteins
 - Fats

Which nutrient has the highest caloric value?

Which nutrient has the lowest caloric value?

Compare activities and calories needed:

- How many calories would I burn running for 60 minutes at a moderate pace?
- What would I have to ensure PRIOR to and AFTER my run in terms of nutrition?
- Compare 60 minutes of moderate running to 60 minutes of walking (in terms of caloric needs)

Resting Metabolic Rate

- Define “Resting Metabolic Rate”
 - The rate at which...

Daily Activity Level

- What is your daily activity level?
 - Sedentary:
 - Moderately active:
 - Very active:

How does your DAL effect your caloric needs?

How many calories do I burn when.....

- I run 60 minutes:
- I walk for 30 minutes:
- Riding the bike for 60 minutes:

- What about other activities?
 - Basketball
 - Hockey
 - Dance

Calculate your personal daily caloric requirements:

- You will need:
 - BMR (to calculate this, visit the next slide)
 - Age
 - Gender
 - Weight (lbs. or kgs)
 - Height (m or ft and inches)

Visit this site:

http://www.freedieting.com/tools/calorie_calculator.htm

Lab #1: Calculating my daily caloric requirements

How to calculate BMR:

The BMR is your daily caloric needs needed for your body to perform its basic tasks, such as heart to beat, breathing, digesting, etc. This measurement can help you fine tune the calorie needs of your body with the Harris Benedict formula.

- The **woman's American measurement BMR** equation is: $(4.7 \times \text{your height in inches}) + (4.35 \times \text{your weight in pounds}) - (4.7 \times \text{your age in years})$. Add 655 to this total for the BMR..
- The **man's American measurement BMR** equation is: $(12.7 \times \text{your height in inches}) + (6.23 \times \text{your weight in pounds}) - (6.8 \times \text{your age in years})$. Add 66 to the total for the BMR.
- The BMR equation in **metrics for women** is: $(9.6 \times \text{your weight in kilograms}) + (1.8 \times \text{your height in centimeters}) - (4.7 \times \text{your age in years})$. Add 655 to the total to learn your BMR.
- The BMR equation in **metrics for men** is: $66 + (13.7 \times \text{your weight in kilograms}) + (5 \times \text{your height in centimeters}) - (6.8 \times \text{your age in years})$. Add 66 to the total to learn your BMR.

Have your BMR written down

Now add in Activity Levels...

- **Apply the Harris Benedict formula to calculate calories based on your activity level and BMR.**
 - All you have to do is multiply the BMR for your body by the number for your activity level.
- If you don't exercise or exercise little, multiply the BMR by 1.2 for daily calories.
- If you take part in light exercise or sports 1-to-3 days each week, multiply the BMR by 1.375 for daily calories needed.
- People who exercise moderately and/or play sports 3-to-5 days a week should multiply their BMR by 1.55
- Active people who engage in strenuous sports or hard exercise 6-to-7 days a week need to multiply their BMR by 1.725.
- People who engage in very physically challenging jobs or exercise, such as 2-a-day workouts, should multiply their BMR by 1.9 for daily caloric needs.

Did you get the same?

- Compare your results from the “calculator” to the “calculations” that you did.
- Were they similar? Way off?
- What could explain the difference if there was one?

Case Study 1: John

- John is a 21 year old who lives in Grande Prairie. He works in the oilfield and is gone for 10 days at a time. He carries heavy equipment and is on his feet almost all day. John used to play hockey when he was in high school, but hasn't gone to the gym or played a full game (other than shiny every Christmas) since that time. He has been gaining weight recently and has gone from 180 lbs.. to 210 lbs.. He is 5'11 so this has changed his appearance drastically.
- John has come to you, a nutritionist, to help him figure out how to get back on track with his eating. Because he is always on the rigs, he doesn't always eat properly so he is looking to you to calculate his daily caloric requirements as a start to his new weight loss program.
- **What is John's BMR?**
- **How many calories should John be eating?**
- **What would you recommend to John to maintain his energy at work and still eat properly?**

Case Study: Kara

- Kara is a 44 year old woman with 3 children. She is an office administrator and has been at this job for 10 years. She has a very busy schedule as all three of her children are in minor hockey. She was recently at her doctors office for her yearly physical and found out she is borderline diabetic. This is reversible, with a change in diet and activity, according to her doctor. So she has made an appointment with you to figure out how to implement changes she and her children can handle in their busy lives. She is 5'2 and 190 lbs..
- **What is Kara's BMR?**
- **How many calories should Kara be eating?**
- **What changes would you recommend to help Kara reverse her borderline diabetes and maintain a healthy lifestyle?**

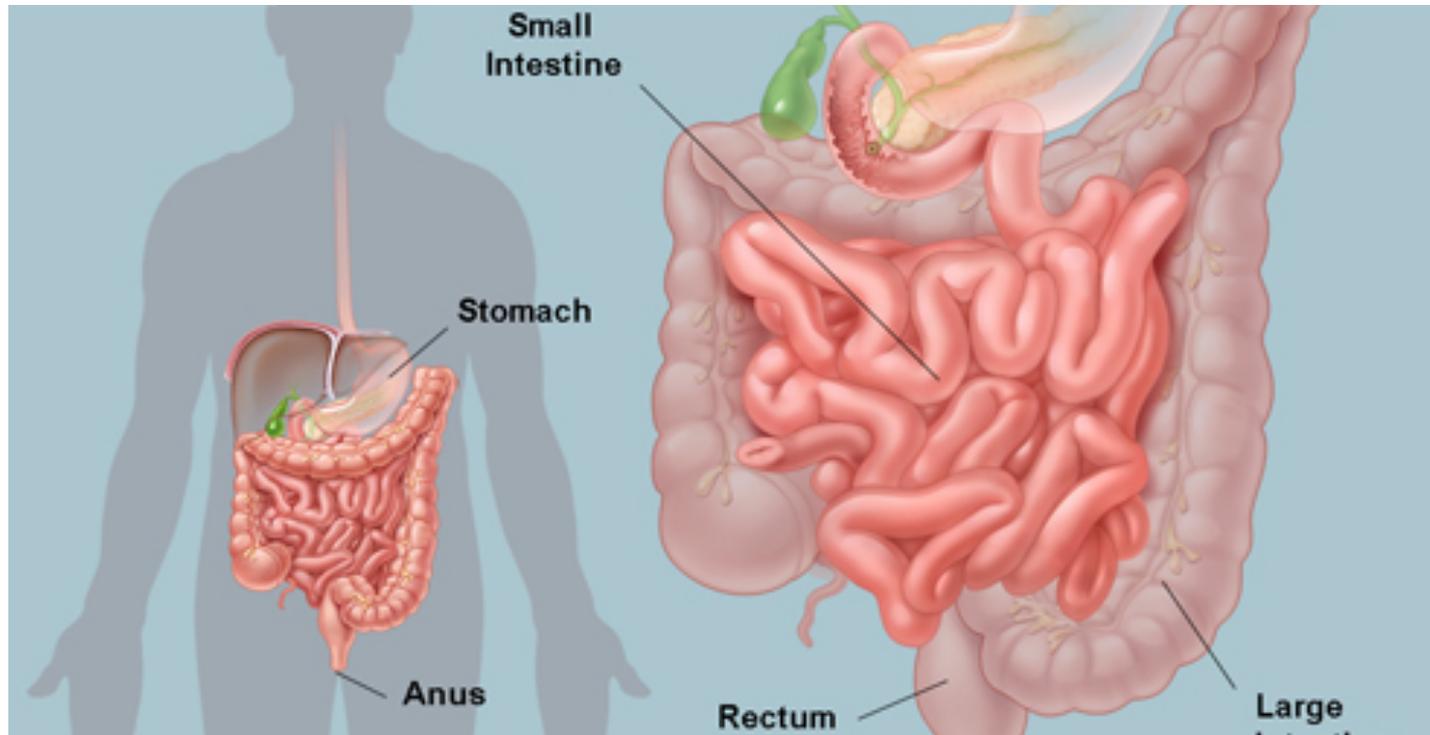
Effects to Caloric Needs

- How do the following effect caloric needs of individuals?
 - Age
 - Height
 - Weight
 - Gender
 - Amount of Body Muscle
 - Amount of Daily Physical Activity

How does my body utilize what I eat?

- When we eat food, what happens to it to become “fuel”?
- When you chew food (mastication) you are breaking down the cell structure of your food.
- When you swallow your chewed up food it goes on a journey through digestion so it can be absorbed and utilized by your body.

Stomach Anatomy



Digestion, absorption and metabolism

- Stomach: bile and stomach acid breaks down the cell structure of the food even further.
- Small intestine: This is where your food nutrients are absorbed. The lining of your small intestine allows the passage of nutrients (water, fats, vitamins, minerals, carbohydrates and proteins, etc.)
- Then your body, depending on how efficient it is at metabolizing your food, will pass it through your small intestine (20 ft. long!) and then into your large intestine and out of your body.

Assignment

- Describe and detail (with a visual – screenchomp app would be good for this) the journey your ham and cheese sandwich would take as it passes through your body and where certain types of digestion and absorption happens
- Assessment: /12

Metabolism

- What is metabolism? (define)
 -
 - What does it mean when someone says they have a high metabolism? Low metabolism?

Training program requirements

- Are the energy requirements different for someone who walks their dogs everyday to someone who is training for a triathlon?
 - How?
 - Why?

Carbohydrates

- Define “carbohydrate”
 - Simple carbohydrates
 - Complex carbohydrates
- What is the main function of a carbohydrate?
- What are sources of carbohydrates (simple and complex)?
- Why is it importance to balance carbohydrate intake?
- Why do sports drinks contain carbohydrates?

Protein

- Define “protein”
- Where do we find sources of protein in our diets?
- What is the role of protein in our diets?
- Why would an athlete need protein?
- Think about this: could a vegetarian be a successful triathlete? How?
- Why would weight lifters drink protein drinks before/after working out?

Energy release systems related to nature of physical activity

- How do various types of physical activity change the way our bodies utilize different types of nutrients? (how do our bodies release energy during different types of activity?)
- Brainstorm ideas:

Glucose and Glycogen

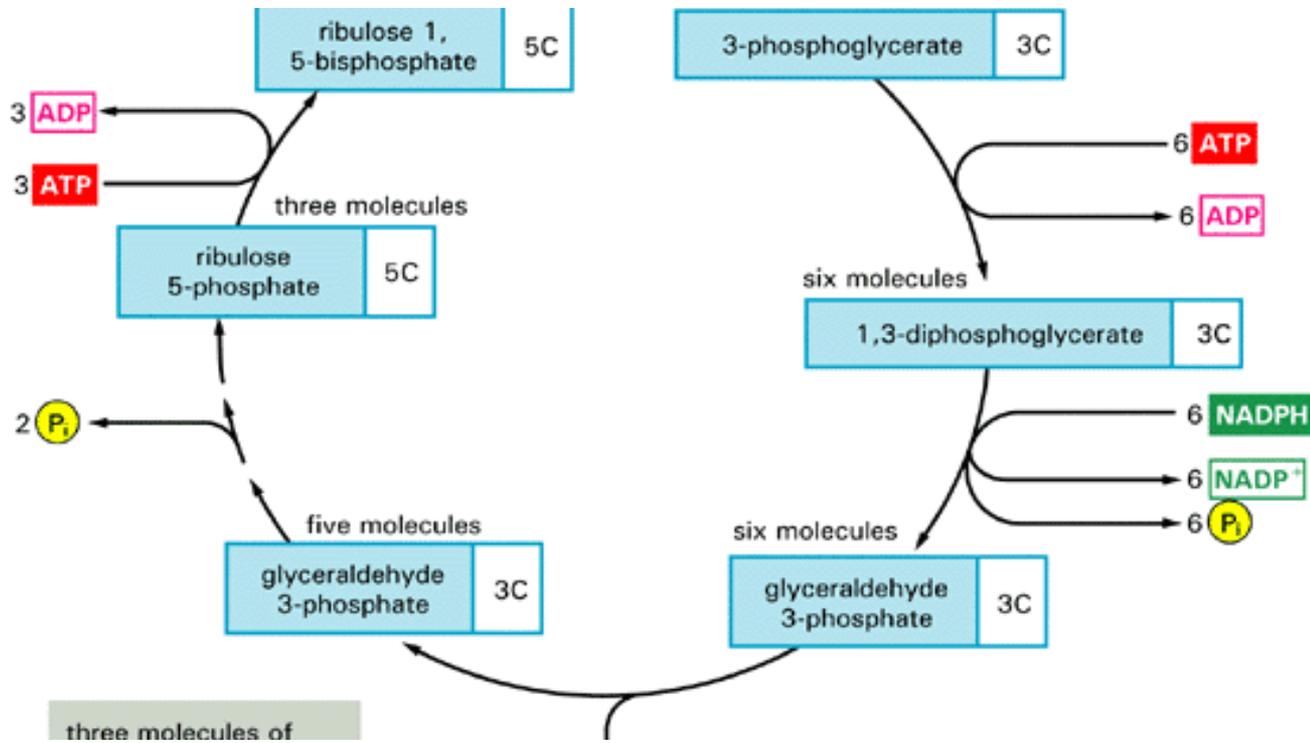
- Glucose = carbohydrates
- What is an example of glucose?
- Glycogen is the stored form of glucose
- So when you eat lots of sugar, and you don't "burn" it off, it is stored as glycogen
- Glucose and glycogen are the easiest and most readily available nutrients for energy release in the body
 - Think about a "sugar high"

Glucose and Glycogen

- When your body needs glucose for the Glycogen Cycle (to release energy for activity) it calls on your stored glycogen to convert to glucose. YOU NEED ATP = energy
- Most of your glycogen is stored in your liver.
- If you have diabetes, you are unable to store glucose or to convert glycogen into glucose for energy needs.

How does my body release energy?

Calvin Cycle



Aerobic vs. Anaerobic Respiration

- Aerobic = with air
- Anaerobic = without air
- Our bodies have different needs based on the type of activity we are doing.
- If I do short duration activities my muscles will not need “reinforcement” energy.
 - This energy is generated through the Anaerobic System (non-oxygen system)

Aerobic vs. Anaerobic

- Strictly speaking, the terms "aerobic" and "anaerobic" refer to the presence and absence of oxygen, respectively.
- Most of our cells prefer to get their energy by using oxygen to fuel metabolism.
- During exercise with adequate fuel and oxygen (i.e., aerobic), muscle cells can contract repeatedly without fatigue.
- During anaerobic or non-oxygen conditions (i.e., higher intensity exercise), muscle cells must rely on other reactions that do not require oxygen to fuel muscle contraction.
- This anaerobic metabolism in the cells produces waste molecules that can impair muscle contractions. We call this deterioration in **performance fatigue**.

Aerobic vs. Anaerobic System

- If I am doing long duration activity, my body will need to enter into the aerobic system to generate energy for my muscle systems.
 - Aerobic system = with air

Comparison Chart

Anaerobic vs. Aerobic Metabolism

Comparison chart

Improve this chart	Aerobic Respiration	Anaerobic Respiration
Oxygen requirement:	Yes	No
Site of reactions:	Cytoplasm and mitochondria	Cytoplasm
Stages:	Glycolysis, Krebs cycle, Electron Transport Chain	Glycolysis, Fermentation
Net Production of ATP:	38 ATP per 1 glucose	2 ATP per 1 glucose
Conversion of Pyruvate:	Carbon Dioxide	Lactic Acid or Alcohol
How it recycles NADH:	Electron Transport Chain	Fermentation
Cells that use:	most cells	yeast, prokaryotes, muscle cells
Production of lactic acid:	Does not produce lactic acid	Produces lactic acid

Intensity and Duration

- How does the level at which I exercise effect how my body will release energy?
- How does the duration of my activity effect how my body will release energy?
- Brainstorm:
 - -
 - -
 - -

Carb-loading

- Research the idea of “carb-loading”
- What is the point of this?
- What are the parameters of this type of carb intake?
- What misinformation exists about carb-loading?
- Non-example: The Office (YouTube video)

Muscles: Development and protein structure

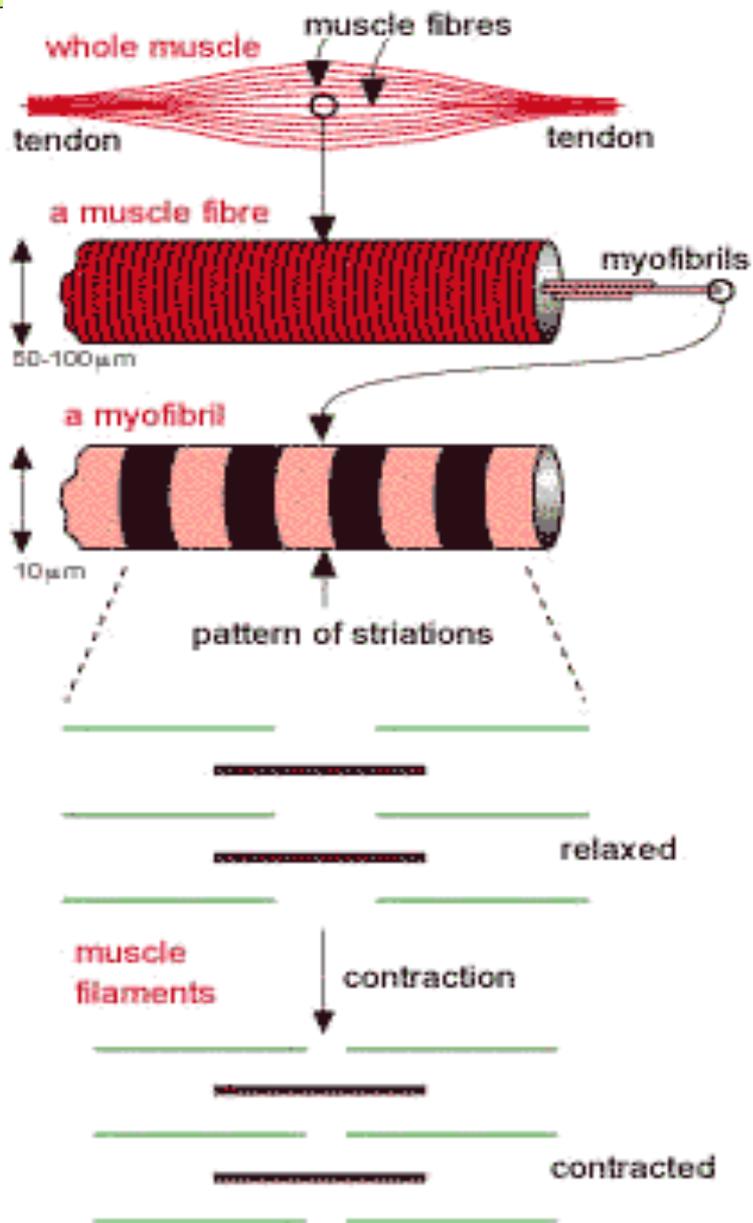
- Define “hypertrophy” and “atrophy” in terms of muscles
- How does muscle hypertrophy happen? Muscle atrophy?
 - Brainstorm:

Protein Structure of Muscles

- Special small molecules (ATP, adenosine triphosphate), produced during respiration, provide the store of energy that muscles use. When these small molecules break down they make energy available to the muscle. How can muscle turn this chemical energy into kinetic energy?
- It is the proteins in the muscle that respond to nerve impulses by changing the packing of their molecules. To see how this works, though, we need to look at how the molecules are collected together and at their structures.

Protein Structure of Muscles

- Hundreds of muscle fibers, each up to several centimeters long, are bundled together to make up a single muscle.
- Many small myofibrils make up each fiber (Figure 5). The myofibrils have a characteristic pattern of transverse lines, called striations, that are formed by the arrangements of protein molecules.
- The protein molecules form **filaments**. There are two types of filament; thick and thin. Thick filaments contain myosin, thin filaments contain actin , troponin and tropomyosin. Scientists think that muscles contract by the two types of filament sliding over each other so that they overlap more



Assignment: Essay/spoken word

- Justify the role of nutrition as a key factor in enhancing physical and athletic performance.
- “Nutrition is the single most important factor to enhancing physical and athletic performance”
- 4 paragraphs – 2 pieces of evidence.

Deficiencies – Discovery Day

- Calcium –
- Zinc -
- Iron -
- Fiber -

What ration of muscle: fat is ideal?

- Muscle : Fat ration is important for different types of activity. Do some research to find out what the ideal ration for men and women (recreational and athletic)

Major Assignment

- Directions:
 - Choose three different real life athletes:
 - In a judged sport (gymnastics, figure skating)
 - In an individual or team sport (hockey, bball)
 - Endurance sport (triathlete, marathons, etc.)
 - Describe the minimal nutritional OBJECTIVES that will support their physical training
 - Objective for training will be based on your research of their age, height, weight, activity requirements.
 - You will then recommend a NUTRITIONAL OBJECTIVE for each of your chosen athletes.
 - Put this together as a short report with pictures of each of your athletes.

Factors that influence Eating Patterns

- Describe “competition anxiety” and how this will effect athletes’ eating patterns
- What taboos and superstitions exist in sports in relation to eating patterns?
- What about athletes that refrain from eating certain types of foods due to religious beliefs and practices?
 - Ramadan (Texas football team), Lent, Beef/pork, etc.

(YouTube video)

Timing of food

- If you are at a tournament, and you play 4 games in 2 days, how does this effect your eating patterns and nutritional requirements?
- When should I eat meals of the follow:
 - 500-800 kcal
 - 300-500 kcal (cliff bars)
 - Small snacks or blender/liquid meals (power gel)

Recovery

- Define “DOMS”:
- How do I optimally recover from physical activity?
- Research and find out why the following nutrients are important for recovery:
 - Carbohydrate intake:
 - Protein intake:
 - Fat intake:
 - Salt intake:
 - Potassium intake:

Cramping

- Why do muscle cramp during/after physical activity?
 - Dietary causes:
 - Hydration causes:
- **Suggest 5 ways to preventing muscle cramps:**

Assignment: Personal Plan

- Weight Loss or Weight Gain
- Directions:
 - Identify personal optimal weight based on BMR
 - Set a SMART goal (specific, measurable, achievable, realistic, time-oriented) for your loss/gain plan.
 - Design a personal plan to meet this goal (i.e. – workout/activity schedule)

Assignment: Research project

- Choose one of the following to do a research project on:
 - Eating Disorders in Sport
 - Female athlete Triad Syndrome
 - Napoleon Syndrome (male)
- Requirements:
 - 2 pages or 6 minutes in length (audiobook)
 - Citations

Assignment: Hydration Log

- Log your liquid intake during an entire day
- Bring this log to class the following day:
 - Which liquids were hydrating?
Dehydrating?

Sweat Rates

- What factors influence sweat rates?
 - heat
 - Heart rate (breathing rate)
 - humidity
 - excess sweat glands in the body
 - Food – spicy foods (curry, peppers, etc.)
 - Nervous/anxiety- you get really nervous and start to sweat

Why is water important?

- For:
 - Replacement of water from sweating
 - Enhancing performance
 - Maintaining core temperature
 - Gastric cramping (stomach cramps)
 - Fatigue

Assignment: CSI – tap vs. bottled water

- Research on which is better for you:
 - Bottled water or tap water?
- Create a comparison chart to demonstrate what you've found

Thirsty? You're dehydrated.

- How does thirst relate to dehydration?
- Does drinking water help during activity to rehydrate me? Why or why not?
- Brainstorm and research:

Hydration – H₂O

- What is the timing of hydration for athletes?
 - Before activity?
 - During activity?
 - After activity?

- Can you overdose on water?
 - See “hyponatremia”

Assignment: Meal Planning

- Pretend you are a Professional Athlete. You have a major game/competition coming up in 1 week. Give me your background and biography.
- Create 3 different meals that demonstrate your knowledge of portion control, nutritional needs, hydration needs.
- DRAW out these meals from a bird's eye view (show me, explain everything) and analyze WHY they are good meal choices for your activity and nutritional/hydration needs.
- DRAW out 1 pre-event snacks/hydration scenario
- Draw out 1 post-event snacks/hydration scenario
- Assessment: /24

Optimal Food Choices

What optimal food choices for athletes trying to recover contain: LIST THEM

- approx. 50 g of carbohydrates?
- approx. 50 g of carbohydrates and 10 g of protein?

Brainstorm:

Assignment: Food to avoid

- Generate a list of foods, snacks and drinks to avoid before activities. Justify your choices.

- Assessment: /12

Food Safety:

- Summarize general rules about food safety in relation to the follow things:
 - Handling and storage of hot foods
 - Handling and storage of cold foods
 - Refrigeration of mayonnaise and eggs
 - Time between preparation and consumption of foods

Lab: Food Labels and You

- Handout
- Presentation
- Comparison lab
- Lab report

Assignment: Research

- Choose one of the following topics to research and present to the class:
 - Advertising of and promotion to athletes of...
 - Vitamin and mineral supplementations
 - Amino acid supplements
 - Sports drinks
 - Protein supplements
 - Energy drinks
 - Carbohydrate supplements

What role does a coach have?

- Describe the role that a coach would have in relation to nutrition of their athletes:
 - Importance of good hydration and nutrition
 - Communication with parents about nutritional planning for performance
 - Reference to nutritionists/psychologists due to weight management, diets, commercial products, eating disorders.