Thank you to our National Sponsors

National Premier Sponsor

Lilly DIABETES

National Supporting Sponsors

Dexcom CONTINUOUS GLUCOSE MONITORING

novo nordisk

Medtronic

Educational Grant Provided by

National Vendor Sponsors

Insulet

xeris PHARMACEUTICALS
Thank you to our Local Sponsors

Chapter Premier

Local TypeOneNation Summit Sponsors
The content of this program is provided for general information purposes only. The content is not intended to replace consultations with a health care professional or to provide medical advice, diagnosis or treatment. Always seek the advice of a physician or other qualified health care provider with any medical or health questions. Never disregard professional medical advice or delay in seeking it because of the information you obtained from this program.
FUELING FOR THE GAME

Participant Curriculum
General Session

Developed by:
Carin Hume

Presented by: Colleen Chuo, RN, MA, CDE
Session agenda

➢ Why nutrition matters for exercise and performance
➢ There is more to nutrition than carbohydrate: A brief look at important micronutrients (“the small stuff”)
➢ Getting the basics right (macronutrients): Protein, carbohydrate, and fats (“the big stuff”)
➢ Fueling for exercise and competition
➢ Weight management tips
GENERAL PRINCIPLES OF A GOOD DIET
GENERAL PRINCIPLES

Nutrition is the key to success

Nutrition
Training program | Sleep

Exercise and sports performance goals

Diabetes management
**GENERAL PRINCIPLES**

Poor nutrition can hinder your performance goals

- **Common nutritional deficiencies include:**
  - Magnesium, iron, iodine
  - Vitamins C, A & D
  - Calcium (in children and adolescents)

- **A poor diet has numerous consequences:**
  - Compromises your immunity
  - Disrupts your digestion and gut ecosystem
  - Leads to weight gain
  - Compromises your ability to build muscle

## GENERAL PRINCIPLES

### Sources of key nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Function</th>
<th>Sources</th>
</tr>
</thead>
</table>
| Vitamin D | • Important for bone health  
• Required for healthy immune function | Fatty fish (e.g. herring, tuna, rainbow trout, mackerel, salmon, sardines), eggs from pastured hens, cod liver oil |
| Vitamin A | • Critical for vision  
• Acts as an antioxidant | Organ meats (e.g. liver, kidney), egg yolks from pastured hens, butter from pastured cows, cod liver oil |
| Vitamin C | • Needed for the growth and repair of tissues  
• Helps to make collagen | Citrus fruits, kiwi, cantaloupe, papaya, tomato, broccoli |
| Magnesium | • Involved in many physiological pathways, including energy production | Nuts and seeds (especially pumpkin), dark leafy greens, dark chocolate, avocado, yogurt, banana, molasses, figs |
| Iron | • Makes up part of the haemoglobin molecule  
• Required to transport oxygen to cells in the body | Clams, oysters, liver, beef, lamb, spinach, pulses |
| Iodine | • Required to make thyroid hormones | Seaweed, fish, shrimp, iodized salt, potatoes, dairy |
| Calcium | • Essential for strong bones and teeth  
• Key role in muscle contraction | Dairy products (e.g. milk, yogurt, cheese), canned fish with bones, molasses, dried figs, almonds, sesame seeds |
BUILD A SOLID NUTRITIONAL FOUNDATION

**UPGRADE YOUR NUTRITION**

- Quantity and quality of macronutrients
  - Protein
  - Carbohydrate
  - Fat
- Timing of nutrients
  - Protein
  - Carbohydrate

**NO ONE SIZE FITS ALL**

- Consider your personal goals, which could include:
  - Weight loss
  - Increases in muscle mass or weight
  - Improve performance
  - Better general health
  - Improved diabetes management
PROTEIN
PROTEIN

The nuts and bolts of your body

- Why is protein essential?
  - Builds lean muscle mass
  - Aids in the recovery process from training
  - Supports recovery from injury/surgery
  - Supports training adaptations
  - Essential for growth in children
  - Important for weight loss as promotes feeling of fullness (satiety)
Protein intake is important for muscle recovery and repair, growth, and sports performance

1.2 – 2g/kg body weight/day
(0.5 – 0.9g/lb body weight)

Lower Protein Requirements
Meeting energy requirements
Endurance exercise

Higher Protein Requirements
Children & adolescents
Older adults
Weight loss
Strength & power sports

PROTEIN

Recommended amount and best sources

- Aim for **1.2 - 2.0g/kg body weight per day OR 0.5 - 1.0g/lb body weight**
- For example:
  - 64 kg female x 1.2 - 2.0g/kg = 77 - 128g protein per day

- Animal sources such as meat, fish, poultry, eggs, dairy:
  - Contain all of the essential amino acids
  - Have the highest protein absorption rates

- Athletes eating a vegetarian diet lacking in animal protein:
  - May be deficient in iron and vitamin B12
  - Should get their blood levels checked periodically
PROTEIN

Protein content in common foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving size</th>
<th>Grams of protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuts, e.g. almonds</td>
<td>1 oz</td>
<td>6</td>
</tr>
<tr>
<td>Egg</td>
<td>1</td>
<td>6-7</td>
</tr>
<tr>
<td>Quinoa</td>
<td>1 cup</td>
<td>8</td>
</tr>
<tr>
<td>Milk</td>
<td>1 cup</td>
<td>8</td>
</tr>
<tr>
<td>Yogurt, regular, natural</td>
<td>6 oz</td>
<td>8</td>
</tr>
<tr>
<td>Pulses, e.g. lentils</td>
<td>1 cup</td>
<td>~ 8</td>
</tr>
<tr>
<td>Tofu</td>
<td>1 oz</td>
<td>~ 8</td>
</tr>
<tr>
<td>Seeds, e.g. pumpkin</td>
<td>1 oz</td>
<td>9</td>
</tr>
<tr>
<td>Cottage cheese</td>
<td>4 oz</td>
<td>14</td>
</tr>
<tr>
<td>Yogurt, Greek</td>
<td>6 oz</td>
<td>18</td>
</tr>
<tr>
<td>Fish, e.g. tuna</td>
<td>3 oz</td>
<td>~ 20</td>
</tr>
<tr>
<td>Chicken, beef, other meats cooked</td>
<td>3 oz</td>
<td>~ 25</td>
</tr>
</tbody>
</table>
## PROTEIN

### Serving sizes

- **Protein serving size**
  - 1.5 - 2 palm sizes = 30 - 40g protein - typical male serving size
  - 1 - 1.5 palm sizes = 20 - 30g protein - typical female serving size

### How to achieve a protein target of **80g** per day:

<table>
<thead>
<tr>
<th>Meal</th>
<th>Food example</th>
<th>Grams of protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>2 eggs / 5.3-7 oz Greek yogurt</td>
<td>15-20</td>
</tr>
<tr>
<td>Lunch</td>
<td>Chicken (1 palm size)</td>
<td>20</td>
</tr>
<tr>
<td>Snack</td>
<td>Handful nuts / 1 oz cheese / glass milk</td>
<td>5-10</td>
</tr>
<tr>
<td>Dinner</td>
<td>Salmon fillet (1.5 palm sizes)</td>
<td>30</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td><strong>80</strong></td>
</tr>
</tbody>
</table>
Protein needs are easily met when calorie intake is high—still need to pay attention to **timing**.

For muscle growth and recovery aim to have **20 - 25g protein** within the first 2 hours post-exercise:
- Higher amounts of protein may be beneficial for some
- Higher amounts of protein may reduce risk of hypoglycemia in the hours following exercise

Distribute protein **throughout the day**:
- Don’t neglect protein at breakfast
- Whole food, protein-rich snacks include:
  - Yogurt with fruit + seeds
  - Sandwich with protein filling
  - Milk
  - Nuts

PROTEIN

Quality of consumption

- Quality matters
  - Eat unprocessed protein foods where possible
- Ideally only use supplemental protein (protein powders):
  - Around exercise bouts
  - If protein needs are high and cannot be met with food alone
  - If a convenient protein source is needed on-the-go
  - Ideally avoid protein supplements in adolescents and children
FATS
FATS
The athlete’s oil

- We need a **balance** of all fats:
  - Mono-unsaturated fatty acids (MUFAs)
  - Poly-unsaturated fatty acids (PUFAs)
  - Saturated fatty acids (SFs)
- **Favour** MUSFs for general use
  - Use olive oil instead of corn, soy and sunflower oils
- **Omega-3** fats are essential
  - Aim to eat fatty fish 2 - 3 times per week
  - Fatty fish includes salmon, sardines, mackerel, oysters, anchovies, herring, and tuna
- **Quality** matters!`
  - “You are not only what you eat, but you are what your food ate”
CARBOHYDRATES
Carbohydrate recommendations for exercise may need to be adapted for people with Type 1 diabetes.

Personalize carb recommendations to meet diabetes and exercise goals.

Consider the absolute amount and type of carbohydrate and timing of consumption.

Some athletes adopt a flexible approach with carbohydrates in order to suit different training phases.
CARBOHYDRATES

Daily intake recommendations

Grams of carbohydrates per day

100-150g

- >24-48 hours between exercise sessions
- Low intensity exercise
- Weight loss
- Smaller individuals
- Unstable blood glucose

150-200g

- Exercise daily (~1 hour/day)
- Low and moderate intensity exercise
- Sedentary lifestyle

250-300+g

- Exercise daily (~1-3 hours/day)
- Moderate to high intensity exercise
- Optimize sports performance
- Active lifestyle or job
- Larger individuals

Always consult your healthcare professional/dietitian before making significant changes to your carbohydrate intake to ensure that appropriate insulin adjustments are made. Be sure to consider your individual goals and activity level.
CARBOHYDRATES
Daily carbohydrate recommendations based on ideal body weight and exercise

- **Conditions:**
  - Lower intensity exercise
  - Shorter duration
  - >24 hours between sessions
  - Weight loss

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>CHO per day (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>100-125</td>
</tr>
<tr>
<td>65</td>
<td>130-160</td>
</tr>
<tr>
<td>80</td>
<td>160-200</td>
</tr>
</tbody>
</table>

- **Conditions:**
  - Higher intensity exercise
  - Longer duration
  - Exercising daily or twice daily
  - Weight gain

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>CHO per day (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>150-250</td>
</tr>
<tr>
<td>65</td>
<td>200-300</td>
</tr>
<tr>
<td>80</td>
<td>240-400</td>
</tr>
</tbody>
</table>

Note: The above recommendations serve as a starting point. The lower end of the recommendations may suit female athletes.

CHO, carbohydrate
CARBOHYDRATES

How many grams of carbohydrates is "low"?
- “Low” is determined by your body weight and calorie (energy) intake
  - Less than 30% calories from carb = moderate to low
  - Less than 10% calories from carb = very low

Not advisable for growing children
- Carbohydrates are necessary for normal development and growth

Possible delayed and prolonged glucose rise after high fat and high protein meal
- Consider use of extended wave/duel wave insulin bolus

May lead to ketone production
- Unclear as to if there is a safe amount of ketones
CARBOHYDRATES

Low carbohydrate diets – are they good for performance?

- Not recommended for high performance
  - Focus should be on **quality and timing** of carbohydrates

- Low-carb diets can be useful for weight loss and diabetes management
  - But performance in high intensity exercise may suffer

- Not a good option if you are:
  - Frequently doing high intensity exercise
  - Not recovering between exercise sessions
  - Under significant stress
  - Not sleeping well
  - Have an under active thyroid

Limited evidence on low-carb diets and performance, but standard sports nutrition recommendations likely too high for most recreational athletes with Type 1 diabetes
CARBOHYDRATES

Make your carbohydrates count!

- Except when fueling for exercise, **quality** (slow burning) carbohydrates should make up the bulk of your diet.
- Criteria for **good** carbohydrates:
  - Slow and low rise in glucose - self experimentation is required
  - High in fiber
  - Minimally processed
  - High in vitamins and minerals
- If meal is less than 2 hours before exercise choose slow burning carbohydrates and low to moderate amounts in order to keep IOB low during exercise.

Example of glycemic index curves

IOB, insulin-on-board; GI, glycemic index
CARBOHYDRATES
Quality carbohydrates are slower burning and “nutrient dense”

<table>
<thead>
<tr>
<th>Whole fruits</th>
<th>Beans and legumes</th>
<th>Root vegetables</th>
<th>Breakfast cereals</th>
<th>Dairy</th>
<th>Whole grains</th>
<th>Bread</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Not juice</td>
<td>✓ Peas</td>
<td>✓ Sweet potato</td>
<td>✓ Steel cut oats</td>
<td>✓ Milk</td>
<td>✓ Quinoa</td>
<td>✓ Sourdough rye</td>
</tr>
<tr>
<td></td>
<td>✓ Lentils</td>
<td>✓ Boiled new potato</td>
<td>✓ Muesli (raw oats + nuts)</td>
<td>✓ Natural yogurt</td>
<td>✓ Buckwheat groats</td>
<td>✓ Dense pumper-nickel bread</td>
</tr>
<tr>
<td></td>
<td>✓ Chickpeas</td>
<td></td>
<td></td>
<td></td>
<td>✓ Barley</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Edamame</td>
<td></td>
<td></td>
<td></td>
<td>✓ Wild rice</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓ Bulgur wheat</td>
<td></td>
</tr>
</tbody>
</table>

Whole fruits: Whole fruits are the base of a healthy diet and provide fiber and essential nutrients. Beans and legumes are a high-protein food group that is also rich in fiber. Root vegetables are a good source of vitamins and minerals. Breakfast cereals can be a good source of nutrients if they are high in whole grains and low in added sugars. Dairy can provide calcium and protein. Whole grains are a good source of fiber and nutrients. Bread can be a source of fiber and energy.
FUELING FOR EXERCISE
FUELING FOR EXERCISE

Meal and insulin planning before exercise

- Longer exercise sessions require more planning
- Factors to consider:
  - Duration of exercise
  - Intensity and type of exercise
  - Active insulin (IOB) – time between last meal or correction bolus and exercise; background insulin and basal rate
- IOB determines how much carbohydrate needed to be ingested before and during exercise
- Low IOB during exercise
  - Easier to manage blood glucose during exercise
  - Preferable for weight loss and “fat burning”

- Resources to track IOB:
  - Pumps
  - Bolus calculators on meters
  - Apps (e.g. Engine 1)
FUELING FOR EXERCISE

Meal and insulin planning **before** exercise

- **3 hours prior to exercise:**
  - No bolus adjustment required
  - Mixture of slow and fast burning carbohydrates

- **1.5 to 1 hour prior to exercise:**
  - Consume meal of protein and good fats (no bolus unless need to correct) AND fuel with carbohydrates during session if required AND/OR eats carbohydrates post exercise
  - Eat a meal with a small amount of slow burning carbohydrates with full or reduced bolus dose
  - Consume very slow burning carb (e.g. Generation UCAN with no bolus)
  - If need to correct take no more than 50% of suggested correction bolus

- **Within 30 minutes prior to exercise:**
  - Amount and type of carbohydrates dictated by blood glucose (+ glucose trend) and basal adjustments (pump)
  - Rapid-digesting carbohydrates if exercising shortly after eating
  - Avoid bolusing for carbohydrates in this window
FUELING FOR EXERCISE

Fueling with carbohydrates just before exercise

- Ingestion of extra carbohydrate (10-15g) prior to exercise is recommended if **blood glucose <100 mg/dL**
- Examples of snacks include:
  - Foods/drinks to treat hypoglycemia if glucose needs to be raised quickly
  - Small banana
  - Small or half dried fruit/energy bar
  - 100-150 mL fruit juice
- Factors to consider:
  - Trend of blood glucose
  - Time of exercise
  - Type of exercise
FUELING FOR EXERCISE

Fueling with carbohydrates during exercise

- General carbohydrate recommendations during exercise:
  - **30 - 60g CHO per hour of exercise** or 10 - 15g CHO every 15 - 20 minutes (low end of range when little IOB and/or basal adjustments have been made)
  - Recommendations for children:
    - 0.5-1.0g CHO/kg body weight
  - Even when carbohydrates may not be needed for performance they may still be required to prevent hypoglycemia
  - “Fast-acting” carbohydrates are the preferred choice if the exercise is short in duration
  - “Fast” and "slower“ carbohydrates (e.g. banana) are preferred if the exercise is longer in duration
  - Practice race/event nutrition strategy
    - This may mean making smaller basal insulin reductions during some training sessions
**FUELING FOR EXERCISE**

Factors influencing carbohydrate needs and distribution during exercise

<table>
<thead>
<tr>
<th>Condition</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood glucose below 90 mg/dL</td>
<td>↑</td>
</tr>
<tr>
<td>Aerobic exercise</td>
<td>↑</td>
</tr>
<tr>
<td>Competition</td>
<td>↑↓</td>
</tr>
<tr>
<td>Anaerobic exercise</td>
<td>↓</td>
</tr>
<tr>
<td>Short duration</td>
<td>↓</td>
</tr>
<tr>
<td>Fasting exercise</td>
<td>↓</td>
</tr>
<tr>
<td>Insulin adjusted with meal prior to exercise</td>
<td>↓</td>
</tr>
</tbody>
</table>
FUELING FOR EXERCISE

Fueling with carbohydrates after exercise

- Refuel with carbohydrates:
  - Ingesting carbohydrates soon after higher intensity exercise allows muscles to rapidly restore their glycogen stores
  - Mainly a priority when training twice a day or if next session is within 8 hours
  - May prevent late-onset hypoglycemia
  - Good blood glucose levels in the post-exercise period is essential for optimizing this process
    - If blood glucose is high post-exercise and refueling is not a priority, consider delaying carbohydrates until blood glucose levels are closer to normal range

Aim for **1-1.2g carbohydrate/kg body weight** after exercise and consider reducing insulin bolus as sensitivity may be increased post-exercise
For muscle growth and recovery aim to have 20 - 25g protein post-exercise

Foods that provide ~10-12g protein:

- 40g (½ palm size) cooked beef/pork/lamb
- 40g (½ palm size) cooked chicken
- 50g canned tuna/salmon or cooked fish
- 10oz milk
- 3.5oz Greek yogurt or cottage cheese
- 30g cheese
- 2 eggs
FUELING FOR EXERCISE

Fueling for competition

- **What is carb loading?**
  - 36 - 48 hour of ingesting 10-12g carb/kg body weight per 24 hours

- **To carb load or not?**
  - Preparation for events >90 min of sustained/intermittent exercise
  - May contribute to hyperglycemia the day and night before an event
  - Best to avoid if leads to hyperglycemia

- **Meal before an event:**
  - Aim to have last big meal 3 - 4 hours before the event
  - Balance between easily digested carbohydrates and lower GI (slow burning) carbohydrates
  - 1 - 4g carbohydrate/kg body weight

### Carbohydrate recommendations for competition

<table>
<thead>
<tr>
<th>Amount of exercise</th>
<th>Carbohydrate recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 45 minutes</td>
<td>Not required</td>
</tr>
<tr>
<td>45 – 75 minutes</td>
<td>Consider small amounts</td>
</tr>
<tr>
<td>&gt; 60 minutes</td>
<td>Consider consuming carbohydrates (30 - 60g CHO per hour of exercise or 10 - 15g CHO every 15 - 20 minutes)</td>
</tr>
<tr>
<td>Longer duration endurance exercise (&gt; ~2.5 hours)</td>
<td>Consider up to 90g CHO per hour (glucose + fructose) with little or no basal insulin reduction (or an increase in usual basal rate)</td>
</tr>
</tbody>
</table>

Be prepared to adjust fueling strategy according to blood glucose

---

CHO, carbohydrate
FUELING FOR EXERCISE

Nutrition for competition

- When planning your nutrition strategy for competition consider your nutritional concerns:
  - Heat and hydration
  - Glycogen depletion
  - Hypoglycemia
  - Gastro-intestinal issues

- Other factors to consider:
  - Have a plan for when blood glucose levels get too high or too low
  - Practice in training
FLUID AND HYDRATION
HYDRATION

Fluid management is essential

- Important for athletes with diabetes
  - Always carry a bottle of water
  - Increase fluid intake if blood glucose levels are high

- Useful to have some idea of sweat loss

- Aim for ~10% carbohydrate solution

- ~4-8% carbohydrate solution
  - 4-8g carbs in 100mL
  - 24-48g carbs in 600 mL (20 fl oz)

HYDRATION
Calculating sweat rate during exercise

1. Empty your bladder and record your weight = _____ lbs(A) (pre-exercise weight)
2. Record how much you drank during exercise = ______ fluid ounces(E)
3. Post-exercise weight: towel dry, empty your bladder and then record your weight = ______ lbs(B)
4. Subtract post-ex weight from pre-ex weight to get number of pounds lost during exercise
   Weight lost = _____ lbs(A) – _____ lbs(B) = _____ lbs(C)
5. To find out how many fluid ounces of water lost, multiply pounds by 16: _____lbs(C) x 16 = _____ fluid ounces(D)
6. To determine hourly sweat rate, add number of fluid ounces lost during exercise (D) to the number of fluid ounces consumed during exercise (E) and divide by the total hours spent training:

   (___fluid ounces(D) + ___fluid ounces(E)) ÷ ___hours =_____fluid ounces lost/hour
SPORTS NUTRITION SUPPLEMENTS
SPORTS SUPPLEMENTS

Evaluating commercial sports nutrition products

- Type of sugars found in most products:
  - Maltodextrin, dextrose, glucose
  - Fructose, sucrose

- Other sweeteners added:
  - Xylitol, agave nectar, stevia

- Other ingredients found in sports supplements include caffeine

- When to consider sodium:
  - When sweat losses are high (> 1.2L/hour)
  - “salty sweater”
  - > 2 hrs of exercise

---

WEIGHT MANAGEMENT
WEIGHT MANAGEMENT
Factors to consider

Diet
Diabetes
Lifestyle
WEIGHT MANAGEMENT
Diet

- Keep it simple – extras add up!
- Have protein at every meal
- Limit snacking
- Do not drink your calories
- Consider tracking calories periodically
- Eat enough
- Be a “mindful eater”
In order to limit the need for carbohydrates during exercise:

- **Option #1** – Perform exercise when insulin levels are lower
  - Exercise in a fasted state (e.g. before breakfast)
  - Reduce basal rate up to 90 minutes before exercise
  - Exercise 3-4 hours after a meal (e.g. before evening meal)

- **Option #2** – Exercise after meals, with significant bolus reduction

- **Option #3** – Perform low intensity exercise, such as walking, shortly after a meal

- **Option #4** – Choose types of sports or exercise that raise blood glucose (or keep it stable)
WEIGHT MANAGEMENT

Lifestyle

- Aim for 7 - 9 hours of sleep per night
- Exercise almost daily
- Include movement **throughout the day**
  - Activity trackers can be helpful
  - Incorporate standing breaks at work
- Do fun activities as a family
- Use your support systems such as community/extra-curricular programs or school activities
Summary

- Pay attention to the “big and small stuff”
- Make protein a part of every meal
- Find the right balance of daily carb intake for your diabetes and exercise regimen
- Find what works for you by periodically tracking blood glucose, diet, and exercise
- Practice and refine your race or event day nutrition strategy
- Prioritize sleep
Thank you!

Acknowledgements: