DiabetesEd Training Conference |San Diego *

Day Three | October 13, 2023 (Pacific Time)

Medical Nutrition Therapy & Pattern Management

Time	Topic	Speaker
7:30 – 8:00	**Breakfast & Welcome**	
8:00 – 10:00	**Medical Nutrition Therapy – Keeping it Person Centered** **Micro and Macronutrients** **Evidence based approaches to MNT**	Ashley LaBrier MS, RD, CDCES
10:00 – 10:15	**Movement Break**	
10:20 -11:40	**Meal Planning- How to Eat by the Numbers**	
11:40 – 12:00	**Keeping Active with Diabetes**	

Scan QR Code below for Day Three Survey

Thank you for joining us!

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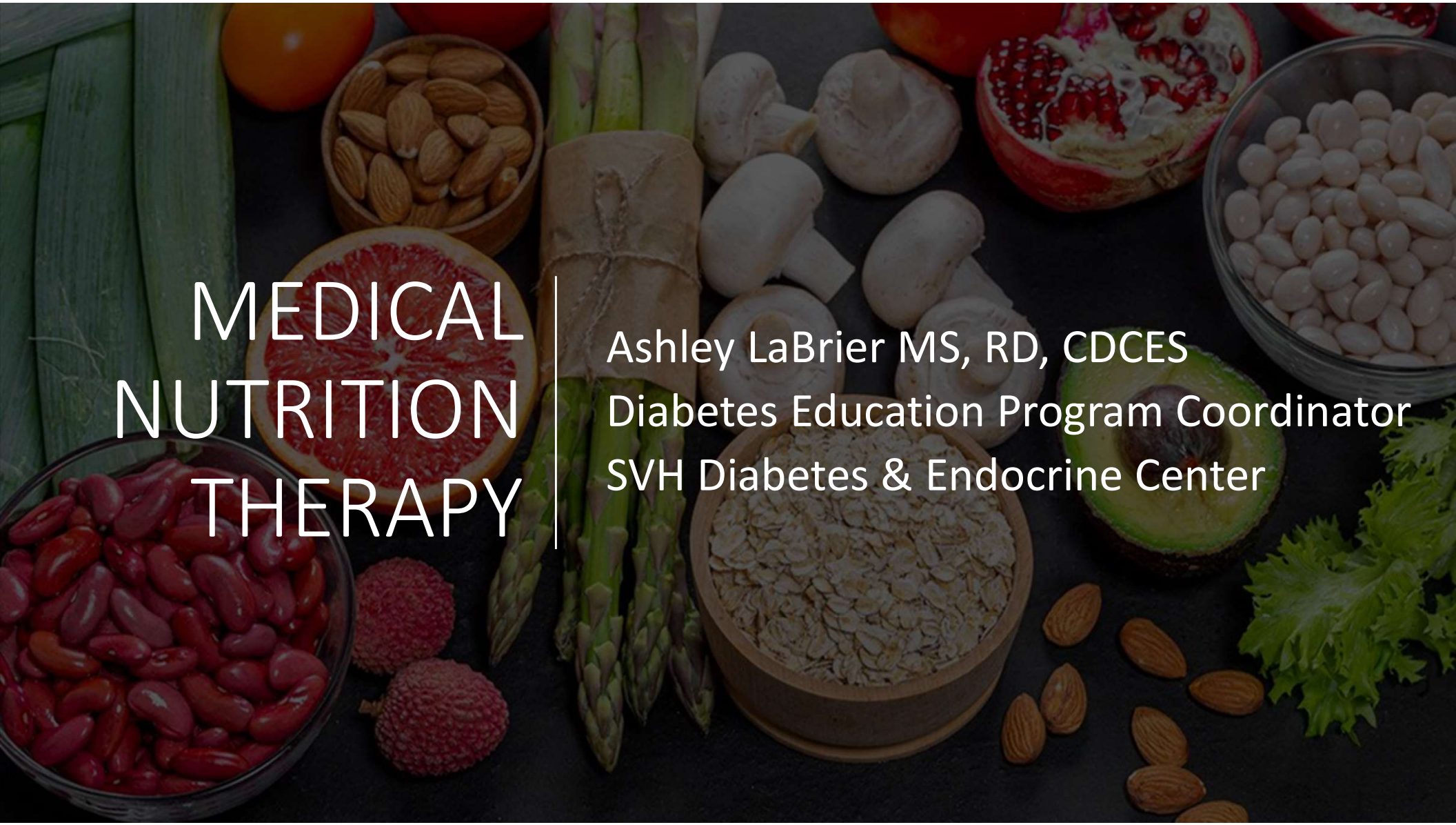
**Topics and Timing Subject to Change*



MEDICAL NUTRITION THERAPY

Ashley LaBrier MS, RD, CDCES
Diabetes Education Program Coordinator
SVH Diabetes & Endocrine Center

Healthy Eating

- Healthy Eating involves behaviors and decisions on what, when, and how much to eat
- Influences on healthy eating are complex and numerous
- Many clinicians consider healthy eating to be the most challenging of the AADE7 Self-Care Behaviors to implement successfully

Healthy Eating

- Medical Nutrition Therapy (MNT)
  - Evidence-based treatment of a condition through the modification of nutrient or whole-food intake
  - Often provided by a RD/RDN or similarly qualified professional
  - All diabetes care and education specialists must be ready and able to apply the principles of MNT!

Goals of MNT for All Persons with Prediabetes

1. Decrease the risk of diabetes and cardiovascular disease with intensive lifestyle modification
   - Refer those at risk for diabetes to an intensive lifestyle program
     - Ex: Diabetes Prevention Program and/or individualized MNT

The Power of Prevention

- Diabetes Prevention Program (DPP) shows that lifestyle changes may reduce the risk of incident type 2 diabetes by 58% over 3 years
  - Benefit of lifestyle change is more significant in those over the age of 60 – may decrease risk of T2DM by 71%
  - Lifestyle intervention was effective in both sexes, across all racial and ethnic groups, and in people predisposed to diabetes

The Diabetes Prevention Program Research Group. (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, *346*(6), 393–403. https://doi.org/10.1056/nejmoa012512

The Power of Prevention

- Lifestyle intervention/goals in DPP included:
  - Increase physical activity: goal of 150 minutes of physical activity per week
  - Decrease fat and calorie intake*
  - Decrease weight: sustained loss of 7-10% of initial body weight

*DPP initially encouraged a lower fat/calorie eating plan but current data suggests there is no ideal percentage of calories from carbs, protein, and fat to prevent diabetes. A variety of eating patterns may be appropriate.

Diabetes Prevention Program (DPP) Research Group. (2002). The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care, 25*(12), 2165-2171. doi:10.2337/diacare.25.12.2165

The Power of Prevention

- Find a DPP in your community:
  - CDC-recognized DPP Lifestyle Change programs:
    - www.cdc.gov/diabetes/prevention/find-a-program.html
  - Medicare-enrolled CDC-recognized programs:
    - https://innovation.cms.gov/innovation-models/medicare-diabetes-prevention-program/mdpp-map

Goals of MNT for All Persons With Diabetes

1. Promote/support healthful eating patterns, emphasizing a variety of nutrient dense foods in appropriate portion sizes, to improve overall health and:
    - Achieve individualized glycemic, blood pressure, and lipid goals, achieve/maintain body weight goals, delay/prevent complications of diabetes

Goals of MNT for All Persons With Diabetes

2. Address individual nutritional needs including:
    - Personal and cultural food preferences
    - Health literacy and numeracy
    - Access to healthful food choices
    - Willingness and ability to make changes
    - Barriers to change

Goals of MNT for All Persons With Diabetes

3. Maintain the pleasure of eating by:
    - Providing positive/nonjudgmental messages about food choices
    - Limiting food choices only when indicated by scientific evidence
4. Provide practical tools for day-to-day meal planning and healthful eating patterns (rather than focusing on individual macro or micronutrients or single foods)

Benefit of MNT for Those With Diabetes

Decrease in A1C After 3-6 Months of Receiving MNT	
Type 1 Diabetes	1.0% - 1.9%
Type 2 Diabetes	0.3% - 2.0%

- Sustained A1C improvement with ongoing support from RD/RDN
- MNT is cost-effective

Franz, M. J., MacLeod, J., Evert, A., Brown, C., Gradwell, E., Handu, D., Reppert, A., & Robinson, M. (2017). Academy of Nutrition and Dietetics Nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the Nutrition Care Process. *Journal of the Academy of Nutrition and Dietetics*, *117*(10), 1659–1679. https://doi.org/10.1016/j.jand.2017.03.022

Nutrition Therapy for Weight Management

In Those at Risk for Diabetes and Those Living with Diabetes

BMI and Diabetes Risk

- An increase in BMI is generally associated with an increase in the prevalence of insulin resistance/DM, hypertension, and dyslipidemia

Classification	**Body Mass Index (BMI), kg/m^2**
With Underweight	<18.5
Healthy Weight	18.5 – 24.9
With Overweight	25 – 29.9
With Obesity	> 30

Effectiveness of Weight Loss in T2D

Percent Weight Loss from Initial Weight	Results
≥5%	Benefit on glycemic control, lipids, and blood pressure Recommended for most people w/ T2D and BMI ≥25
≥15% *When feasible and safe	Optimal, especially in those who are newly diagnosed.
Clinical benefit of weight loss is progressive; more intensive loss maximizes benefit	

Franz, M. J., MacLeod, J., Evert, A., Brown, C., Gradwell, E., Handu, D., Reppert, A., & Robinson, M. (2017). Academy of Nutrition and Dietetics Nutrition practice guideline for type 1 and type 2 diabetes in adults: Systematic review of evidence for medical nutrition therapy effectiveness and recommendations for integration into the Nutrition Care Process. *Journal of the Academy of Nutrition and Dietetics*, *117*(10), 1659–1679. https://doi.org/10.1016/j.jand.2017.03.022

Lean, Michael E, et al. "Durability of a Primary Care-Led Weight-Management Intervention for Remission of Type 2 Diabetes: 2-Year Results of the Direct Open-Label, Cluster-Randomised Trial." *The Lancet Diabetes & Endocrinology*, vol. 7, no. 5, 1 May 2019, pp. 344–355., https://doi.org/10.1016/s2213-8587(19)30068-3.

Nutrition for Weight Management

- Weight loss is primarily associated with energy-reduction NOT macronutrient composition or type of eating pattern
  - For weight loss, aim for 500-750 kcals/day energy deficit
- Calorie restriction
  - 3500 calories = 1 pound
    - Fat: 9 kcals/gram
    - Protein and carbohydrate: 4 kcals/gram
  - Calorie deficit of 500 kcals/day = 1 lb. wt. loss/wk.

Challenges: Diabetes Meds & Weight

- Glucose-lowering medications may impact weight

Impact on Weight	Medication Class
Associated w/ Some Degree of Weight Loss	Metformin, alpha-glucosidase inhibitors, SGLT-2 inhibitors, GLP-1 RAs, GIP/GLP-1, amylin mimetics
Weight Neutral	DPP-4 inhibitors
Associated w/ Some Degree of Weight Gain	Sulfonylureas, TZDs, meglitinides, insulin

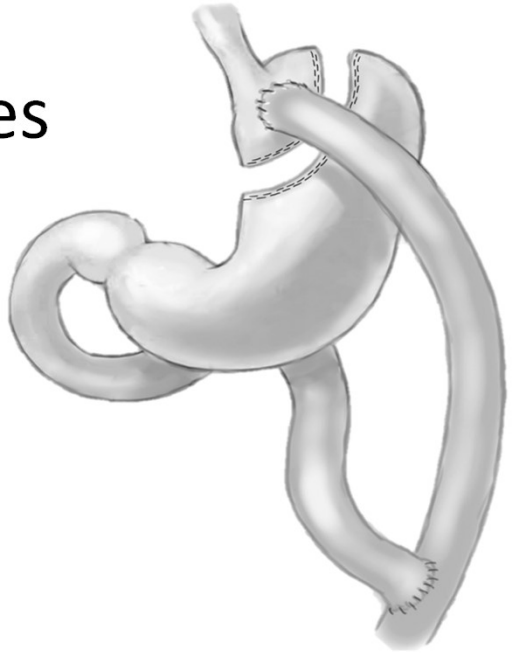
- When selecting a med, consider impact on weight

Meds for Weight Loss

- Weight loss meds can be effective (>5% weight loss after 3 months) when used with diet, activity, and behavior change
  - Consider for those with T2DM and BMI ≥ 27 kg/m^2
  - Med should be discontinued if early response to it is ineffective (<5% weight loss after 3 months)

Metabolic Surgery for Weight Loss

- Recommended as an option to treat T2DM for screened surgical candidates with:
  - BMI ≥ 40 kg/m^2
  - BMI 35 - 39.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods



**All BMI thresholds need to be reduced by 2.5 kg/m^2 for Asian Americans*

Metabolic Surgery for Weight Loss

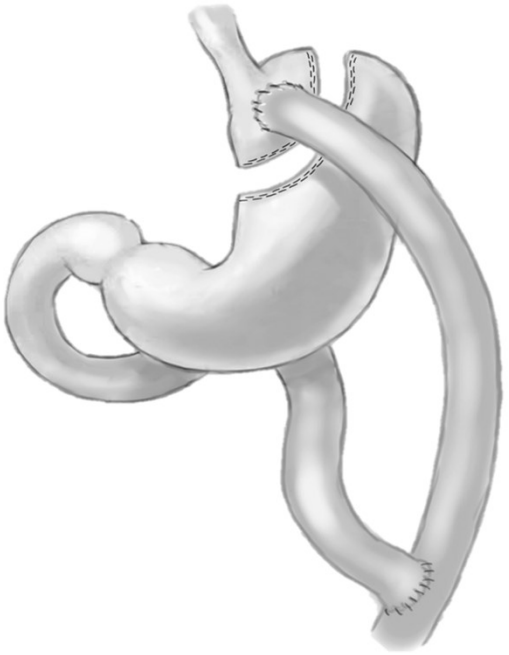
- Considered as an option to treat T2DM for screened surgical candidates with:
  - BMI 30 – 34.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods

**All BMI thresholds need to be reduced by 2.5 kg/m^2 for Asian Americans*

Metabolic Surgery for Weight Loss

Advantages in T2DM

- Diabetes remission in 30-63% of those with RYGB.
  - 35-50% of those who go into remission experience recurrence, but median disease-free period is 8.3 years.
- Many with diabetes will sustain glycemic improvement for 5-15 years.
- Additional health benefits



Metabolic Surgery for Weight Loss

Disadvantages in T2DM

- Costly (but likely cost effective)
- Long-term concerns: dumping syndrome, anemia, osteoporosis, severe hypoglycemia, nutrient deficiency.
- Increased risk of substance use, new-onset depression/anxiety

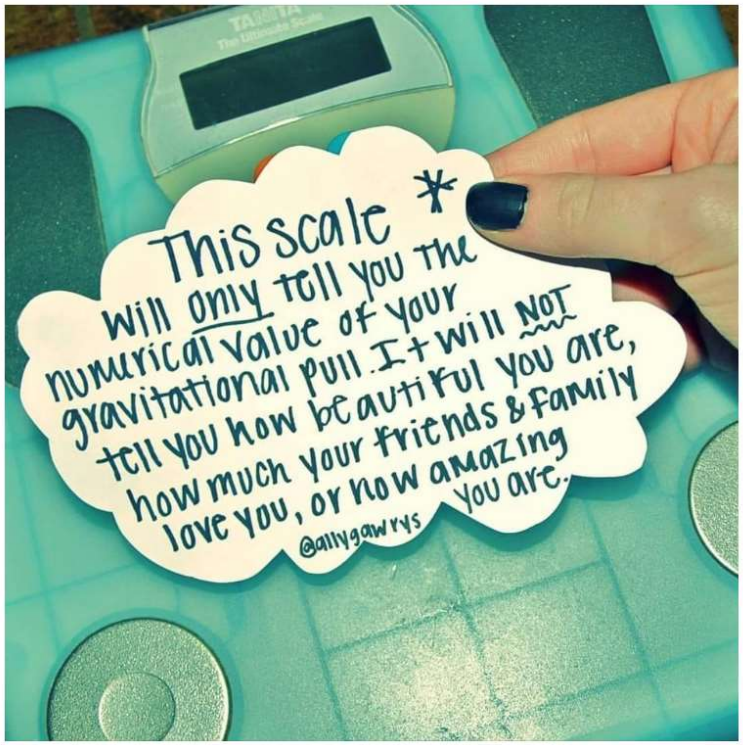

TIME FOR REVIEW

Knowledge Check

Joe is 5’9” and weighs 202 lbs. (BMI 29.8). He was just diagnosed with prediabetes with an A1C at 6.3%. He does not want to start medication. What is his best option?

A. Lose 10-15 lbs.
B. Lose 14-20 lbs.
C. Decrease his fat intake by 5-10%
D. Reconsider medications and try Metformin

Weight is a Heavy Issue



Weight & Respect

- If weighing is questioned or refused:
  - Be mindful of possible prior stigmatizing experiences
  - Consider the value of weight monitoring - is it needed to inform treatment decisions?
- Situate scales in a private area or room
- Measure and report weight non-judgmentally
- Take care to regard weight and BMI as sensitive health information

Weight & Respect

- ADA Standards:
  - Calculate BMI and document in medical record at annual visit
  - Be sensitive and allow for privacy when weighing
  - Use person-centered, nonjudgmental language

Using a Weight Neutral Approach

- Ask whether weight loss is a goal before assuming
- Remember: there are many indicators of success!

or

Setting Goals with a Weight Neutral Approach

- I will continue to care for my body by doing [x].
  - x = walking 10 minutes after lunch each day
  - x = having a vegetable with dinner every night
  - x = keeping all my appointments with my therapist
  - x = getting 7-8 hours of sleep each night
  - x = checking my blood sugar every morning

Healthy Eating Patterns & Macronutrients

Carbohydrates, Protein, & Fat

Healthy Eating Patterns

- Consensus Recommendation: Evidence suggests there is no ideal percentage of calories from carbohydrate, protein, and fat for people with diabetes.
- A healthy eating pattern should:
  1. ↑ non-starchy vegetables
  2. ↓added sugars and refined grains
  3. Choose whole foods over highly processed foods when possible
- This limits saturated and trans fats, added sugar, and sodium.

Carbohydrates & Sweeteners

Sugars, High Intensity Sweeteners, Sugar Alcohols, Starch, & Fiber

Carbohydrates

- Inconclusive evidence for ideal amount of carbohydrate per day
  - RDA is 130 g/day in people w/o diabetes. This can be fulfilled via diet or by body's metabolic processes
- Amount of carb eaten is main dietary influence on postprandial BG
  - Type/quality of carb makes a difference

Carbohydrates

- Reducing overall carbohydrate intake for individuals with diabetes shows evidence for improving glycemia
  - Low and very low carb diets lower A1C in short-term only; difficult to sustain macronutrient distribution changes long-term
  - Most PWD report moderate carb intake (44-46% of total calories)

Carbohydrates

- Focus on the “quality of carbohydrate foods selected”
  - Nutrient dense carbs with dietary fiber, vitamins, and minerals
  - Low in added sugars, fats, and sodium
  - Minimally processed

Sugars

- Types: glucose, fructose, sucrose (glucose + fructose), and others
  - Glucose: If eaten alone, has highest glycemic peak relative to other sugars
  - Fructose: metabolized mostly in the liver; goes to replenish liver glycogen & triglyceride synthesis so it has less acute impact on BG
  - Sucrose: Broken into 50% glucose and 50% fructose

Fructose as a Sweetener

- Lower postprandial response compared to other sweeteners
- Not recommended as a sweetening agent because it may adversely effect lipids

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Fructose in Fruit

- No reason to avoid naturally occurring fructose in fruits and vegetables
  - “Free fructose” in fruit may result in better glycemic control compared with isocaloric intake of sucrose or starch and is not likely to have detrimental effects on triglycerides

A Unique Sugar: Allulose

- A type of sugar that is GRAS by the FDA
  - Small amounts naturally in wheat and some fruits; can be manufactured
  - ~70% as sweet as table sugar
  - Contributes few calories, produces negligible increases in blood glucose and insulin levels, does not promote dental decay
- Labeling for allulose:
  - Not included in “Total Sugars” or ”Added Sugars”
  - Included in Total Carbohydrates
  - Calories calculated with 0.4 kcals/gram
  - Must be in ingredient list

A Unique Sugar: Allulose

Nutrition Facts

About 12 servings per container

Serving size **2 tbsp (30 mL)**

Amount per serving

Calories **20**

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 28g	10%
Dietary Fiber 0g	0%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Allulose 26g	
Protein 0g	

* Percent Daily Values (DV) are based on a 2,000 calorie diet.

2G NET CARBS = 28G TOTAL CARBS - 26G ALLULOSE

INGREDIENTS: Besti Monk Fruit Allulose Blend (Liquid Allulose, Monk Fruit Extract), Vegetable Glycerin, Natural Flavors

Sugar Sweetened Beverages (SSBs)

- General population: SSBs should be avoided to ↓risk of type 2 diabetes, heart disease, weight gain, non-alcoholic liver disease, and tooth decay.
- In people with and without diabetes: replace SSBs with water as often as possible.
  - Helps ↓ calorie intake.

Hypoglycemia Treatment

- Treat hypoglycemia with 15-20g fast-acting carbs if glucose level reaches <70 mg/dl
  - Best option: pure glucose
  - Other options: glucose-containing carbs
  - Do NOT select foods with fat, or, particularly in person with type 2 diabetes, foods with protein
- Recheck 15 minutes later; retreat if still low
- Real-world tip: Often, liquid sugars are a “quicker” treatment than solids like hard candies

High Intensity Sweeteners

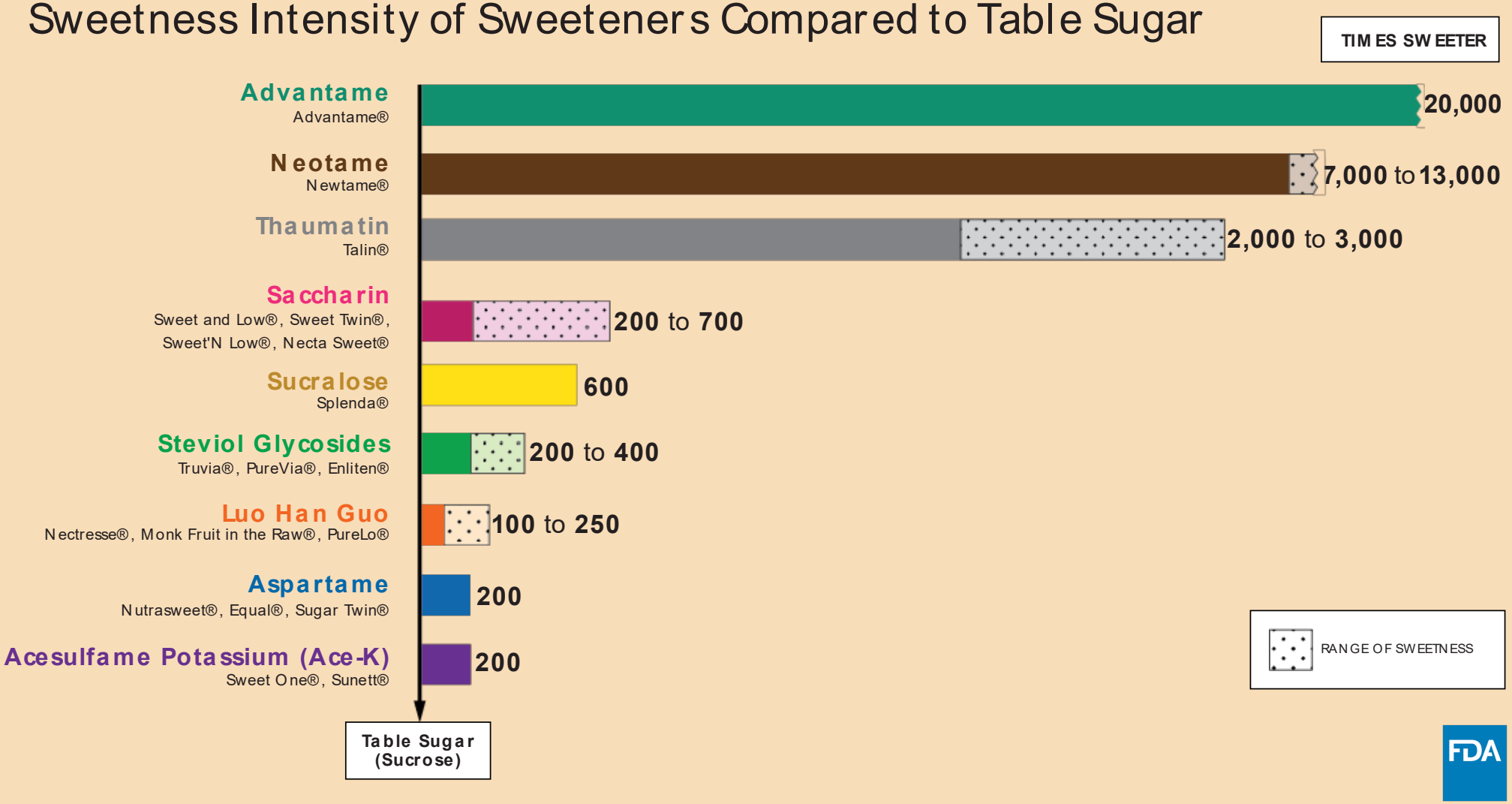
- Ingredients used to sweeten and enhance the flavor of foods
- FDA approved for consumption by the general public and PWD
- Significantly sweeter than sucrose, so smaller amounts are needed to achieve the same sweetness as sugar in food
- Other names: sugar substitutes, nonnutritive, artificial, or low-calorie sweeteners

High Intensity Sweeteners

- Six are approved by the FDA as food additives
  1. Advantame
  2. Neotame
  3. Saccharin
  4. Sucralose
  5. Aspartame
  6. Acesulfame potassium

- Plant and fruit-based GRAS Sweeteners
  1. Thaumatin
  2. Stevia
  3. Luo Han Guo (Monk Fruit)

Sweetness Intensity of Sweeteners Compared to Table Sugar



High Intensity Sweeteners

- Current consensus statement from ADA:
  - High Intensity Sweeteners contribute no/few calories to the diet and generally do not raise blood sugar levels
    - Could reduce overall calorie/carb intake, as long is there is no compensatory energy increase elsewhere
    - Mixed evidence regarding weight management

High Intensity Sweeteners

- Current consensus statement from ADA:
  - "Using sugar substitutes does not make an unhealthy choice healthy; rather, it makes such a choice less unhealthy."
  - Overall, encourage fewer SSBs.
  - Ok to use nonnutritive-sweetened beverages as an alternative, but emphasize water intake

FDA Response to External Safety Reviews of Aspartame

The FDA is aware of the International Agency for Research on Cancer (IARC) and Joint FAO/WHO Expert Committee on Food Additives (JECFA) conclusions about aspartame issued July 14, 2023. Aspartame being labeled by IARC as "possibly carcinogenic to humans" does not mean that aspartame is actually linked to cancer.

The FDA disagrees with IARC's conclusion that these studies support classifying aspartame as a possible carcinogen to humans. FDA scientists reviewed the scientific information included in IARC's review in 2021 when it was first made available and identified significant shortcomings in the studies on which IARC relied. We note that JECFA did not raise safety concerns for aspartame under the current levels of use and did not change the Acceptable Daily Intake (ADI).

Aspartame is one of the most studied food additives in the human food supply. FDA scientists do not have safety concerns when aspartame is used under the approved conditions. The sweetener is approved in many countries. Regulatory and scientific authorities, such as Health Canada and the European Food Safety Authority have evaluated aspartame and also consider it safe at current permitted use levels.

Sugar Alcohols

- Another category of sweeteners approved for consumption for general public and PWD
  - Calorie contribution is often similar to sugar
  - Associated with bloating, flatulence, and diarrhea
- Examples: Sorbitol, maltitol, erythritol, isomalt, xylitol, lactitol

Sugar Alcohols

- Little evidence on benefit for people with diabetes
- Consumption produces a small rise in blood glucose
  - Postprandial response is lower than with fructose, glucose, or sucrose
  - To carb count: consider subtracting ½ of sugar alcohol from total carb grams

Sugar Alcohols

Nutrition Facts

Serving Size 1/18 package (29g)

Amount Per Serving

Calories 110

	% Daily Value*
Total Fat 0.5g	**1**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Sodium 80mg	**4**%
Total Carbohydrate 25g	**9**%
Total Sugars 18g	
Incl. 17g of Added Sugars	**35**%
Protein 1g	
Vitamin D 0mg	0%
Iron 1mg	6%
Potassium 98mg	2%

Not a significant source of

Nutrition Facts

Serving Size 1/12 package (29g)

Amount Per Serving

Calories 90

	% Daily Value*
Total Fat 2g	**2**%
Saturated Fat 0g	**0**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 80mg	**4**%
Total Carbohydrate 24g	**9**%
Total Sugars 0g	
Incl. 0g of Added Sugars	**0**%
Sugar Alcohol 10g	
Protein 1g	

Ingredients

Enriched Bleached Flour (Wheat Flour, Niacin, Iron, Thiamin Mononitrate, Riboflavin, Folic Acid), Maltitol, Polydextrose, Maltodextrin, Cocoa Processed With Alkali And Cocoa, Canola Oil, Contains 2% Or Less Of: Salt, Baking Soda, Acesulfame Potassium (Non Nutritive Sweetener), Sucralose (Non Nutritive Sweetener), Natural And Artificial Flavor.

Product Information

- Sugar Free*
- *Not a Low Calorie Food
- Sweetened with SPLENDA® Brand Sweetener
- Kosher Dairy

Starch

- The digestive tract is efficient in breaking starches into glucose
- Glycemic effect of a particular starch is determined by:
  - Type/structure of starch
  - Types of processing and cooking used
  - Other macronutrients consumed with the starch
- Focus on starches with fiber, rather than refined/processed grains

Impact of Starch on BG

- Structure/type of the starch
  - Amylose vs. amylopectin

AMYLOSE
More “resistant starch”
Lesser impact on glucose levels
Example: Long grain rice, beans, lentils

AMYLOPECTIN
Greater impact on glucose levels
Example: Short grain rice, potatoes

Impact of Starch on BG

- Structure/type of the starch
  - Ripeness
    - Example: As a banana ripens, resistant starch converts into sugars

Impact of Starch on BG

- Types of processing and cooking used
  - Cooking method and time
  - Amount of heat and moisture
    - Example: The longer pasta cooks, the more water-logged its molecules become, making it easier for the body to break it down to glucose

Fiber

- A type of carbohydrate that passes through the body largely undigested, thus contributes minimal glucose to the postprandial rise
- Intake is inversely associated with risk of T2DM
- Sufficient intake is associated with lower all-cause mortality in people with diabetes

Fiber

- Sources of fiber:
  - Whole fruits, starchy and non-starchy vegetables, beans, peas, lentils, nuts, seeds, and whole grains
- Goal: 14 grams of fiber/1000 kcal
  - Typical American gets ~15 grams/day
  - Improved glycemia with ~44-50 grams/day; may be difficult due to palatability and GI side effects
- 50% of grain consumption from whole intact grains

Tips to Increase Fiber

- Real-world tips to increase fiber:
  - Eat whole fruit instead of drinking juice
  - Replace white flour products/rice with brown rice and whole grains
  - Snack on nuts, seeds, fruit, or vegetables more often
  - Substitute beans/lentils for meat in a salad, chili, or soup

Soluble & Insoluble Fiber

- Two varieties of fiber
  1. Soluble: dissolves in water
     - Associated with improved BG and ↓ blood cholesterol
     - Goal: 7-13 grams/day
     - Sources: oatmeal, oat bran, apples, pears, psyllium, barley, legumes
  2. Insoluble: does not dissolve in water
     - Moves food thru the GI system, helping to prevent constipation
     - Sources: whole wheat and grains, nuts, beans, and vegetables

Fiber & Carbohydrate Counting

- Since fiber is a type of carbohydrate that the body can't digest, it does not affect blood sugar levels like other carbs.
- On Nutrition Facts food labels, the grams of dietary fiber are already included in the total carbohydrate.
- In those who are intensively managed with insulin and carb counting, consider subtracting the grams of fiber from the total carbohydrate.


TIME FOR REVIEW

Knowledge Check

Which of the following is true about sucrose digestion?

A. Sucrose is broken down into glucose & fructose, and the fructose is metabolized almost completely in the liver

B. Sucrose is broken down into glucose & maltose, and the glucose is metabolized almost completely in the liver

C. Sucrose is broken down into glucose & fructose, and the glucose is metabolized almost completely in the liver

D. Sucrose is broken down into glucose & maltose, and the maltose is metabolized almost completely in the liver

Knowledge Check

Taylor, who has type 1 diabetes, begins experiencing symptoms of hypoglycemia after a long-day of swimming. When she checks, her blood sugar is 63 mg/dl. What should she do?

A. Drink 8 oz of soda and recheck her glucose level in 15 minutes
B. Eat 4 glucose tablets and recheck her glucose level in 15 minutes
C. Drink 15g of liquid glucose and recheck her glucose level in 30 minutes
D. Eat a piece of fruit and recheck her glucose level in 30 minutes


Stand up & Stretch!

Protein

Protein Sources

- Meat: beef, pork, lamb, veal, etc.
- Plant-based meats
- Poultry: chicken, turkey, duck, emu, goose, bush birds, etc.
- Fish and seafood: fish, prawns, crab, lobster, scallops, etc.
- Eggs
- Dairy products: milk, yogurt, cheese, cottage cheese
- Soy milk
- Nuts, seeds, nut butters
- Tofu, tempeh, edamame
- Beans, lentils, peas, hummus
- Grains: quinoa, wheat berry, millet, couscous, buckwheat, oatmeal, high protein cereal

Protein

- Recommended vs. Actual Intake
  - RDA: 0.8 g/kg body weight/day
  - Most Americans eat 1-1.5 g/kg body weight/day or 15-20% of total calories from protein
- No evidence that adjusting actual intake towards the recommended intake will improve health

Protein

- Dietary protein in diabetes management:
  - Inconclusive research regarding the ideal amount of dietary protein to optimize glycemic management or CVD risk
  - Individualize protein goals based on current eating patterns

Protein & CKD

- Dietary protein in diabetes management for persons with kidney disease (nondialysis-dependent stage 3 CDK or higher)
  - Intake should be 0.8g protein/kg body weight/day
    - Less doesn't provide benefit and may increase malnutrition risk
    - More is associated with accelerated decline in kidney function

Protein & CKD

- For persons with diabetes on dialysis
  - Malnutrition is common
  - Intake higher than 0.8g protein/kg body weight/day should be considered to reduce risk of malnutrition

Protein

- In someone living with T2DM, protein intake may stimulate the release of insulin
  - Therefore, use of carb sources high in protein to treat/prevent hypoglycemia should be avoided
  - Examples of foods to avoid are milk, nuts, peanut butter

Protein

- In someone living with T2DM, consuming non-starchy vegetables and protein 5-15 minutes prior to eating carbohydrate foods has been shown to lower postprandial glucose and insulin excursions

Fats

Saturated, Trans, and Unsaturated Fats

Fats

- Sources: a variety of foods including meat, poultry, fish/seafood, eggs, dairy products, nuts and seeds, avocado, butter/oil, processed and fried foods
- Dietary fat is needed for absorption of fat-soluble vitamins (A, D, E, and K), function of nerves and brain, and healthy skin and body cells.

Fats

- There is not an ideal percentage of calories from fat for people at risk for or living with diabetes
- Type of fat consumed is more important than total fat
  - Limit intake of saturated fat
  - Avoid trans fat
  - Keep cholesterol as “low as possible” w/o compromising diet

Saturated Fat

- “Unhealthy Fat”
- Primary sources of saturated fats include:
  - Red meat (beef, lamb, pork)
  - Chicken skin
  - Whole fat dairy products (milk, cream, and cheese), butter, and ice cream
  - Lard
  - Tropical oils like coconut and palm oil
  - Processed foods

Saturated Fat

- Limit calories from saturated fat
  - Quality of fat is more important that quantity of fat
  - Replace saturated with unsaturated fat to reduce total and LDL cholesterol
  - Replace saturated with unsaturated fat; not refined carb
    - This would also reduce total and LDL cholesterol, but may increase triglycerides and reduce HDL

Trans Fat

- “Unhealthy Fat”
- Historical sources: processed foods like baked goods, microwave popcorn, frozen pizza, refrigerated dough like biscuits and rolls, fried foods, nondairy coffee creamer
- Trans fat should be avoided; associated with all-cause mortality, total CHD, and CHD mortality.

Trans Fat

- Most trans fat in food is formulated through partial hydrogenation
  - Manufacturers added hydrogen to vegetable oil, turning the liquid into a solid fat (like shortening or hard margarine)
  - Process increases the shelf life and flavor stability of foods

Trans Fat

- The FDA's Ban of Partially Hydrogenated Oils (PHOs)
  - In 2015 the FDA determined that PHOs are not GRAS*
  - Food manufacturers were allowed time to reformulate foods and move foods already produced through distribution
  - Compliance date to move these food through distribution was January 1, 2021.

*GRAS: "generally recognized as safe"

Mono and Polyunsaturated Fats

- “Healthy Fats”: eating patterns rich in these can improve glycemic control and blood lipids (Ex: Mediterranean diet)

Type of Fat	Sources
Monounsaturated	Foods: avocado, edamame, olives, nuts Oils: avocado, olive, peanut, canola
Polyunsaturated	Foods: Walnuts, sesame, flax, and sunflower seeds, fish (salmon, albacore tuna) Oils: corn, soybean, safflower, sesame

Polyunsaturated Fats

- Increasing foods with the long-chain omega-3 fatty acids (EPA and DHA) is recommended for prevention of cardiovascular disease
  - Have two servings of fatty fish per week
    - Wild salmon, mackerel, herring, anchovies
    - NOT commercially fried fish filets
  - Plant sources for vegetarian/vegan eating patterns (ALA)
    - Ground flaxseed/flax meal, chia seeds, walnuts, soybeans, mung beans, green leafy vegetables, whole grains, and beans

Polyunsaturated Fats

- Evidence does not conclusively support recommending omega-3 (EPA and DHA) supplements for all people with diabetes for the prevention or treatment of cardiovascular events

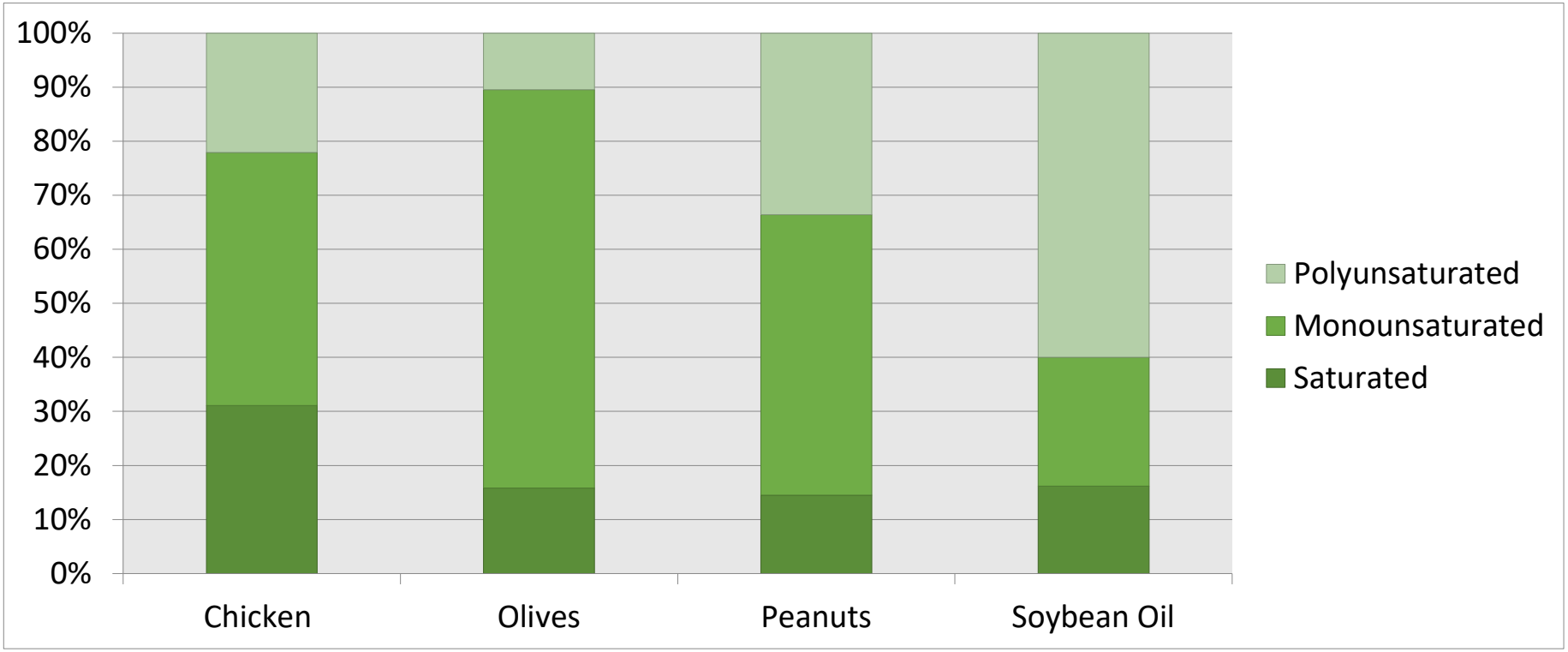

TIME FOR REVIEW

Knowledge Check

Which of the following food items has the highest percentage of saturated fat per ounce?

A. Chicken
B. Olives
C. Peanuts
D. Soybean oil

Knowledge Check: Answered



Knowledge Check

Olive oil and canola oil are good sources of:

A. Monounsaturated fats
B. Polyunsaturated fats
C. Saturated fats
D. Trans fats

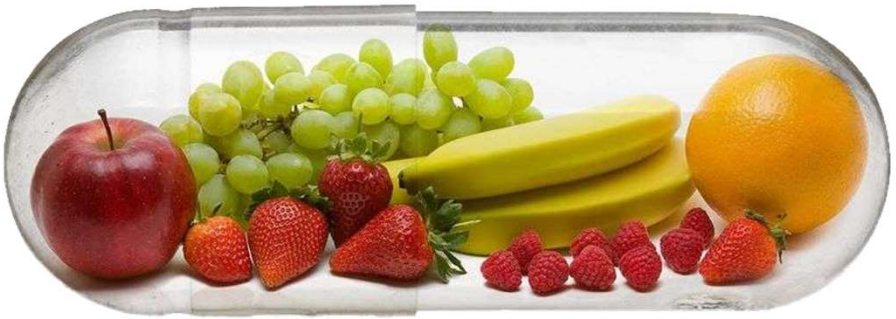
Micronutrients & Supplements

Sodium

- Limit sodium intake to less than 2300 mg/day (the same as the general population)
  - Limit of <1500 mg/day is not recommended
- Sodium recommendations should consider palatability, availability, affordability, and the difficulty of achieving low-sodium recommendations in a nutritionally adequate diet.

Micronutrients & Supplements

- Nutrition therapy should include education on how to acquire adequate amounts of vitamins and minerals from food
- Unless deficient, use of herbal, vitamin, or mineral supplementation in those with diabetes is not supported



Micronutrients & Supplements

- Select groups with may need a multivitamin supplement
  - Elderly
  - Women planning pregnancy, currently pregnant, lactating
  - Strict vegetarians/vegans
  - People with celiac disease
  - Those on calorie or carb-restricted diets

Micronutrients & Supplements

- Long-term metformin use may be associated with vitamin B12 deficiency
  - Consider periodic testing of of B12 status if taking Metformin chronically, especially with anemia or peripheral neuropathy

Micronutrients & Supplements

- Ask PWD about supplement use
- Routine supplementation with antioxidants such as vitamins E, C, and carotene is not advised due to lack of evidence of efficacy and long-term safety concerns.
- Insufficient evidence to support the routine use of most herbal supplements and micronutrients.
  - See Bev's handout for more information

Micronutrients & Supplements

Supplements to Help Manage Total Cholesterol, LDL, and HDL

- Beta glucan (whole oats/barley)
- Plant sterols and stanols
- Psyllium
- Alpha linolenic acid (flaxseed oil)
- Chia Seed
- CoQ10 (as adjunct to statin therapy to lower LDL cholesterol)
- Flaxseed (ground)
- Niacin
- Pectin
- Probiotics-Lactobacillus reuteri NCIMB 30242
- Red yeast rice
- Soy
- Vitamin D
- Garlic
- Ginseng
- Guar Gum
- Krill Oil
- Omega 3 fatty acids (fish oil)
- Magnesium

OTHER FIBERS

- Calcium polycarbophil
- Inulin
- Methylcellulose
- Soluble corn fiber
- Wheat dextrin
- Resveratrol (grape skin extract)
- Glucomannan

Supplements to Help Lower Blood Sugar

- Psyllium
- Alpha lipoic acid
- Beta glucan (whole oats/barley)
- Chromium
- Cinnamon
- Pectin
- Alpha linolenic acid (flaxseed oil)
- Garlic
- Ginseng
- Guar Gum
- Magnesium

OTHER FIBERS

- Soluble corn fiber
- Calcium polycarbophil
- Inulin
- Methylcellulose
- Wheat dextrin
- Bitter Melon
- Glucomannan

This downloadable version is compliments of

Diabetes Education SERVICES

www.DiabetesEd.net

Supplement Safety Ratings from Cleveland Clinic

Safety Rating Color Key
Recommended: Several well-designed studies in humans have shown positive benefit. Our team is confident about its therapeutic potential.
Recommended with Caution: Preliminary studies suggest some benefit. Future trials are needed before we can make a stronger recommendation.
Not Recommended-Evidence: Our team does not recommend this product because clinical trials to date suggest little to no benefit.
Not Recommended-High Risk: Our team recommends against using this product because clinical trials suggest substantial risk is greater than the benefit

This content was adapted from The Cleveland Clinic Wellness flyer. For more detailed information, access full supplement review at www.clevelandclinicwellness.com/supp review

2020

Alcohol & Glycemia

Alcohol & Glycemia

- Moderate consumption has minimal acute or long-term effect on glucose and insulin concentrations
- Limit intake to:
  - 1 drink or less per day for women
  - 2 drinks or less per day for men

Alcohol & Glycemia

- What is a drink?
  - 5 ounces of wine
  - 12 ounces of beer
  - 1½ ounces of a hard alcohol
- 1 drink has approximately ~15 grams of alcohol
- 1 gram of alcohol = 7 calories
  - Consider when discussing wt. managemen

Alcohol & Glycemia

- Risk of hyperglycemia:
  - Consistently having 3+ drinks/day can contribute to hyperglycemia
  - Carb consumed with alcohol (e.g. mixed drink, beer, wine) may acutely raise BG

Alcohol & Glycemia

- Risk of hypoglycemia:
  - Individuals using insulin or insulin secretagogues are at risk for hypoglycemia following consumption
    - Evening drinking may increase the risk of nocturnal/fasting hypo
  - Individuals may consume food with alcohol to reduce the risk


TIME FOR REVIEW

Knowledge Check

Chris has had T1D for 30 years. He uses MDI and wears a CGM. He is out celebrating and has 4 rum and cokes and appetizers. He takes insulin for his carbs. When he gets home, his Dexcom shows his glucose at 162 mg/dl. Drinking alcohol put Chris at risk for:

A. Hyperglycemia through the night due to gluconeogenesis
B. Hyperglycemia through the next day
C. DKA due to ketone production associated with excessive alcohol consumption
D. Hypoglycemia due to inhibition of gluconeogenesis in the liver

Nutrition Interventions for Special Populations

Youth, Pregnancy, Celiac Disease, and Eating Disorders

Youth with Diabetes

- Key concepts for youth with all types of diabetes
  - Meet energy requirements for growth and activity
  - Use *food plan* or *meal plan* rather than *diet*
  - Engage the child or adolescent in planning, shopping, and preparing healthy foods for the entire family

Youth with Diabetes

- In all youth with diabetes who also have dyslipidemia, use MNT to support the following changes:
  - Limit calories from fat: 25-30%
  - Limit calories from saturated fat: <7%
  - Limit cholesterol: <200 mg/day
  - Avoid trans fat
  - Aim for ~10% of calories from monounsaturated fat
  - For elevated triglycerides: ↓ simple sugar, ↑ omega-3s

Youth with T1D

- Provide individualized MNT
- Balance carb intake and insulin
- Integrate insulin regimen into lifestyle
- Avoid withholding food to prevent hyperglycemia or having a child eat without an appetite to avoid hypoglycemia

Youth with T1D

- For those on fixed insulin program, focus on consistent carb intake considering timing and amount
- For those on flexible insulin program, provide education on carb counting

T1D & Flexible Insulin Therapy

- In a mixed meal (carb + high in fat/protein), insulin need is not based on carb alone
  - Consider the glycemic impact of fat and protein, too
- Relative to a lower fat/protein meal, high-fat and high-protein meals may require:
  - More insulin
  - A different approach to insulin timing
- More research is needed to determine optimal insulin dose and delivery strategy

Youth with T2D

- Youth and family must prioritize lifestyle modifications
  - Dietary recommendations:
    - Focus on nutrient dense, high quality foods / decrease calorie-dense, nutrient-poor foods (particularly SSBs)
  - Increase exercise
  - Aim for sustainable 7-10% decrease in excess weight for youth with overweight/obesity

Pregnancy

- For women with diabetes in pregnancy or GDM, focus on:
  - Adequate calories for appropriate weight gain (weight loss not recommended)
  - Minimize blood glucose excursions
  - Ensure safe nutrition

Pre-pregnancy BMI and Weight Gain

Weight-for-Height Category	Recommended Total Weight Gain (Singleton Gestation)
With Underweight (BMI ≤18.5)	28-40 lbs
Healthy Weight (BMI 18.6 – 24.9)	25-35 lbs
With Overweight (BMI 25.0 – 29.9)	15-25 lbs
With Obesity (BMI ≥ 30)	11-20 lbs

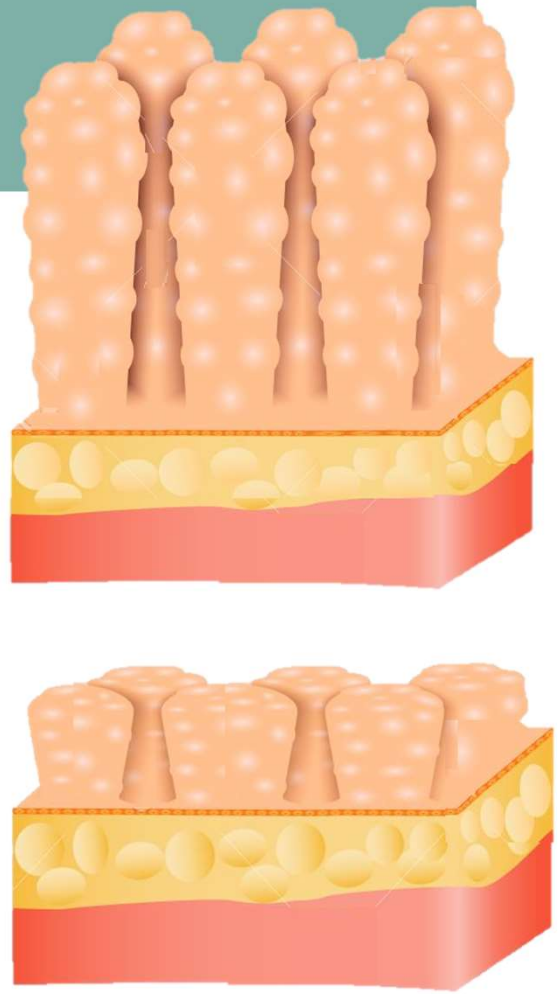
Moore Simas, T. A., Waring, M. E., Sullivan, G. M., Liao, X., Rosal, M. C., Hardy, J. R., & Berry Jr, R. E. (2013). Institute of Medicine 2009 gestational weight gain guideline knowledge: Survey of obstetrics/gynecology and family medicine residents of the United States. *Birth*, *40*(4), 237–246. https://doi.org/10.1111/birt.12061

DRIs and Pregnancy

- For pregnant women, Dietary reference intake recommend a minimum of:
  - 175 grams/day of carbohydrates
  - 71 grams/day of protein
  - 28 grams/day of fiber
- Amount/type of carb will impact postprandial glucose levels
- Emphasize mono- and polyunsaturated fats

Celiac Disease

- Immune-mediated disorder where destruction of the small intestine villi occurs following exposure to gluten
  - Interferes with nutrient absorption
- Occurs at an increased frequency in people with T1D
  - 1%-16% of individuals compared to 0.3%-1% in general population



Celiac Disease

- Diagnosis via blood tests and a small intestine biopsy
  - Screen for celiac by testing IgA if adult with T1D has suggestive symptoms or signs:
    - If normal serum IgA, measure IgA-tTG antibodies
    - If IgA deficient, measure tTG-IgG or DGA-IgG

IgA: immunoglobulin A
IgG: immunoglobulin G
tTG: tissue transglutaminase
DGA: deaminated gliadin antibodies

Celiac Disease

- Treatment for celiac disease is a lifetime gluten-free diet
  - Eliminate all wheat (including durum, semolina, spelt, and farro) and the related grains of rye, barley, and triticale.
  - Caution with oats – may be contaminated with wheat
  - Remember “BROW” – Barley, Rye, (some) Oats, Wheat
- Refer to a dietitian for help with food selection/label reading

Nutrition Interventions: Celiac Disease

Gluten Free Whole Grains & Starches include:

- Quinoa
- Potatoes
- Beans & Peas
- Cassava
- Corn
- Oats*
- Flax
- Amaranth
- Millet
- Rice
- Wild rice
- Buckwheat
- Job's Tears (Hato Mugi)
- Montina (Indian rice grass)
- Sorghum
- Teff

**Oats are inherently gluten-free may be contaminated with wheat during growing or processing.*

Disordered Eating Patterns

- Estimated prevalence of disordered eating behavior and eating disorders varies in people with diabetes
- Most reported disordered eating behaviors:
  - T1D: insulin omission causing loss of glucose/calories via the urine
  - T2D: bingeing (excessive intake with sense of loss of control)

Disordered Eating Patterns

- Consider screening for these patterns when hyperglycemia and weight loss are unexplained
- Multidisciplinary team approach to treatment is a standard of care
  - Early referral to mental health professional

Disordered Eating Patterns

- Anorexia nervosa: restricted energy intake relative to need
  - Marked by low body weight, fear of weight gain, and disturbance in the way in which one's body weight or shape is experienced
- Bulimia nervosa: recurring binge eating and compensatory behavior
  - Binging characterized by a sense of a lack in control.
  - Compensatory behaviors vary
- Diabulimia (unofficial diagnostic term): reduction/omission of insulin doses
  - This causes hyperglycemia and loss of glucose calories through the urine.


TIME FOR REVIEW

Knowledge Check

Sara has just been diagnosed with gestational diabetes. Her current weight is 176 lbs. and her pre-pregnancy BMI was 28. What is the total recommended weight gain for Sara's pregnancy?

A. 15 pounds
B. 15-25 pounds
C. 25-35 pounds
D. 28-40 pounds

Knowledge Check

What are the nutrient goals for pregnant women?

A. 130 grams of carbohydrate/day, 71 grams of protein/day, 14 grams of fiber/day
B. 130 grams of carbohydrate/day, 90 grams of protein/day, 28 grams of fiber/day
C. 175 grams of carbohydrate/day, 90 grams of protein/day, 14 grams of fiber/day
D. 175 grams of carbohydrate/day, 71 grams of protein/day, 28 grams of fiber/day

Nutrition to Support the Management of Diabetes Complications & Comorbidities

Mediterranean Diet

Description & Notes	• Encourages plant-based foods, fish and shellfish, some dairy. Olive oil is primary fat source. • Limitations: • Moderate number of eggs, minimal red meat, wine in low to moderate amount, rare use of concentrated sugars or honey.
Current Literature	• Improves CVD risk factors • Energy restricted version of these meal plans can improve weight and glycemia

DASH Diet

Description & Notes	*Dietary Approaches to Stop Hypertension* Encouraged foods: • Fruits & Veg (8-10 servings/day), whole grains (6-8 servings/day), low-fat dairy (2-3 servings/day), poultry & fish (6 servings/week), nuts & seeds (4-5 servings/week) • Limitations: • Red meat, sweets, sugar-containing, processed food, excessive alcohol consumption
Current Literature	• Improves BP and reduces risk for CVD in people w/o diabetes • Limited evidence exists for people with diabetes but ”one would expect similar results”

Plant-Based Eating

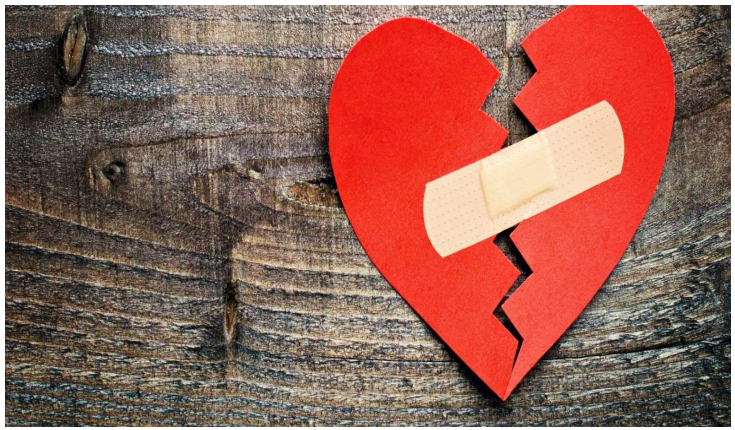
Description & Notes	• Limited/no flesh foods; may allow egg and/or dairy • Associated with lower intake of saturated fat and cholesterol
Current Literature	• Energy restricted version of these meal plans can improve CVD risk factors, weight, and glycemia

Intermittent Fasting & Time Restricted Eating

Description & Notes	• Alternate-day fasting • 5:2 diet • Time-restricted eating
Current Literature	• Results in mild to moderate weight loss over short durations • No difference vs. continuous calorie restriction • Time restricted eating may be easier to follow due to ease, no need to count calories, sustainability

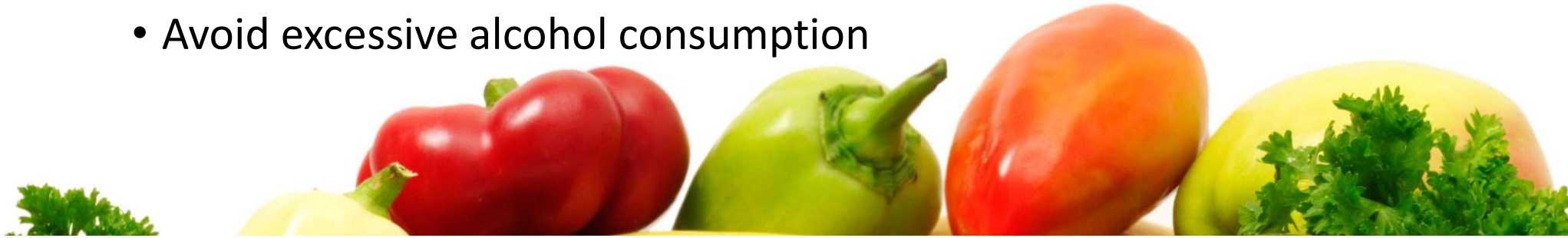
Nutrition for Lipid Management

- Consider a calorie-restricted (for wt. loss) Mediterranean-style or DASH eating pattern
- Reduce saturated and trans fat, increase omega-3 fatty acids
- Increase fiber
- Increase plant stanols/sterols



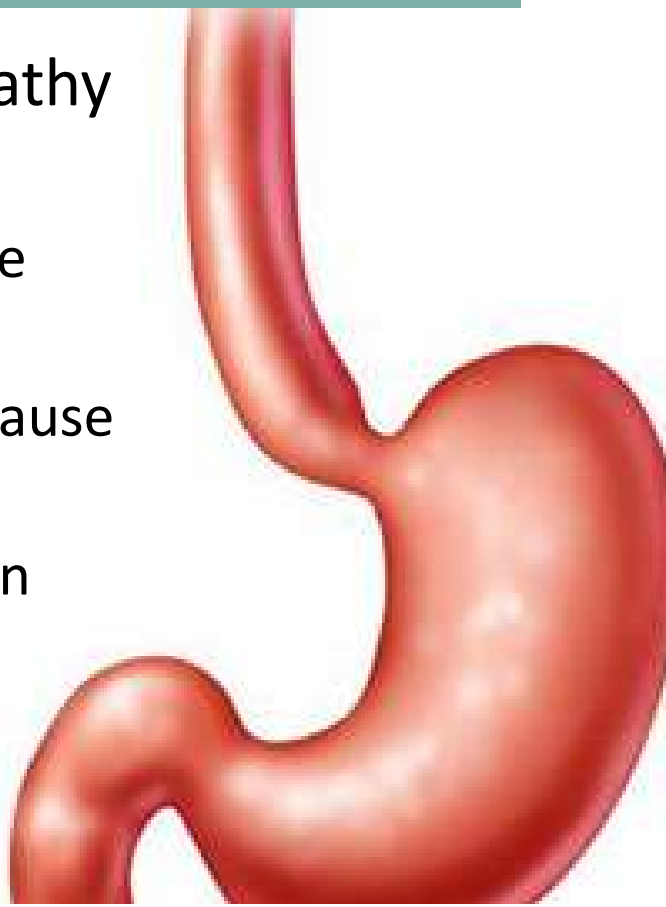
Nutrition for Hypertension

- Managing HTN reduces rate of micro/macrovascular complications
- For individuals with BP >120/80 mmHg, focus on:
  - Weight loss
  - Increase physical activity
  - Try DASH diet for healthy eating
  - Sodium restriction (~2300 mg/day)
  - Avoid excessive alcohol consumption



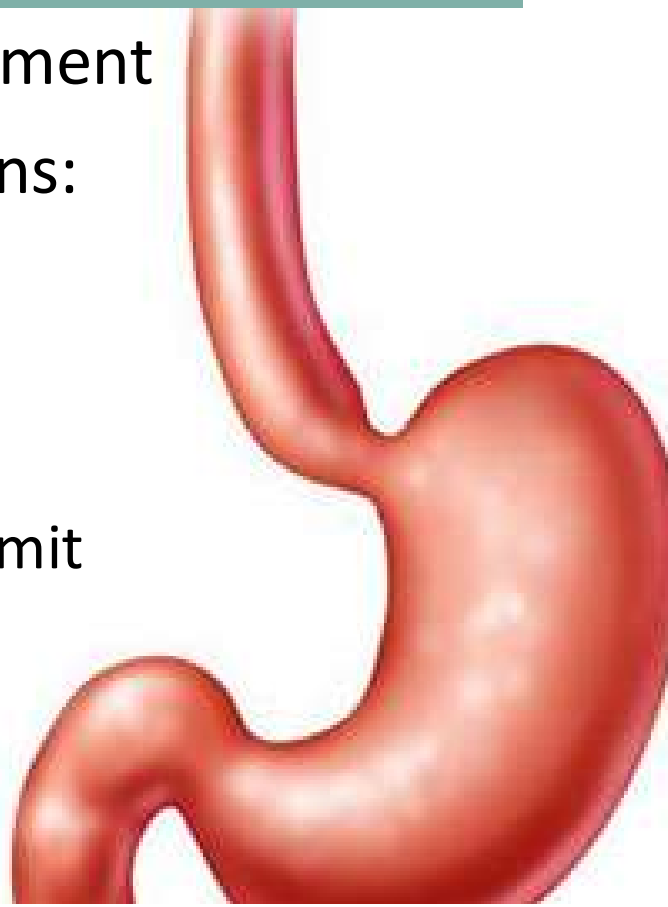
Nutrition for Gastroparesis

- Gastroparesis: a form of autonomic neuropathy that delays emptying of the stomach
  - Symptoms: nausea, vomiting, fullness with little food, bloating, and low appetite.
  - Unpredictable movement of food thru GI can cause erratic BGs
  - Timing of insulin delivery is important; hypo can result if insulin is given and gastric emptying is delayed



Nutrition for Gastroparesis

- Dietary changes are a high priority in treatment
- Consider the following dietary modifications:
  - Decrease fiber (may lead to bezoar formation)
  - Evaluate fat intake
    - Fat is a good/high source of calories so limit only after other measures are exhausted
    - Liquid fats may be tolerated better



Nutrition for Gastroparesis

- Consider dietary modifications:
  - Multi supplement if intake is insufficient
  - Small and frequent meals
  - Liquid/pureed calories
    - May need to try liquid calories later in the day
  - Chew foods well
  - Sit up for 1-2 hours after eating


TIME FOR REVIEW

Knowledge Check

Jane has type 1 diabetes and was recently diagnosed with gastroparesis. She is a runner and has not been able to exercise recently due to nausea, vomiting, bloating, and intestinal pain. She experiences lows about 3 times a week. What hypoglycemia treatment should she use?

A. Juice
B. Fruit
C. Glucose tablets or gels
D. Peanut butter crackers

Meal Planning & Recommended Eating Plans

Meal Planning & Recommended Eating Plans

- Plate Method
- Carbohydrate considerations:
  - Exchanges
  - Carbohydrate Counting

Meal Planning: Strategies for Carb Management

Therapy	Strategies for Carbohydrate Management
Nutrition therapy only or on meds excluding insulin or insulin secretagogues	Use carbohydrate management strategies such as reducing overall carb intake, portion sizes, plate method, or food exchange lists
Fixed insulin doses or insulin secretagogues	Educate on carbohydrate consistency with respect to time and amount. Use tools such as carbohydrate counting or choices, plate method, simplified meal plan, or food exchange lists
Flexible insulin therapy	Educate on carbohydrate counting and using an insulin-to-carb ratio

Plate Method

- MyPlate introduces simple nutrition
  - Emphasizes portion control and healthy food choices
  - Using a small plate and filling ½ plate with fruits and veg helps with calorie management
  - Consider using with:
    - Individuals with T2D not on insulin
    - Those with limited health literacy or numeracy
    - Older adults prone to hypoglycemia

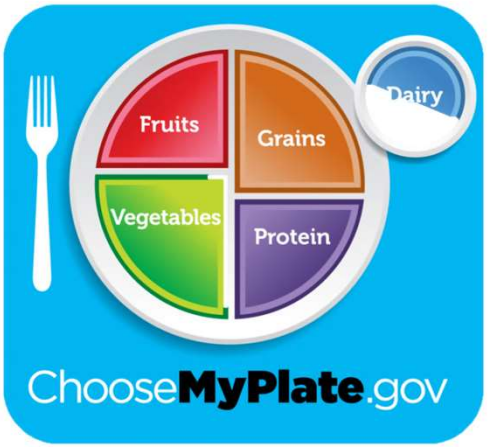
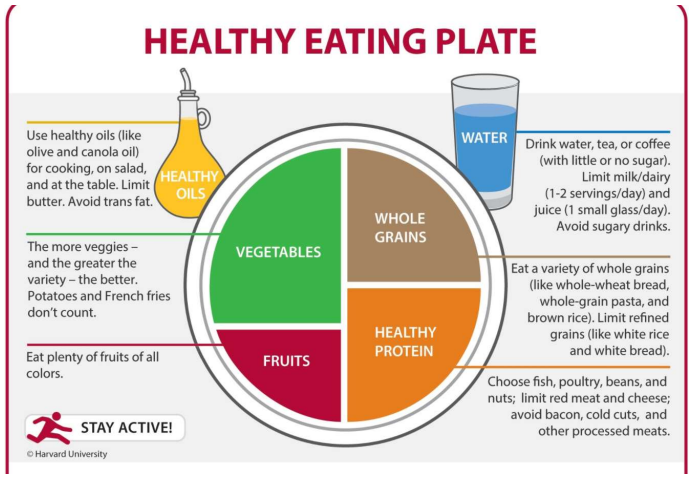


Plate Method Alternatives

- Harvard School of Public Health alternative =“Healthy Eating Plate”
  - Visit www.hsph.harvard.edu/nutritionsource
- ADA alternative = “Diabetes Plate Method”
  - Visit diabetesfoodhub.org



Exchanges

- The exchange system groups like foods that have similar nutritional value (specifically macronutrient and caloric value) into exchanges that can be swapped for another
  - Example: the “starch” category has food items in predetermined servings that are ~80 kcals, ~15g of carb, and ~3g protein
- An individual may count the number of food exchanges in each category at each meal/thru the day

Exchanges

Advantages

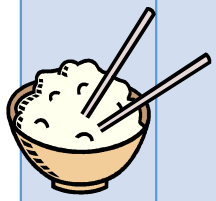
- Allows for flexibility and personalization
- Encourages consistency in the timing and amounts at meals and snacks

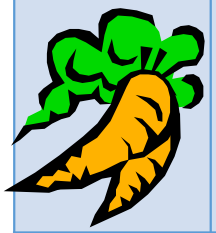
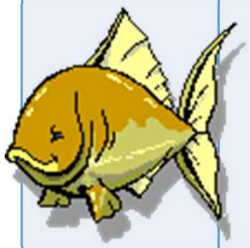
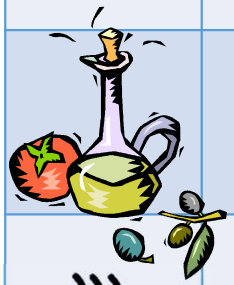
Disadvantages

- Requires learning how to fit unlisted foods into the plan (especially today with so many food choices)
- Less attention given to micronutrient content

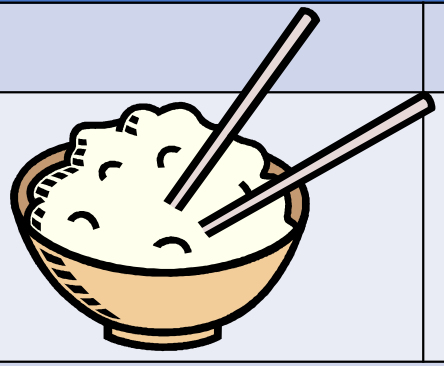
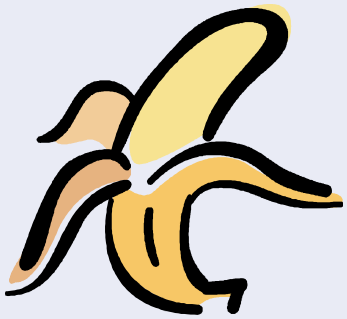
Exchanges

- Categories within the exchange system
  - Starch 
  - Fruit 
  - Dairy / Milk 
  - Sweets/ Dessert 
  - Vegetable 
  - Meat / Protein 
  - Fats 
  - “Free” 

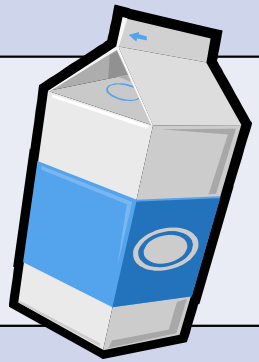
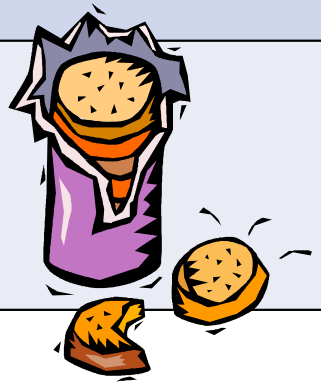
	Exchange	Carb	Prot	Fat	Cals	Examples
	Starch	15	3	0-1	80	⅓ cup beans, lentils, peas, rice, ½ cup cooked cereal, corn, potato, pasta 1 oz. bread (1 slice) or bagel (½), ½ english muffin
	Fruit	15	0	0	60	1 small apple or kiwi, ½ large banana, 1¼ cup whole strawberries, 1 cup raspberries, ¾ cup blackberries, ½ (most) to ⅓ (grape, cran) cup juice
	Dairy / Milk	12	8	0-8	90-120	1 cup milk, 8 oz. plain yogurt (any fat content)
	Sweets/ Desserts	15	Varies	Varies	Varies	¼ cup granola, 1 small granola bar, ½ cup frozen fruit yogurt, ½ cup ice cream (any flavor)

	Exchange	Carb	Prot	Fat	Cals	Examples
	Veggies	5	2	0	25	1 cup raw vegetables, ½ cup cooked vegetables of vegetable juice
	Meat / Protein	0	7	1-8	35-100	1 oz. fish, chicken, beef, pork or cheese, ½ cup tofu, 1 egg
	Fat	0	0	5	45	1 tsp. oil, butter, or mayo, 6 almonds, 2 whole walnuts
	Free	0-5	0	0	0-25	Sugar free gelatin, 1 tbsp catsup 2 tsp sugar free jam, 1-2 tbsp sugar free syrup, coffee, tea, spices

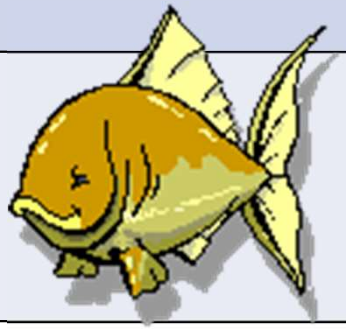
General Rules for Serving Sizes

	Exchange	Category	Measure
	Starch	Beans/Lentils/Peas/Rice	⅓ cup
		Cooked Cereals/Pasta/Potato	½ cup
		Bread Products	1 ounce
	Fruit	Fresh	1 small piece
		Dried	¼ cup
		Juice/Canned/Applesauce	½ cup
		Cubed Melon	1 cup

General Rules for Serving Sizes

	Exchange	Category	Measure
	Dairy / Milk	Skim, 1%, 2%, Whole	1 cup
		Ice Cream	½ cup
		Yogurt	1 cup
	Sweets / Desserts	Cookies	1 small (1¾”)
		Granola	¼ cup
		Cake	1½” square

General Rules for Serving Sizes

	Exchange	Category	Measure
	Vegetables	Raw	1 cup
		Cooked	½ cup
		Juice	½ cup
	Protein	Meats/Chicken/Fish	1 ounce
		Cheese	1 ounce
		Egg	1

General Rules for Serving Sizes

	Exchange	Category	Measure
	Fat	Avocado	1/8 whole
		Butter/Margarine/Oil/Mayo	1 tsp
		Nuts/Seeds	1 tbsp
	Free	Coffee, tea	Unlimited
		SF Syrup	1-2 tbsp
		SF Jam/Jelly	2 tsp

Carbohydrate Counting

- Reading nutrition facts to carb count
  1. Look at the serving size
  2. Look at "Total Carbohydrates"
     - Consider subtracting ½ of sugar alcohols and fiber content
  3. Adjust the count depending on the number of servings that will be eaten
  4. Total the carbs for all items in the snack/meal

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

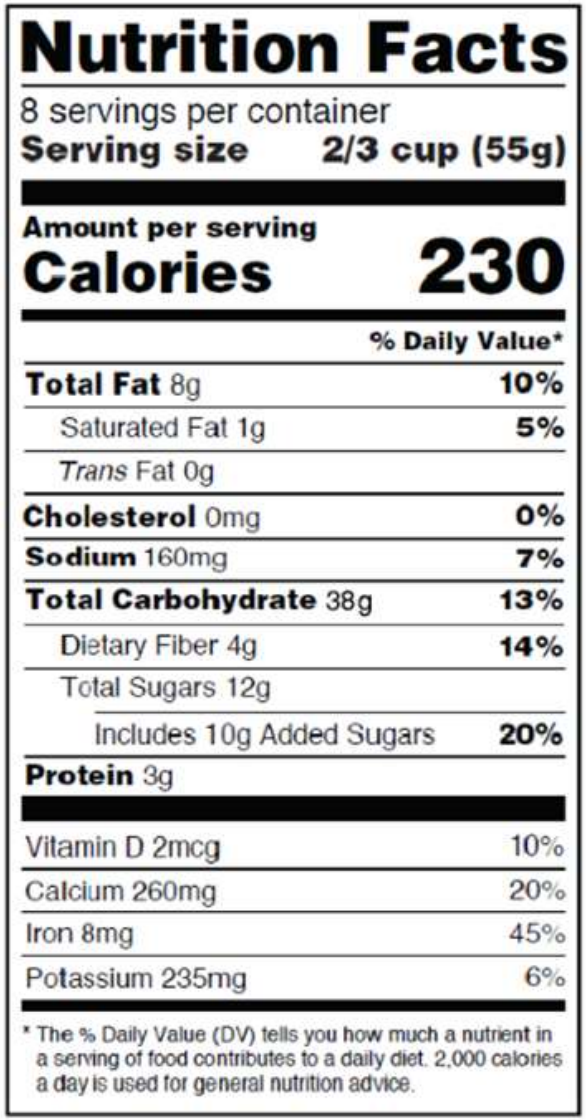
Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**

Carbohydrate Counting

- Things to consider:
  - Will simpler portion guidelines suffice?
  - Does the PWD have measuring tools?
  - Does the PWD feel comfortable doing the math?
  - Is the PWD motivated to learn carb counting?



Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

Amount per serving

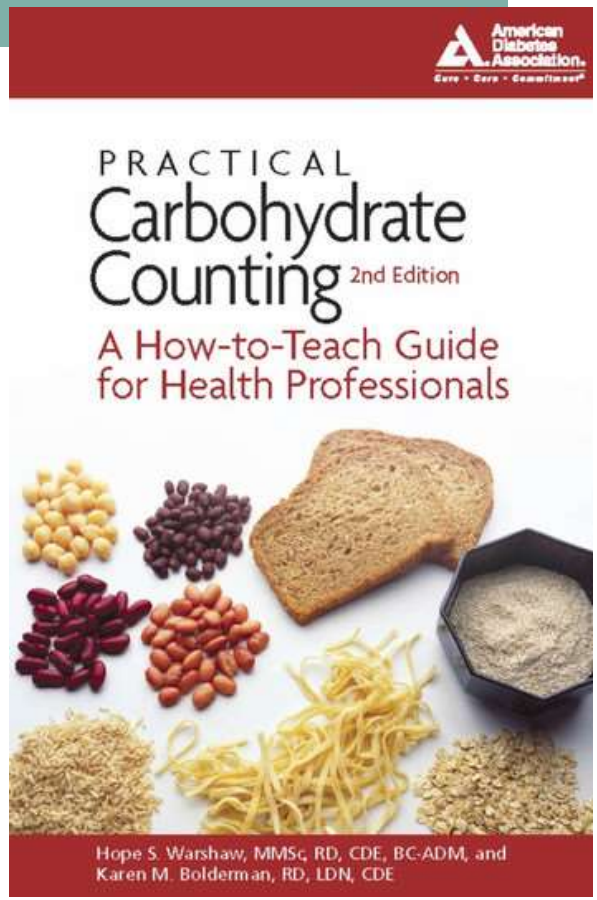
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Tips for Carb Counting

- Understanding and teaching carb counting:
  - Practice carb counting your own meals!
  - Keep foods in your office for practice
  - Encourage the PWD to bring in familiar foods into the office to practice with you
  - Encourage a “cheat sheet” with counts for regularly consumed foods



Tips for Carb Counting

- Understanding and teaching carb counting:
  - Buy measuring cups/spoons at the dollar store
  - Watch/share online tutorials on fractions
  - Encourage a calculator for math
  - Encourage the PWD practice/record using food logs; review logs prior to moving on to more complicated topics like using an ICR
  - Encourage books, phone apps, and carb counting sheets for assistance

Tools for Carbohydrate Counting

- Resources for carbohydrate counting:
  - Calorie King (book, website, smartphone app for iOS and Android – available in English & Spanish)
  - Diabetes Tracker (app $)
  - MyFitnessPal (smartphone application for iOS and Android)
  - Nutrition.gov (website)
  - Smart food scales

Nutrition Facts

12 servings per container

Serving size	**1 cup (31g)**
Amount Per Serving	
Calories	**120**
	% Daily Value*
Total Fat 0.5g	**1%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 240mg	**10%**
Total Carbohydrate 26g	**9%**
Dietary Fiber 2g	**7%**
Total Sugars 3g	
Includes 4g Added Sugars	**8%**
Protein 2g	**4%**

NOTE: The 1 cup measure as the serving size is for convenience only! All information provided by the Nutrition Facts label is based on the weight (the information in parentheses) of the food serving.

Tools for Carbohydrate Counting

- Smart food scales can be purchased to do the math

Kitrics Nutritional Scale

Perfect Portions Scale

Case Study: Patient L.J.

- L.J. is a 43 year old female dx with T2DM 8 days ago
- At dx, her PCP started her on the following medications:
  - Metformin: 1000 mg BID
  - Crestor: 10 mg per day
  - Amlodipine: 5 mg per day

Lab Work / Vitals at Dx	
BMI	29.6 kg/m^2
A1C	6.9%
Total Cholesterol	198 mg/dL
LDL	127 mg/dL
HDL	36 mg/dL
Triglycerides	207 mg/dL
BP	148/90 mm Hg

Case Study: Patient L.J.

Other important considerations:

- Eager to making dietary changes; would really like guidance on what types of foods to eat more/less of
- Has a family hx of CVD
- Has a strong family support system
- Enjoys a variety of foods, cooking with her family, and her husband's favorite dishes are chicken mole and pollo verde
- Would like to increase the nutritious foods in her children's diet, as well.

DASH Diet

- Addresses elevated blood pressure and other CV risk factors
- Incorporates chicken, where plant-based eating would minimize fleshy foods

Case Study: Patient C.S.

- C.S. is a 68 year old male dx with with T2DM 13 years ago
- Current medications:
  - 30u Lantus QHS
  - 10u Novolog TID before B, L, D
  - 1000 mg Metformin XR BID
  - Lipitor 20 mg/day
  - Lisinopril 10 mg/day
- Other important considerations:
  - Low health numeracy
  - Has hypoglycemia unawareness
  - Lives alone

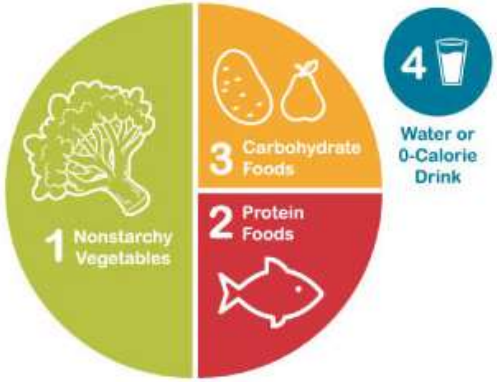
Most Recent Lab Work / Vitals	
BMI	35.2 kg/m^2
A1C	7.9%
Total Cholesterol	176 mg/dL
LDL	103 mg/dL
HDL	49 mg/dL
Triglycerides	122 mg/dL
BP	128/82 mm Hg

C.S.'s Diet Recall

Fasting BG	Breakfast Meal	2 Hrs PP
102	2 eggs scrambled with ½ cup beans and fajita vegetables, ½ large banana, 1 cup milk	172
-	2 eggs, 4 pieces turkey bacon, 2 slices bacon, water	58
117	1 cup cooked oatmeal, 1 large banana 1 cup milk, 1 hardboiled egg	199
108	Large Carmel Macchiato and breakfast sandwich	257
130	1 cup granola, 1.5 cups milk	223
-	4 corn tortillas, 2 scrambled eggs w/ potatos, peppers, and onions	200
140	1 large banana with peanut butter, water	165

ADA's Plate Method

- Encourages consistent carbohydrate intake to help balance fixed insulin dosages
- Balance carbohydrates with protein/veg
- Simple and avoids complicated math



Calculating Mealtime Insulin

Carbs & Carb Ratios PLUS Blood Sugar & Correction Factors

Meal Planning: Strategies for Carb Management

Therapy	Strategies for Carbohydrate Management
Nutrition therapy only or on meds excluding insulin or insulin secretagogues	Use carbohydrate management strategies such as reducing overall carb intake, portion sizes, plate method, or food exchange lists
Fixed insulin doses or insulin secretagogues	Educate on carbohydrate consistency with respect to time and amount. Use tools such as carbohydrate counting or choices, plate method, simplified meal plan, or food exchange lists
Flexible insulin therapy	Educate on carbohydrate counting and using an insulin-to-carb ratio

Calculating Mealtime Insulin

- Carb counting and using an insulin-to-carb ratio (ICR)
  - Can be used with flexible insulin therapy, including MDI and CSII, where bolus insulin is used at mealtimes

Pros	Cons
• Flexibility for the PWD • Insulin/food matched precisely = improved BGs	• It is easy to lose sight of overall nutritional quality

Calculating Mealtime Insulin

- To calculate mealtime insulin, you will need the following pieces of information:
  - Total grams of carbohydrate being eaten
  - Carbohydrate ratio (ICR)

  } Food Bolus

  - Current BG
  - Target BG
  - Insulin sensitivity factor (ISF)

  } Correction Bolus

- To get the total bolus, add the food bolus and correction bolus

Calculating Mealtime Insulin

- ICR: specifies how many grams of carb are "covered" by 1 unit of insulin
  - For example, a 1-unit-per-10-grams-of-carb (1:10) ratio means that one unit of insulin will cover 10 grams of carb
  - ICRs are personalized
- Use this formula to calculate the amount of insulin needed for carbs:

$$\frac{\textbf{Total carbs (g)}}{\textbf{ICR}} = \textbf{Food Bolus}$$

# of units of insulin required to cover carbs

Calculating Mealtime Insulin

Example: Kathy needs to take her Novolog for a meal that has 86 grams of carbohydrate. Her insulin to carb ratio is 1:8. She uses an insulin pen. How many units of insulin does she need to cover her food?

86 grams of carb ÷ 8 = 10.75 units of insulin

$$\frac{\textbf{Total carbs (g)}}{\textbf{ICR}} = \textbf{Food Bolus}$$

# of units of insulin required to cover carbs

Calculating Mealtime Insulin

- Insulin sensitivity factor (ISF): specifies how far a unit of bolus insulin will lower blood glucose
  - For example, a 1-unit-per-50 mg/dl (1:50) factor indicates that 1 unit of insulin will lower the blood glucose by 50 mg/dl.
  - Also referred to as a "correction factor"
- Use the following formula to calculate insulin to lower BG to goal:

$$\frac{\textbf{(Current BG – Goal BG)}}{\textbf{ISF}} = \textbf{Correction Bolus}$$

# of units of insulin required to bring blood sugar to goal

Calculating Mealtime Insulin

Example: Kathy checks her blood sugar and it is 280 mg/dl. Her goal blood sugar is 120 mg/dl. Her ISF is 1:40. How many units of insulin does she need to lower her glucose to target?

$$\frac{(280\ \text{mg/dl} - 120\ \text{mg/dl})}{40} = 4.0\ \text{units of insulin}$$

$$\frac{\textbf{(Current BG – Goal BG)}}{\textbf{ISF}} = \textbf{Correction Bolus}$$

# of units of insulin required to bring blood sugar to goal

Calculating Mealtime Insulin

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \text{Food Bolus} + \frac{(\text{Current BG} - \text{Goal BG})}{\text{ISF}} = \text{Correction Bolus} = \text{Total Bolus}$$

Calculating Mealtime Insulin

Food Bolus	Correction Bolus	Total Bolus
Kathy needs to take her Novolog for a meal that has 86 grams of carbohydrate. Her insulin to carb ratio is 1:8	Kathy checks her blood sugar and it is 280 mg/dl. Her goal blood sugar is 120 mg/dl. Her ISF is 1:40.	Add the food bolus and correction bolus to get the total
10.75 units +	4.0 units =	**14.75 units**

Since Kathy is using an insulin pen… = **15 units**

Calculating Mealtime Insulin

- On the exam, round your final answer when using an insulin pen or syringe
  - Round up to nearest whole unit if ≥ 0.5
  - Round down to nearest whole unit if ≤ 0.4
- On the exam, is ok to use decimal places if PWD uses CSII
- In real life, consider:
  - Insulin sensitivity
  - Starting blood sugar
  - What's happening next


TIME FOR REVIEW

Knowledge Check

Erandy is going to eat the following breakfast: A whole english muffin, 2 scrambled eggs with 1 oz cheese, ½ a large banana, and an 8 oz. glass of 1% milk. How many grams of carbohydrate is she having?

A. 42g
B. 57g
C. 60g
D. 72g

Knowledge Check: Answered

Food	Amount	Carbs (g)
English muffin	1 whole	15 x 2 = 30
Eggs, scrambled	2	0 x 2 = 0
Cheese	1 oz.	0 x 1 = 0
Banana, large	½	15 x 1 = 15
Milk, 1%	8 oz.	12 x 1 = 12
Total		**57g**

Knowledge Check - Continued

Now Erandy checks her BG and it is 298 mg/dl. Her goal BG is 150 mg/dl. How much Humalog insulin will she need to take by syringe if her carb ratio is 1:12 and her correction factor is 1:60?

A. 7 units
B. 7.2 units
C. 8 units
D. 9.7 units
E. 10 units

Knowledge Check - Answered

1) Calculate the food dose
   1) Total Carbs: 57g
   2) ICR: 1:12

$57g \div 12 = 4.75$ units

2) Calculate the correction dose
   1) Current blood sugar: 298 mg/dl
   2) Goal blood sugar: 150 mg/dl
   3) ISF: 1:60

$$\frac{(298 - 150)}{60} = 2.46 \text{ units}$$

$$\frac{\text{Total carbs (g)}}{\text{ICR}} = \text{Food Bolus} + \frac{\text{(Current BG – Goal BG)}}{\text{ISF}} = \text{Correction Bolus}$$

Knowledge Check - Answered

- Erandy will need: 4.75 units + 2.46 units = 7.21 units
  = 7 units

*Remember: Since Erandy is injecting her insulin with a syringe, she is limited to giving herself whole units of insulin

Knowledge Check

The Nutrition Facts panel on a package of cookies reveals that there are 28 g of carbohydrate and 5 grams of fat in 2 cookies. If Ryan eats 4 cookies, how many carbohydrate and fat servings will he consume?

A. 2 carb serving and 1/2 fat serving
B. 2 carb servings and 1 fat serving
C. 4 carb servings and 1 fat servings
D. 4 carb servings and 2 fat servings

Knowledge Check

Grace has T2DM controlled with lifestyle. Her typical weekday breakfast is 2 eggs, 2 slices turkey bacon, 1 slice WW toast with margarine, and ½ cup apple juice. Her 2-hour post-prandial BG generally runs <140. She has noticed that on weekends, when she eats her breakfast consisting of 1 English muffin with margarine, ½ banana, and 1 cup skim milk her 2-hour post-prandial BG generally runs higher. Why?

A. Breakfast carbohydrate intake is higher on the weekend

B. Breakfast carbohydrate intake is lower on the weekend

C. Physical activity is likely lower on the weekend

D. Variation in meal timing is contributing to glucose variation

Food Insecurity

Food Insecurity

- The unreliable availability of nutritious food and inability to consistently obtain nutritious food
- Providers should assess food insecurity and refer to appropriate community resources:
  - ”Within the past 12 months, we worried whether our food would run out before we got money to buy more.”
  - Within the past 12 months the food we bought just didn’t last, and we didn’t have the money to get more.”

Healthy Eating on a Budget

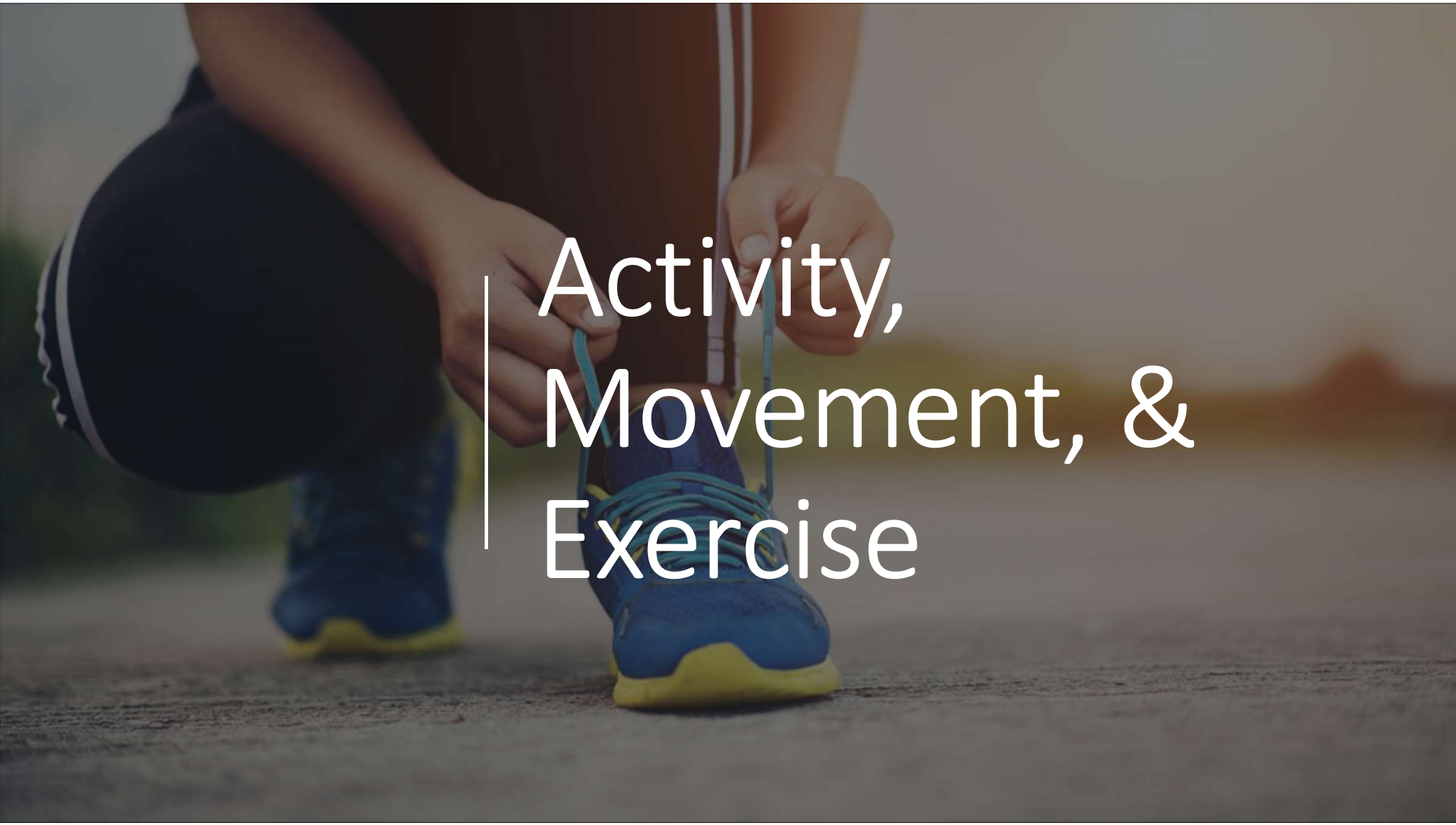
- Plan meals
- Shop smart
  - In season produce
  - Frozen or canned fruits and vegetables
  - Low-cost proteins include beans, peas, lentils, canned tuna, eggs
  - Grains like brown rice and oatmeal are often more affordable
- Remember that eating out is often more expensive than nutrient dense home prepped options!

Healthy Eating on a Budget

Breakfast at Home	
Bottle of water (16 oz)	$0.21
2 eggs	$0.45
½ banana	$0.13
½ cup dry oatmeal	$0.18
Total	**$0.97**

Fast Food Breakfast	
Sausage Egg Sandwich	$5.15
Hash brown	$3.01
Orange Juice	$2.75
Total	**$10.91**


Stand up & Stretch!



Activity, Movement, & Exercise

Types & Benefits of Exercise

Aerobic, Resistance Training, and Flexibility

Types of Exercise: Aerobic Activity

- Aerobic, also called “Cardio”
  - Repeated/continuous movement of the same large muscle groups
  - Typically have the greatest acute impact on BG
  - Examples: walking, biking, dancing, swimming
- Studies show benefit of walking 10,000 steps a day
  - 2,000 steps = 1 mile

Impact of Aerobic Activity on DM

- BG improves for 2-72 hours after aerobic activity; thus need to do it regularly to maintain improved BGs
- Postprandial exercise can prevent/reduce the rise in BG levels that occurs after eating

Types of Exercise: Resistance Training

- Use of muscular strength to move a weight or work against a resistive load
- Increases strength, endurance, and overall calories burned in a day
- Example: weightlifting, sprinting

Impact of Resistance Training on DM

- Resistance training may improve glycemic levels more than aerobic activity in T2D
  - Best results come from mix of resistance and aerobic
  - Results are less clear for individuals with T1D

Impact of Resistance Training on DM

- Resistance exercise may weaken the exercise related decrease in BGs during and after exercise
  - In T1D: complete resistance training 1st, aerobic training 2nd to ↑ glycemic stability ↓ post exercise hypo
- Key for older adults for maintaining independence
  - Improved strength/balance reduces fall risk
  - Increases mobility

Types of Exercise: Flexibility

- Flexibility (stretching / postural):
  - The ability to move a joint through complete range of motion
  - Examples: Yoga, tai chi, or other with balance, agility, coordination

Impact of Flexibility Training on DM

- Benefits less established than other exercise types
  - Yoga and tai chi may improve glucose and lipid levels, body comp, neuropathic symptoms, and quality of life
  - May help prevent falls
- Minimal precautions needed with this type of activity

Sedentary Time: The benefit of Reducing It

- Long-periods of sedentary activity (regardless of physical activity) may be associated with the onset of T2D.
  - Encourage breaks in sedentary activity every 30 minutes
  - Small increases in activity may reduce mortality from all causes and improve insulin resistance/BG, BP, and BMI

Exercise Goals for Various Populations

Children, Adults, and Older Adults

Exercise: All Children

- Exercise Goals:
  - Aerobic: 60 minutes of moderate to vigorous-intensity activity daily
  - Resistance training: at least 3 days/week

- Other considerations if using insulin
  - Due to risk of hypo, advise frequent glucose monitoring before, during, and after. Use CGM when possible
  - Educate on targets, management of blood sugars including hypo

Exercise: Children with T1DM

- If using insulin, educate on strategies to prevent hypo before, during, and after exercise. Consider:
  - Lowering meal or snack time insulin before exercise
  - Reducing basal insulin
  - Increasing carb intake
  - Eating a bedtime snack
- Some of these recommendations may be helpful for kids with T2DM on insulin, as well.

Exercise: Adults with Prediabetes

- Exercise Goals:
  - Increase moderate-intensity physical activity to at least 150 minutes/week
    - Example: brisk walking
    - May include resistance training
  - Break-up sedentary time
- Achieving the behavioral goal of 150 minutes of physical activity per week reduces the incidence of type 2 diabetes by 44% (even w/o weight loss!)

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Aerobic: ≥150 minutes/week of moderate to vigorous-intensity activity
    - Tips: spread over 3 or more days/week with no more than 2 consecutive days w/o activity
    - For those who achieve weight loss goals, long-term maintenance is supported by 200-300 minutes/week
  - Resistance exercise: 2-3 sessions/week on nonconsecutive days

Exercise: Adults with T1 or T2 Diabetes

- Exercise Goals:
  - Sedentary Time: All adults, particularly those with T2DM, should reduce sedentary time
    - Interrupt sitting every 30 minutes
  - Flexibility and balance training: recommended 2-3x per week for older adults

Hormone Response with Diabetes & Exercise

Physiology of Exercise

Physiology of Exercise: Without Diabetes

- Blood glucose levels remain stable
- Normoglycemia is largely driven by hormones
  - Insulin, glucagon, epinephrine, growth hormone, and cortisol
- Initial energy: supplied from glucose in the muscle and liver glycogen
- Later energy: TG's in adipose break into FFA's
  - Occurs 20-40 minutes into activity

Hormone Response Without Diabetes

- Insulin production is decreased
- Counter-regulatory hormones increase
  - Release stored glucose and breakdown glycogen
- Glycogen stores are replenished up to 48 hours after completion of exercise

Hormone Response with T1D / Insulin Use or Secretagogues

- Insulin levels can remain high and can block counter-regulatory hormones
  - Injected/pumped insulin continues to be released from subq depots (and at a faster rate)
  - Cannot be regulated without pre-exercise planning
- Increased insulin absorption/sensitivity

Hormone Response w/o Insulin or Secretagogues

- Decreased secretion of endogenous insulin
  - Counter-regulatory hormones kick in as needed
- Increased sensitivity to insulin
- Results in improved blood glucose levels

Hypoglycmia & Hyperglycemia with Activity

Hypoglycemia Risk and Prevention plus Hyperglycemia

Exercise, Medications, and Hypoglycemia

- Fear of hypo is most reported barrier to exercise in individuals on insulin and insulin secretagogues
- If PWD has a low risk of hypo, communicate this to reduce the potential perceived risk

Exercise, Medications, and Hypoglycemia

- T1DM
  - Exogenous insulin can prevent the increased mobilization of glucose needed in exercise
- T2DM
  - Low risk for hypo if treated by diet and/or medications that do not cause hypo
  - Concern if on insulin, and/or insulin secretagogues
  - Anecdotal reports of hard-to-treat hypo with activity and GLP-1 agonists and pramlinitide

Hypoglycemia Risk

- Risk is high during and immediately after exercise
- Post exercise late onset hypoglycemia
  - More often seen in T1D
  - Associated with high intensity exercise >30 minutes
  - May occur at night and up to ~24 hours after exercise
- Best indicator of hypo risk is experience in the past

Hypoglycemia Prevention

- Planned exercise: reduce insulin or medications
- Unplanned exercise: eat a snack with carbohydrate
  - Consider a snack according to starting BG level and anticipated activity
  - Not recommended unless on insulin or insulin secretagogues
- Carry fast-acting carbohydrates
- Consume extra carb in the post-exercise period
- Caution use of alcohol after exercise

Hypoglycemia Prevention

Carbohydrate Replacement During Physical Activity			
Intensity	**Duration**	**Carb Replacement**	**Frequency**
Mild to Moderate	<30 minutes	May not be needed	N/A
Moderate	30-60 minutes	15 grams	Each hour
High	>60 minutes	30-50 grams	Each hour

Hyperglycemia Risk

- Hyperglycemia during exercise occurs when there is too little insulin in circulation
- T2D: Low risk of exercise worsening hyperglycemia
- T1D: Risk of hyperglycemia with exercise
  - Possible lack of insulin can impair glucose utilization
  - Excessive counter-regulatory hormones
  - Enhanced hepatic glucose production
  - Lipolysis and ketogenesis

Ketone Testing

- Type 1: recommendations vary but consider checking ketones in BG is >250 mg/dl
- Do NOT exercise if ketones are positive; can worsen hyperglycemia
- Not necessary to postpone exercise if BG is elevated, ketones are negative, and PWD feels well


TIME FOR REVIEW

Knowledge Check

Matt has T2D and runs 3-4 miles several times per week. Before his afternoon run on Tuesday his blood sugar is 156 mg/dl. After the run his BG was 43 mg/dl. Which of the following was not a possible contributor to the low?

A. Elevated exogenous insulin
B. Increased sensitivity to insulin
C. Increased insulin absorption
D. Elevated endogenous insulin

Knowledge Check

Which of the following describes the normal hormonal response and acute metabolic impact of physical activity?

A. Insulin levels increase to reduce FFA production
B. Glucagon rises and hepatic glucose production is increased
C. Both epinephrine and norepinephrine are reduced, and FFA production is inhibited
D. Growth hormone and cortisol are decreased, and insulin-stimulated glucose uptake is enhanced