

Nutrition therapy in diabetes

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Example

46 years old woman, T2D for 1y, oral anti-diabetic drugs

Ht 161 cm / Bwt 76 kg

Parameters	Values	Parameters	Values
Glucose (FBS)	128 mg/dL	Glucose (PP2)	252 mg/dL ↑
Total Cholesterol	179 mg/dL	HDL-Cholesterol	52 mg/dL
Albumin	4.6 g/dL	TG	321 mg/dL ↑↑
HbA1c	7.9%	γ-GTP	42 U/L

High PP2 glc & TG...
Why?



Doctor, Because I wanted to loose my weight and my friend told me that potato is good for diabetes, I ate only two meals a day with potatoes a lot.

What is the problem?

1. Too much Carbs!
2. Low basic knowledge of nutrition/food
3. Unbalanced meal pattern



Needs Nutrition therapy!

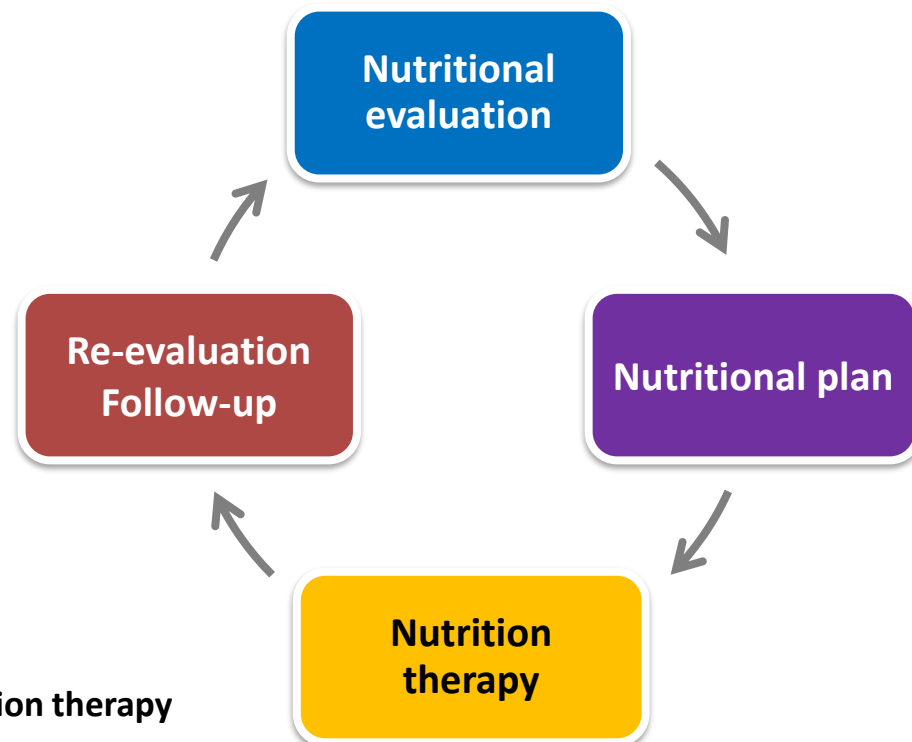
Objective

- **Understand the clinical nutrition in diabetes**
- **Practice individualized clinical nutrition**
- **Evaluation of caloric requirement**
- **Meal planning**
 - Principles of diet therapy
 - Food exchange table
 - hand portion method
 - The plate model

Clinical nutrition

- **Clinical nutrition**

: A comprehensive service provided by clinical nutritionist to treat diseases or injuries



Flowchart of clinical nutrition therapy

- **Diabetic clinical nutrition**

: Assistance provided to help diabetic patient correct his/her behavior pattern and improve overall management of diabetes, including nutritional status.

- **What diabetic patients must know**

: Educating diabetes and diet therapy

Individualized meal plan that best fits the lifestyle and diabetes management.

Objective of diabetic clinical nutrition

- Maintain **blood glucose, serum lipid, blood pressure** within normal limit
- Provide adequate calories :
 - **Adult**– Attain and maintain ideal body weight
 - **Children/adolescent**– Normal growth and development
 - **Pregnancy, breastfeeding, critical care patients, etc.** – provide adequate calorie and nutrition
- Preventing and treating acute/chronic **complications of diabetes**
- Promoting health by choosing healthy food and exercising regularly
- Fulfilling each individual's nutritional requirement while also considering **lifestyle preferences**

Practicing *individualized* clinical nutrition

Practicing individualized clinical nutrition

- Health status (blood labs, complications, drug, etc.)
- Socio-economic status
- Body measurements (BMI, WHR)
- Diet problem (teeth)
- Diet evaluation (Habit, history)

Evaluation

start

Individualized target setting based on nutritional evaluation and therapy goal

Target setting

Evaluating effects of nutritional management:
modify diet plan
if necessary

Follow-up

Education

Using **diet planner** to construct and educate appropriate diet plan

Diet evaluation

Methods

- Diet record
 - Learn normal diet through interview
 - **Self-record :**
(2 weekdays, 1 weekend)
Date, time, location, food name, ingredient, amount, supplements, exercise

Content

- Diet pattern everyday/special day (regularity, binge eating, etc.)
- Amount, frequency
- Diet balanced?
- Eating out, snack, alcohol
- Depending on folk medicine?
- Socio-economic status
- Problems in eating (teeth, etc.)



Helps plan, target, and reinforce diet therapy

Example of diet record

Oct. 4th, 2018

Type	Time (place)	Food	Ingredient	Amount (about...)	Blood glucose
Breakfast	8:00 (Home)	Barley rice	Barley	1/3 bowl	
		Roast seaweed	Seaweed Sesame oil	1/2 plate 1/2 teaspoon	
		Kimchi	Cabbage kimchi	1/2 plate	
		Coffee	Coffee Sugar Powder milk	5g 10g(fat:2g)	
Snack	10:30 (Home)	Milk	Low fat Milk	200mL	
Lunch	13:00 (Work)	White rice	White rice	1 bowl	
		Cabbage-miso soup	Cabbage	1/2 plate	
		Fried noodle	Noodle, Beef Spinach Sesame oil	1/2 bowl 1/4 plate 1/2 plate 1 teaspoon	
		Kimchi	Cabbage kimchi	1/2 plate	
Snack					230 (2 hours after meal)
Dinner	19:00 (Chinese restaurant)	Noodle with black sauce	Noodle Onion Pork Oil	1 portion	
		Pickle	Radish	1/2 plate	
		Kimchi	Cabbage kimchi	1/2 plate	
Night snack					

- Folk medicine (Deer horn)
- Exercise
- Other

Determining caloric requirement

Calculation of caloric requirement

- Calculation based on **ideal body weight**
- Modified according to **activity level**, **age**, weight change, etc.
- Consider normal caloric intake
- Long-short-term target weight based on individual's appropriate weight rather than ideal body weight.
- Consider normal growth/development for children and adolescents

Ideal body weight / Evaluating obesity

Ideal body weight

Appropriate weight to maintain health in everyday life

- Men = Height (m) × Height (m) × **22**
- Women = Height (m) × Height (m) × **21**

Obesity (BMI)

$$\frac{\text{Current weight (kg)}}{\text{Height (m)} \times \text{Height (m)}}$$



BMI(kg/m ²)	Classification
< 18.5	Underweight
18.5~22.9	Normal
23~24.9	Overweight
≥ 25	Obese

Determining caloric requirements in adult

- Daily requirement (kcal/day) = IBW (kg) × coefficient for activity level

IBW=ideal body weight

Obesity / Activity level	Caloric requirement
Obese / Low physical activity	IBW × 25~30 (kcal/day)
Normal / Average physical activity	IBW × 30 ~35 (kcal/day)
Low body weight / Intense physical activity	IBW × 35~40 (kcal/day)

Ex) IBW 60kg, average physical activity and exercise. Requirement?

$$60\text{kg} \times 30 \sim 35 = 1800 \sim 2100 \text{ kcal/day}$$

Diet planning

3 Major Principles of diet therapy

Regularly



Properly



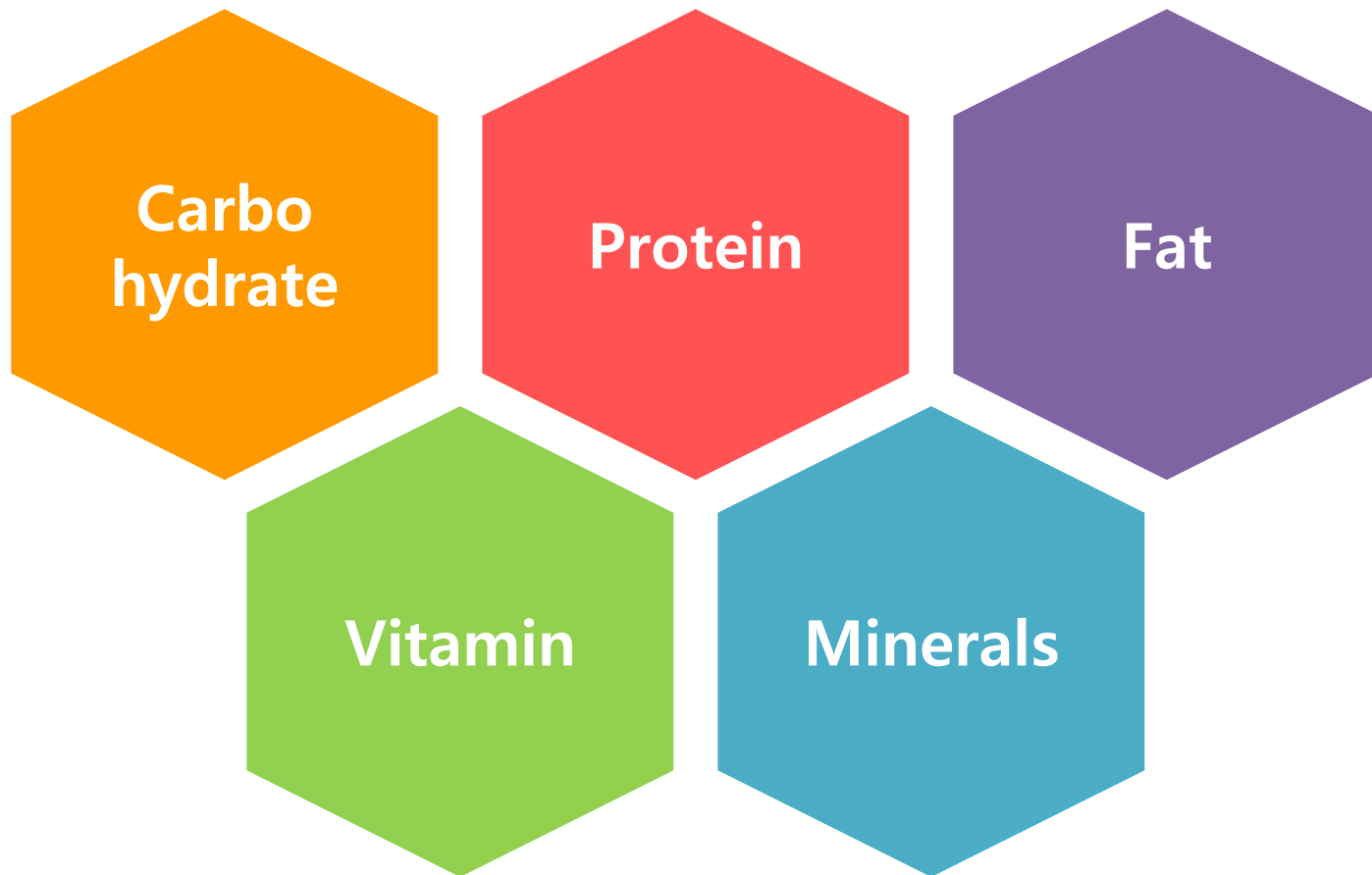
Balanced



■ Good diet habit (brief)

- Regularly eat right amount of food at regular interval.
 - Beware of simple sugars (sugar, honey, etc.).
 - Consume enough dietary fiber.
 - Consume adequate amount of fat; restrict cholesterol.
 - Avoid salt intake.
 - It is recommended to avoid alcohol.
- ➡ **Diabetic diet is healthy diet!** Families participate together.

Nutrients



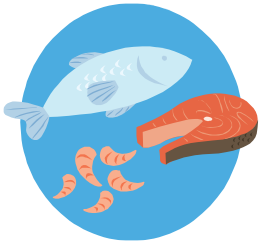
Nutrients to blood glucose



Fat



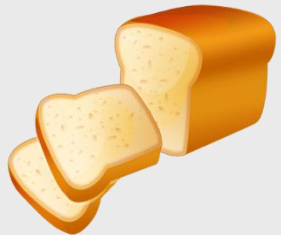
Minimal



Protein



Minimal



Carbohydrate



**100% turns into
Blood glucose**



How can we know amount of carbs?

1. Look at the label
2. Search on internets
3. Use 'Food Exchange Table'



Nutrition Facts	
Serving Size	4 cookies (30g)
Servings Per Container	4
Amount Per Serving	
Calories 220	Calories from Fat 110
% Daily Value*	
Total Fat 12g	18%
Saturated Fat 6g	30%
Trans Fat 0.5g	
Cholesterol 10mg	2%
Sodium 70mg	4%
Total Carbohydrates 25g	8%
Dietary Fiber 1g	4%
Sugars 20g	
Protein 3g	
Vitamin A 0%	Vitamin C 8%
Calcium 2%	Iron 4%



Let's look at
the label...

Diet planning using

- Local food guides
- Food exchange table
- The hand portion method
- The plate model

Simple diabetes meal planning

ADA 2018

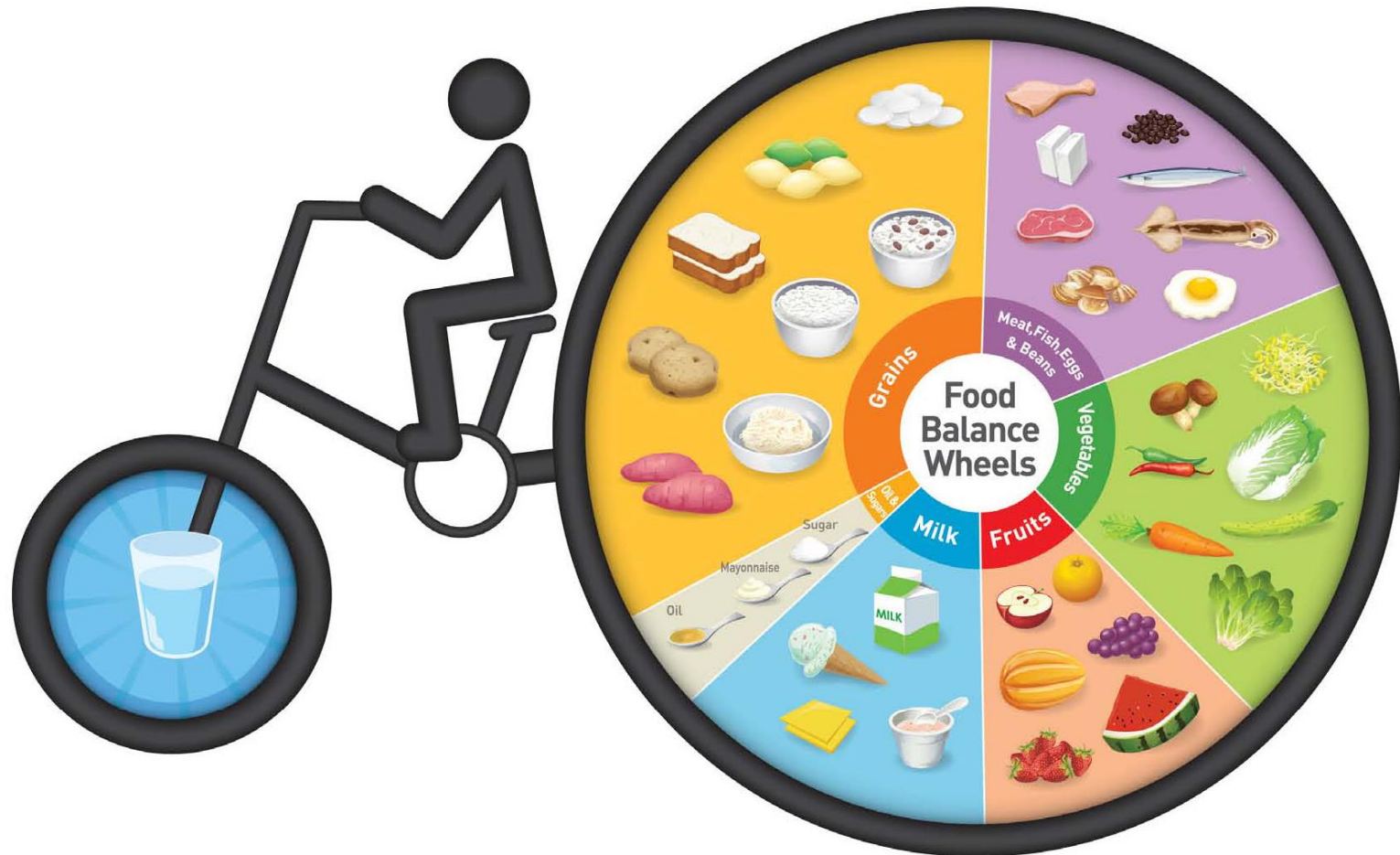
A **simple** and effective approach to glycemia and weight management emphasizing **portion control** and **healthy food choices** may be considered for those with type 2 diabetes who are not taking insulin, who have limited health literacy or numeracy, or who are older and prone to hypoglycemia.

Grade. B

Local food guide

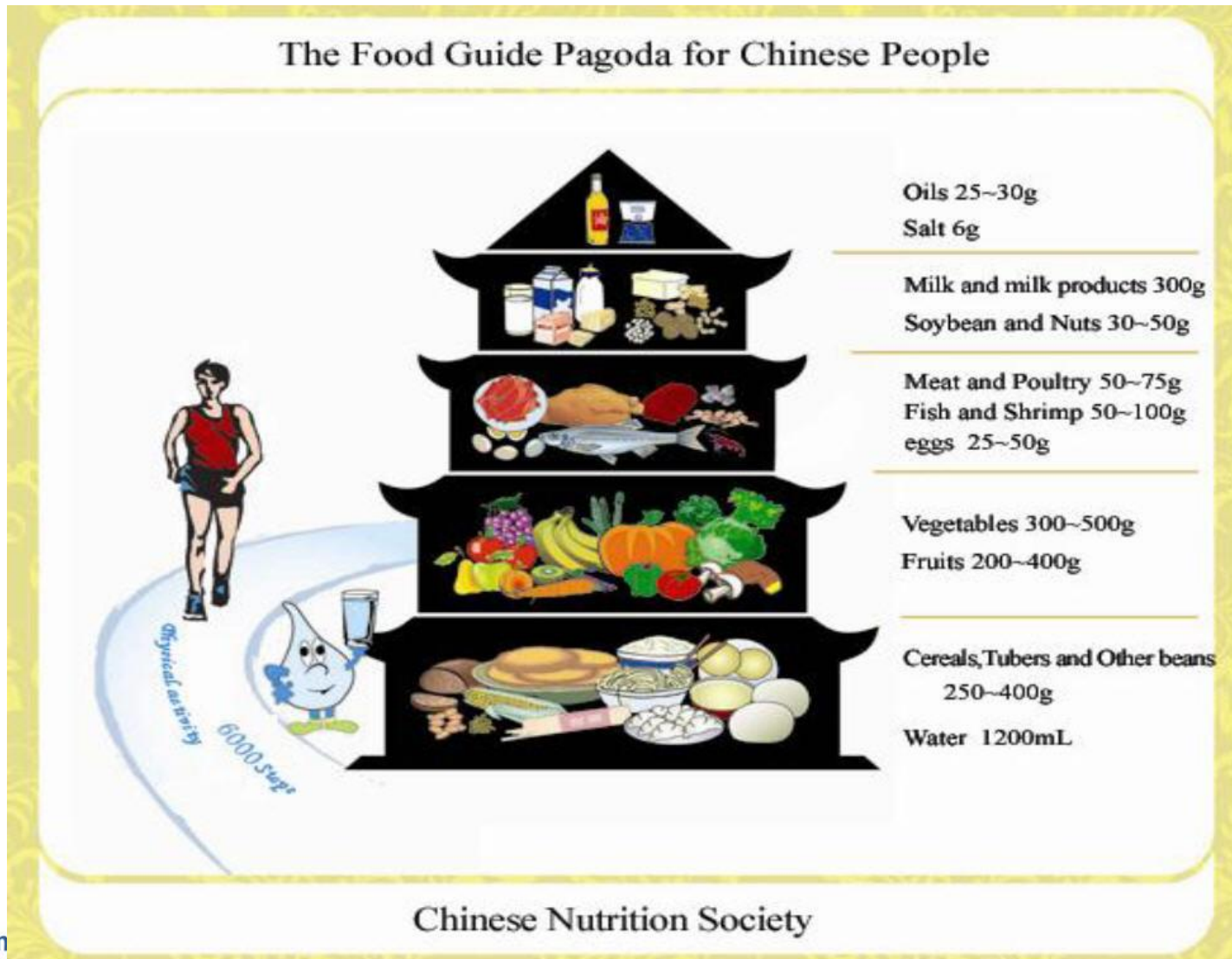
Food Balance Wheels

Korea



Local food guide

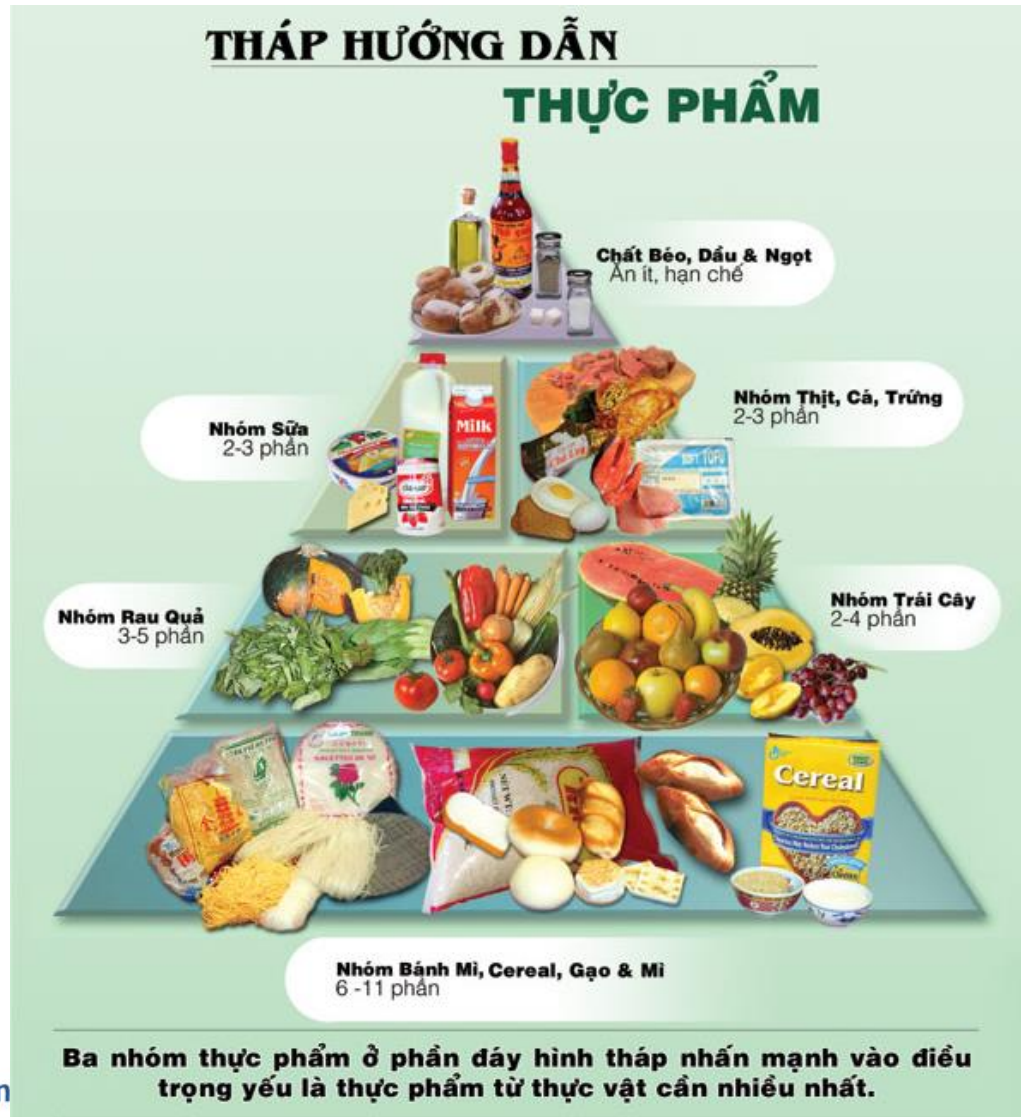
China



Intern
Diabetes
Federation

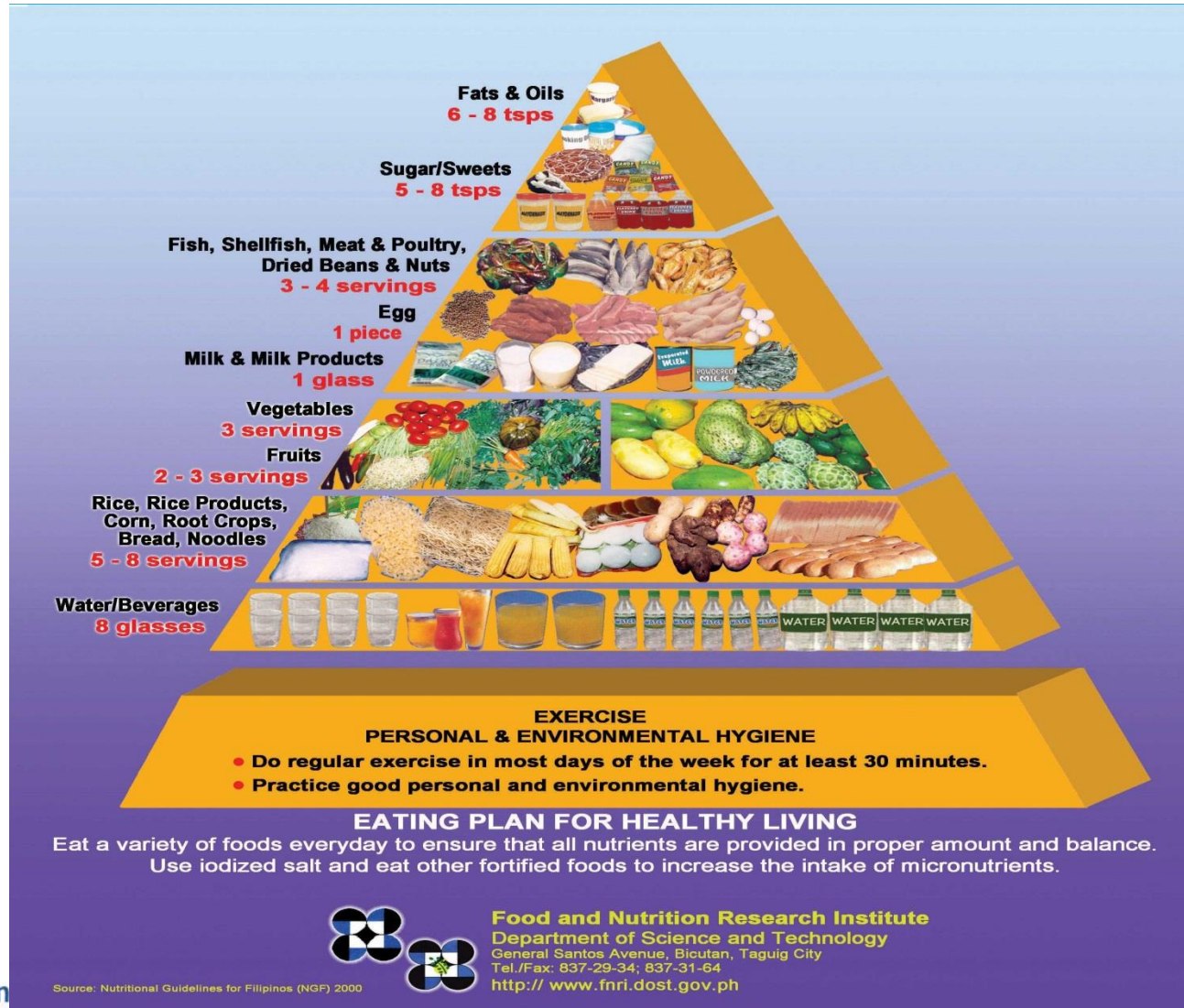
Local food guide

Vietnam



Local food guide

Philippine



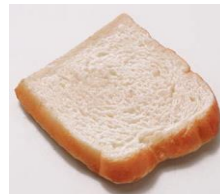
Food exchanges

- Similar food types placed in same exchange groups
- Within groups, a single food based on weight, measure, size has the same carbohydrate or kcal value as another
- Food from different groups cannot be interchanged
ex)

1 exchange
unit



=



≠



1/3 bowl of Rice (70g)

1 slice of Bread (35g)

1½ tsp of Butter

Food exchange table

- Groups everyday food with similar nutritional components into 6 food groups
- **Grains, Fish and meat, Vegetable, Fat, Milk, Fruits**
- Nutritional component of each food group

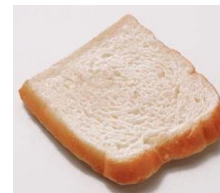
		Calories (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
Grain		100	23	2	-
Fish and meat	Low-fat	50	-	8	2
	Mid-fat	75	-	8	5
	High-fat	100	-	8	8
Vegetables		20	3	2	-
Fats		45	-	-	5
Milk	Whole	125	10	6	7
	Low-fat	80	10	6	2
Fruits		50	12	-	-

Grain (Carbohydrate 23g, Protein 2g, 100kcal)



Rice 70g (1/3 bowl)

=



Bread 35g (1 slice)



**Rice cake 50g
(3 pieces)**



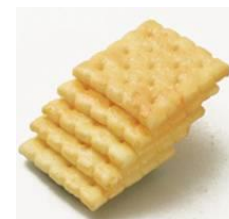
**Sweet potato
70g
(1/2 piece)**



**Potato 140g
(1 piece)**



**Corn
70g
(1/2 piece)**



**Cracker
20g
(5 pieces)**



**Grain powder
30g
(1/4 cup)**

• If possible, pick multigrain rice and wheat breads than white rice/bread

1 Unit

5 Units/day

Fish and Meat (carbohydrate 8g, fat 2~8g, 50~100kcal)

Low-fat



Chicken meat
40g (1 piece)



Pork loin 40g
(1 piece)



Stingray 50g
(1 small piece)



Anchovies 15g
($\frac{1}{4}$ cup diced)



Pollack 15g
($\frac{1}{2}$ piece)

Mid-fat



Beef sirloin 40g
(1 piece)



Mackerel 50g
(1 small piece)



Hairtail 50g
(1 small piece)



Black bean 20g
(2 large spoon)



Tofu 80g
($\frac{1}{5}$ block)

High-fat



Chicken with skin
40g (1 drumstick)



Bacon 40g



Tuna can 50g
($\frac{1}{3}$ cup)



Fried tofu 30g
(5 pieces)



Cheese 30g
(1.5 piece)

- Foods in high-fat group also contain large amount of fat and cholesterol.
Beware when planning diet.

1 Unit

7 Units/day

Vegetables (Carbohydrate 3g, Protein 2g, 20kcal)



Spinach 70g
(1/3 cup boiled)

=

※



Carrot 70g
(1/3 large piece)



※ **Bellflower
root 40g**



Fresh chili 70g
(7~8 pieces)



※ **Lotus root 40g**



※ **Pumpkin 40g**
(1/10 piece)



**Seaweed
(raw)
70g**



Mushroom 50g
(3 large pieces)

Eat raw or marinated instead of juicing to increase dietary fiber

1 Unit

4 Units/day

Fat (fat 5g, 45kcal)



**Soybean oil 5g
(1 teaspoon)**

=



**Pine nut
(1 tablespoon)**



**Sesame oil 5g
(1 teaspoon)**



**Walnut 8g
(1.5 piece)**



**Peanuts 8g
(8 pieces)**



**Italian dressing 10g
(2 teaspoon)**



**Mayonasi 5g
(1 teaspoon)**

- **Avoid deep-fries: use in stir-fry or vegetable marination**
- **Nuts should be limited to 1-2 units/day for calorie control**

1 Unit

Milk

2 Units/day

(Whole milk: Carbohydrate 10g, Protein 6g, Fat 7g, 125kcal)

(Low-fat milk: Carbohydrate 10g, Protein 6g, Fat 2g, 80kcal)



Whole milk
200cc(1 cup)



Soy milk
200cc(1 cup)



Low-fat milk
200cc(1 cup)

- Low-fat milk contains less saturated fat and cholesterol compared to normal milk

Fruits (Carbohydrate 12g, 50kcal)



**Apple 80g
(1/3 piece)**

=



**Tomato 350g
(2 pieces)**



**Banana 50g
(1/2 piece)**



**Strawberry
150g
(7 pieces)**



**Watermelon
150g
(1 slice)**



**Tangerine 120g
(2 pieces)**



**Persimmon
50g
(1/3 pieces)**

• Fruit juices have low dietary fiber. Eat fresh fruits.

Food distribution per meal

- Keeping meal time and amount in regular interval crucial for maintaining steady blood glucose
- Meal frequency and snacks based on everyday lifestyle
- **Example of distributing exchange units in 1800kcal meals**

Food group		Units	Morning	Snack	Lunch	Snack	Dinner	Snack
Grain		8	2		3		3	
Meat and fish	Low-fat	2			1		1	
	High-fat	3	1		1		1	
Vegetable		7	2		3		2	
Fat		4	1		1.5		1.5	
Milk		2		1				1
Fruit		2				1		1

- Adjust according to drugs, hypoglycemic time, gestational diabetes, and blood glucose level

Meal planning using ‘Carbohydrate counting’

- Focus on consumed carbohydrates that determined blood glucose, rather than total calories.
- Emphasis on **total amount** of carb, not the type.

Basic carb. counting

Distribute regular amount of carbohydrate into meals and snacks at same time every day to maintain steady carbohydrate intake

Advanced carb. counting

Multiple insulin injection or using insulin pump

- Not easy to apply to other culture..
→ need to develop own ‘**Food Exchange Table**’

Handy portion method



Carbohydrates (starch and fruit)

: choose an amount equivalent to the size of **two** fists.

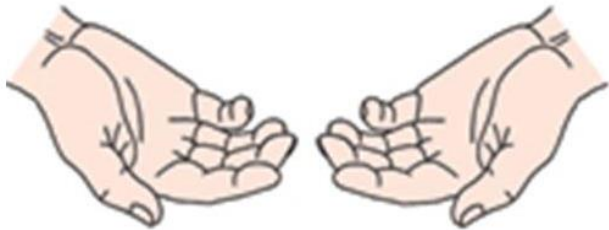
: For fruit use **one** fist



Protein

: choose an amount equivalent to the size of the **palm** of your hand and the **thickness** of your little **finger**

Handy portion method



Vegetables

:choose as much as you can hold in **both hands**.

These should be low CHO vegetables – green or yellow beans, cabbage or lettuce.



Fat

:limit fat to an amount the size of the **tip of your thumb**.

Drink no more than **250 ml** of **low-fat milk** with a meal

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Plate model

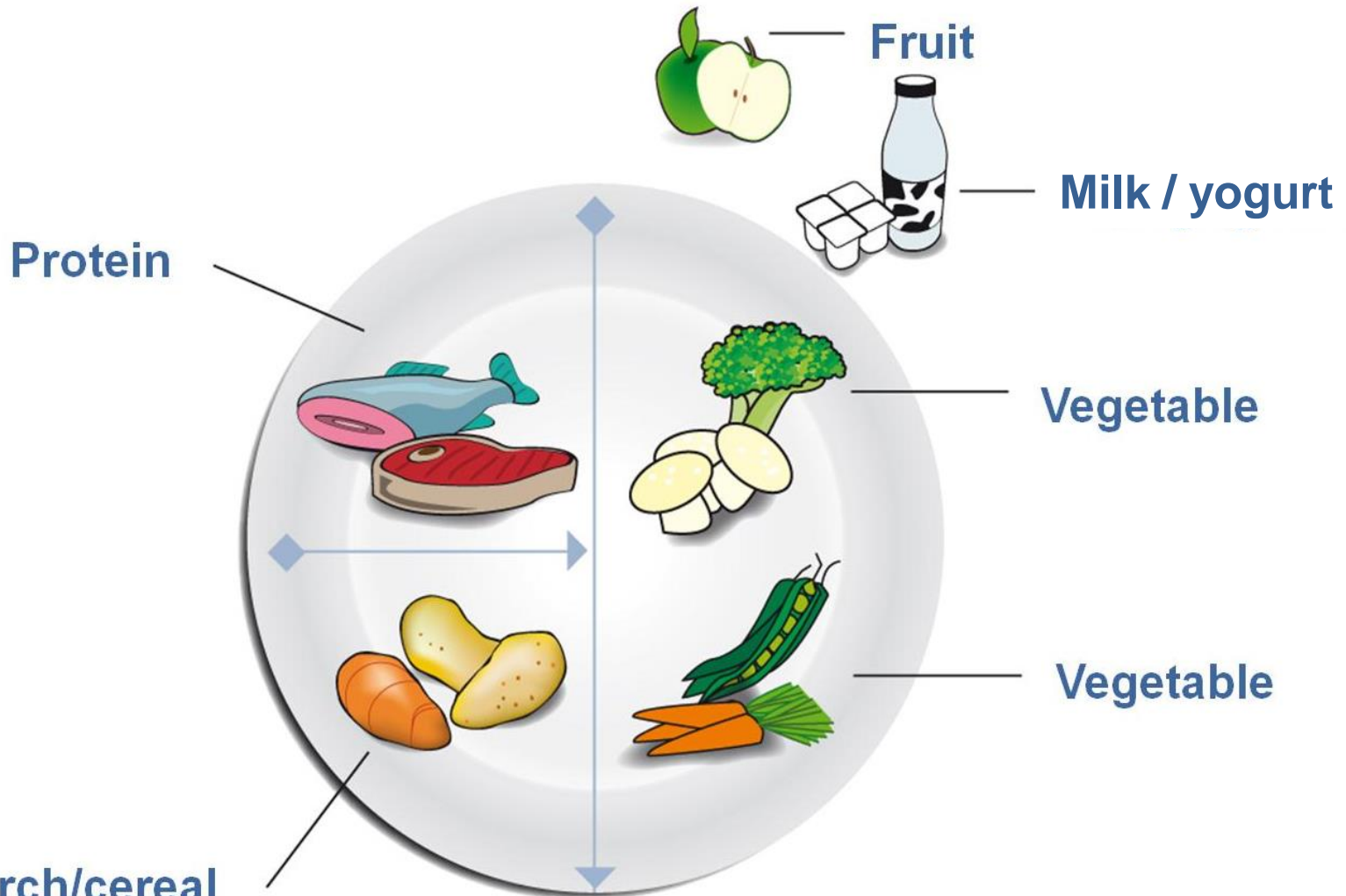


Plate model

Useful as a basic teaching tool for people who

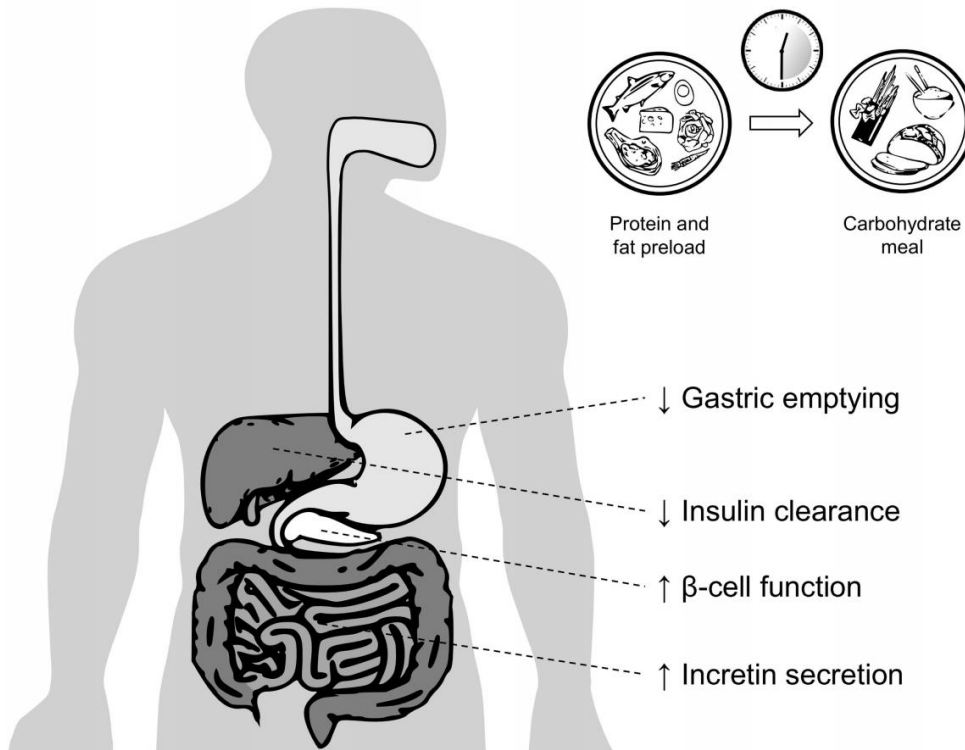
- Have recently been diagnosed
- Want a **simple** plan or find it difficult to implement other advanced plans
- Have difficulty reading or dealing with numbers
- Learn better by visualising
- **Eat out frequently**
- Want to reduce the amount of proteins or carbohydrates they ingest

Nutrient Sequence

50g parmesan cheese + 50g egg + 300ml water → 30min → main meal



A Schematic representation of glucose-lowering mechanisms



C Oral glucose absorption

