Nutrition

CHARBOHYDRATES

Dr.Yossra K.Al-Robaiaay
Assistant professor
FICMS (FM)

Learning objectives:

- **Objective 1:** Describe the functions of the simple and complex carbo-hydrates
- **Objective 2:** Describe the health effect of CHO
- **Objective 3:** Identify the types and the benefits of fibers
- **Objective 4:** Define glycemic index

Energy:

- The ability to perform work, produce change, &maintain life.
- Energy exists in many forms; mechanical, chemical, heat, electrical, light, & nuclear.
- Each type can be converted from one form to another.
- In the body, chemical energy from food is converted to mechanical energy & heat.
- The major dietary sources of energy-yielding are ***CHO***, *fats & proteins.*

Energy balance

Energy IN = Energy OUT

Energy intake 24h → Energy expenditure

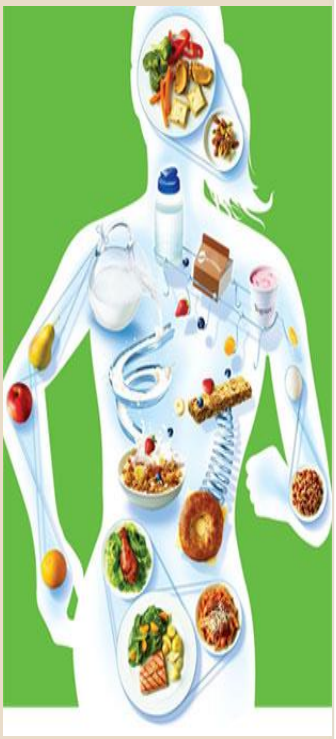
Adipose tissues

Release fat →

Energy intake inadequate (negative energy balance); decrease in body wt.

Store fat. ←

Excess energy intake (positive energy balance); Increase in body wt



Calorie: it is the basic unit of energy.

It is the **amount of heat energy required to raise the temperature of one gram of water by 1°C at the standard temperature**.

But because the calorie is a small unit we usually use;

Kilocalorie (Kcal or Cal) =1000 calories:

- **Which is the amount of heat energy required to raise the temp. of a kilogram of water 1°C**.

Joule (J): is the work done (energy expended) when 1 kg is moved 1 m. by a force of 1 Newton.

The total calorie content of food can be measured by a device called **Bomb Calorimeter** It is design to burn food, the amount of energy produced/gram of prot ein, fat or CHO by Bomb calorimeter are;

- 1 gm of **protein** = ***4*** **Kcal**
- 1gm of **fat** = ***9*** **Kcal**
- 1gm of **CHO** = ***4*** **Kcal**

Usually the food content of; prot., CHO, fat , are taken from **food composition tables**.

E.g : **2 eggs =100 gm contain** ;

- 13% protein = 13 gm x 4 = 52 kcal
- 12% fat = 12 gm x 9 = 108 kcal
- 1% CHO = 1 gm x 4 = 4 kcal

Total = 164 kcal

Bread 100 gm contains ;

- 8% protein = 8 gm x 4 = 32 kcal
- 2% fat = 2 gm x 9 = 18 kcal
- 58% CHO = 58 gm x4 = 232 kcal

Total = 282 kcal


CARBO
HYDRATES

"Carbohydrates (CHO)"

Carbohydrates: are organic compound consist of carbon, hydrogen &oxygen.

CHO; consist of starches & sugars, they are rich food, in their **natural state** are **low in calories & high in fibers**.

Starches:

Are the least expensive (cheapest source of energy), the most easily obtained & the most readily digested form of fuel, also they considered as the major source of food for the people.

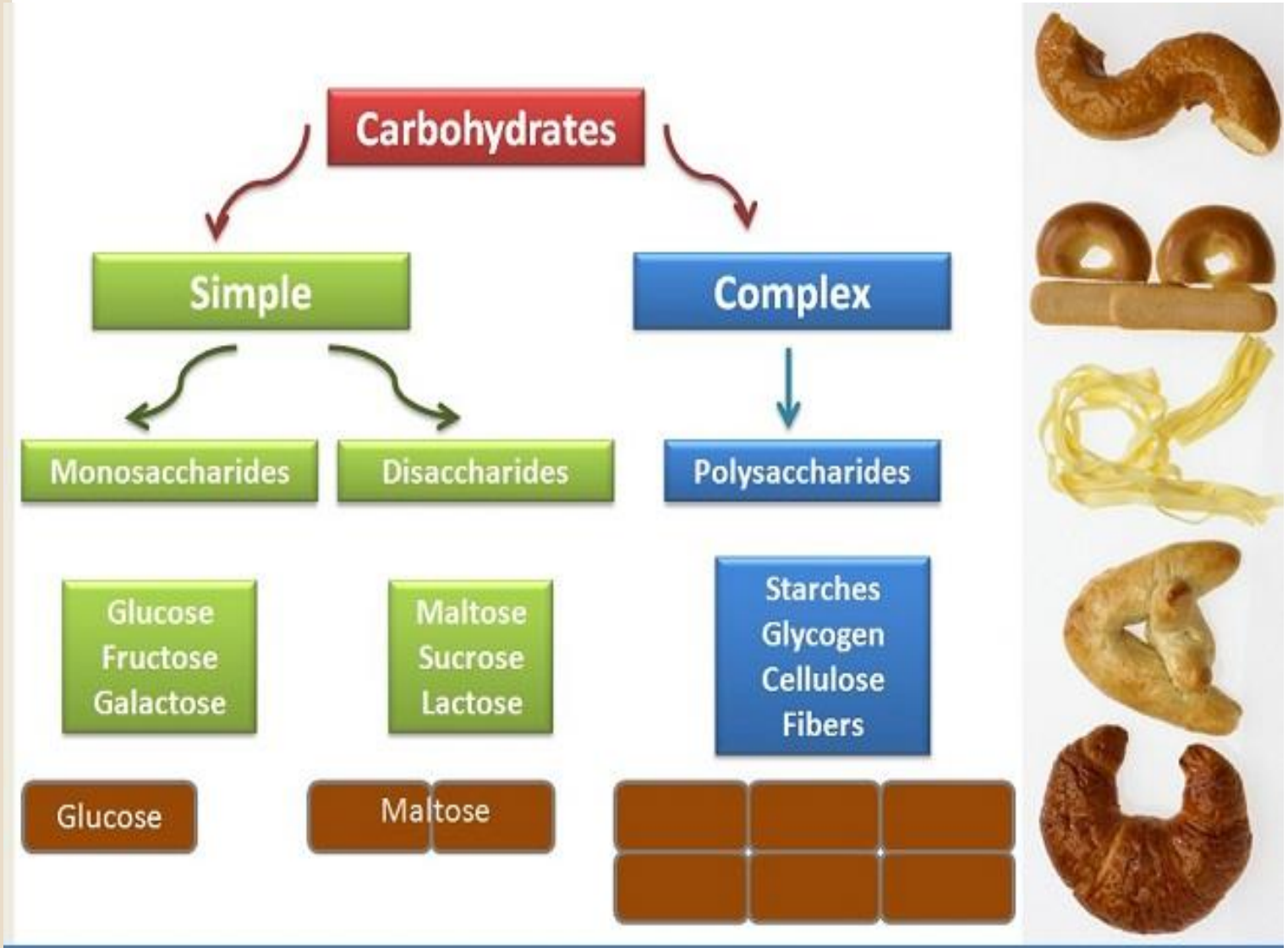
The main source of CHO;

- **Cereals**; breads, pastas, rice.
- **Grains:** legumes:

  lentils, chick peas, beans, favabeans
- **Fruits& vegetables**
- **Sugars**(candy, sweats, sodas, ----).

WHAT ARE SIMPLE & COMPLEX CARBOHYDRATES





Simple vs Complex Carbohydrates

Major Types of Carbohydrates

Simple carbohydrates

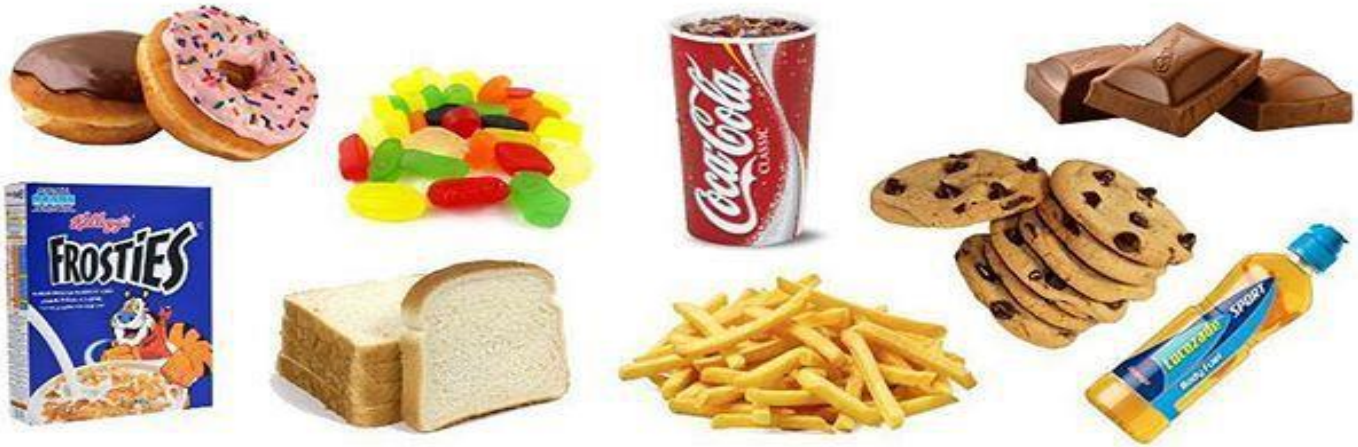
Monosaccharides	Disaccharides
Glucose	Sucrose (glucose+fructose)
Fructose	Lactose (glucose+galactose)
Galactose	Maltose (glucose+glucose)

Complex carbohydrates

Polysaccharides	Fiber
Starches	Cellulose
Dextrins	Hemicellulose
Glycogen	Pectins
	Gums
	Mucilages

✔ COMPLEX CARBS

✘ SIMPLE CARBS



Classification of CHO:

1-Monosaccharides = Simple sugars;

(great sources of quick energy), include:

- **Glucose =grape sugar & dextrose**

the simplest form, in fruits, vegetables & honey.

- **Fructose= fruit sugar;** in fruits, veg., sugar beet , sugar cane& honey.

- **Galactose& mannose = milk sugar :** in milk.

2-Disaccharides:

- **Sucrose= table sugar (glucose+ fructose);**
  in cane, beet sugar &molasses.
- **Lactose= milk sugar (glucose+ galactose)**
  milk & dairy products
  (not found in plant food).
  In lactase enz.deficency lead to distended abdomen diarrhea &flatulence
  Due to lactose fermentation by bacteria in the bowel.
- **Maltose= malt sugar (glucose +glucose):**

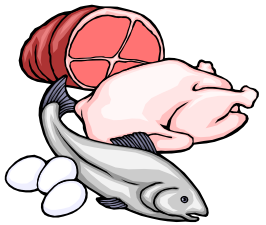
3-Polysaccharides = complex CHO

(Take longer time to be digested &release glucose to the blood), include:

A-Digestible form:

***Starches:** in cereals, bread, rice, oatmeal, whole grains, peas& beans (the end product is glucose).

***Glycogen= animal starch** stored in the muscles & liver): in meat products& sea food.



B- Indigestible= dietary fibers (in plant food):

These substances have affinity for water, **form bulk & slow gastric emptying time & may bind to bile acids.** They are not digested by G.I.enzymes & may divide into;

-**Soluble form:** pectin, & gum.
-**Insoluble forms**: cellulose & hemicellulose.

(**Bran cereals**; are the most concentrated fiber source , providing ***6-13 gm fibers/ serving).***

***Cellulose:** in leaves of veg., outer covering of seeds.

***Hemicellulose:** in leaves of veg., outer covering of seeds,it used as laxatives & feeling of satiety.

***Pectin:** fruits, jams &jellies (absorb water to form jells).

***Gums:** plant secretion &seeds.

Importance of CHO:

1-Major & cheapest source of energy.

2-**Protein sparing action**. Because carbohydrates are an excellent energy source for the body, optimal levels of digestible carbohydrate in the diet **serve to spare dietary protein from being used as an energy source.**

3-Anti-ketogenic action; when decr. CHO intake lipolysis ⟶ incr. fat& keton bodies +Na ⟶ acidosis & dehydration.

4-Role in the activity of nervous tissues &they are the **main source of energy for brain** (glucose) .

5-Importance of dietary fibers.

6-Lactose affects growth of bact. in the colon ⟶ laxative effect & synthesis of vit .K. in large intestine incr. absorption of Calcium .

7-Glucouronic acid (**metabolites of glucose**) act in the liver to **combine with chemical &bacterial toxins to form substances that can be excreted outside.**

8-CHO &their derivatives serve as a precursors for production of **nucleic acid & conn. tissues matrix**..

- **Recommended intake of CHO:**

1- Minimum intake **50-100gm**/day is needed to meet glucose needs & prevent ketosis.

2- Total CHO **55-60%** of total energy intake. **Refined sugar limited to 5-10%.**

3-Increase dietary fiber intake to **25-35 gm/ day.**

-Fiber intake should consist of equal amount of sol. & insol. Fibers

(5 serving of veg. &fruits + 6 serving of whole grain, cereals & legumes).

Health Effect of Sugars:

The sugars should be consumed in moderate amount but the over consumption of sugars lead to:

1-Nutrient displacement; which the major health problem because of losing important nutrients replaced by empty energy foods.

2-Dental caries: eating concentrated sweats & sticky CHO support bacterial growth ⟶ plague formation & tooth decay.

3-Obesity: high calories intake stored as fat.

4-Risk of development of D.M. type II: there is a strong relationship between obesity &D.M.

5-Hyperactivity &/ or attention deficient disorders (ADD): in children whose increase sugars intake, these foods possibly cause altered behaviors (nutrients deficiency).

Glycemic Index

- **GI is the scale to show effects of different carbs on the blood sugar levels**
- The GI uses glucose as the standard measure (100)
- Foods with score of 70+ have **HIGH GI**
- Foods with score of 55-69 have **MEDIUM GI**
- Foods with score of 54 > have **LOW GI**
- **Lower score = healthier foods**

The Glycemic Index

- The body digests some foods slower than others depending on the rate of food digestion and energy release

- Ex. Nuts vs. chocolate bar

- Simple sugars (monosaccharaides) = Rapid Release + decline
- Complex Carbs = Slow release

Glycemic Index Chart

GI Foods

GLYCEMIC INDEX CHART

Low Glycemic (55 or Below) High Glycemic (70 or Higher)





SNACKS	G.I.	STARCH	G.I.	VEGETABLES	G.I.	FRUITS	G.I.	DAIRY	G.I.
Pizza	33	Bagel, Plain	33	Broccoli	10	Cherries	22	Yogurt, Plain	14
Chocolate Bar	49	White Rice	38	Pepper	10	Apple	38	Yogurt, Low Fat	14
Pound Cake	54	White Spaghetti	38	Lettuce	10	Orange	43	Whole Milk	30
Popcorn	55	Sweet Potato	44	Mushrooms	10	Grapes	46	Soy Milk	31
Energy Bar	58	White Bread	49	Onions	10	Kiwi	52	Skim Milk	32
Soda	72	Brown Rice	55	Green Peas	48	Banana	56	Chocolate Milk	35
Doughnut	76	Pancakes	67	Carrots	49	Pineapple	66	Yogurt, Fruit	36
Jelly Beans	80	Wheat Bread	80	Beets	64	Watermelon	72	Custard	43
Pretzels	83	Baked Potato	85	Onions	75	Dates	103	Ice Cream	60

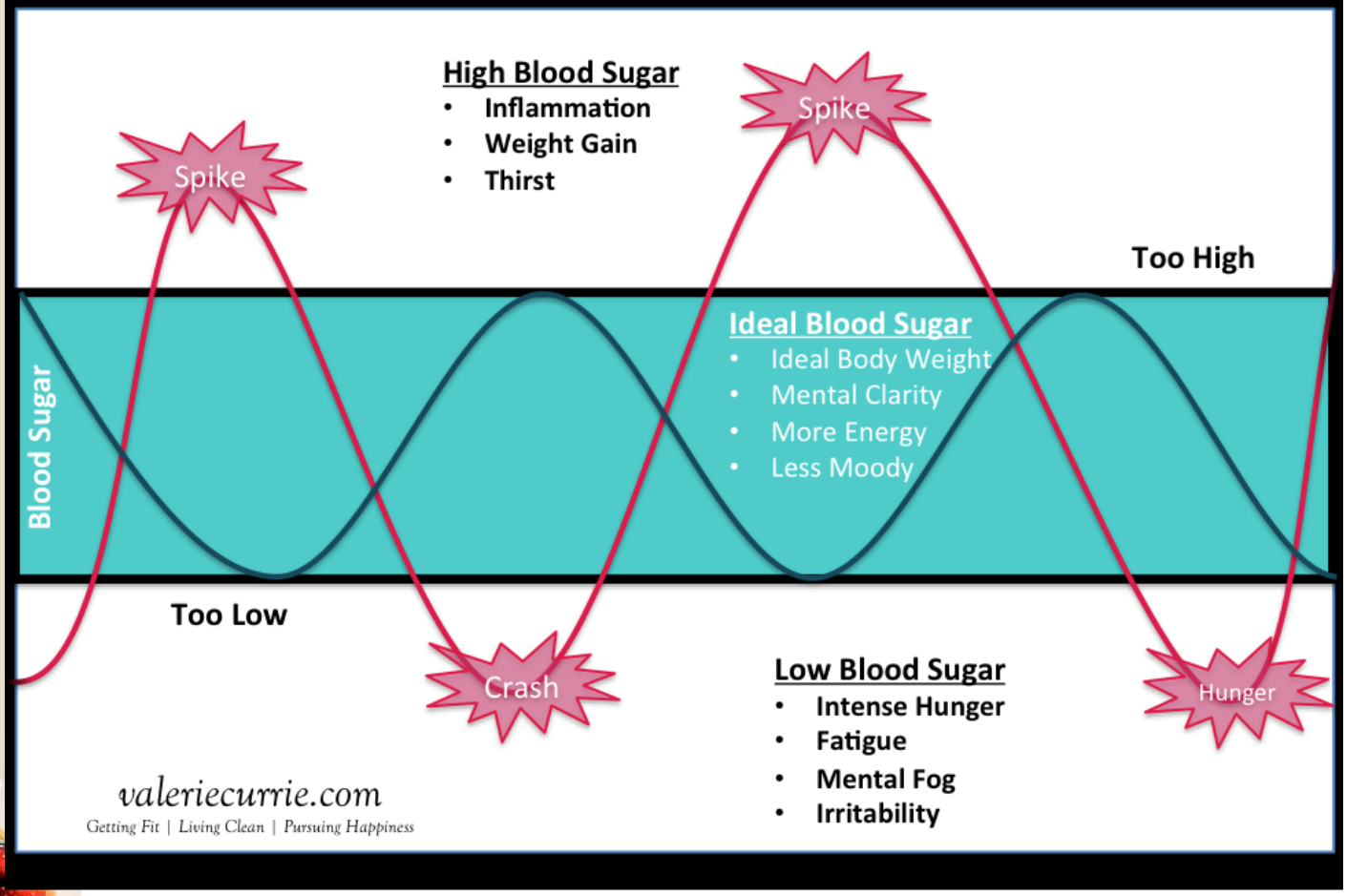
Glycemic Index values obtained from www.lowglycemicdiet.com, www.nutritiondata.com and www.diabetesnet.com

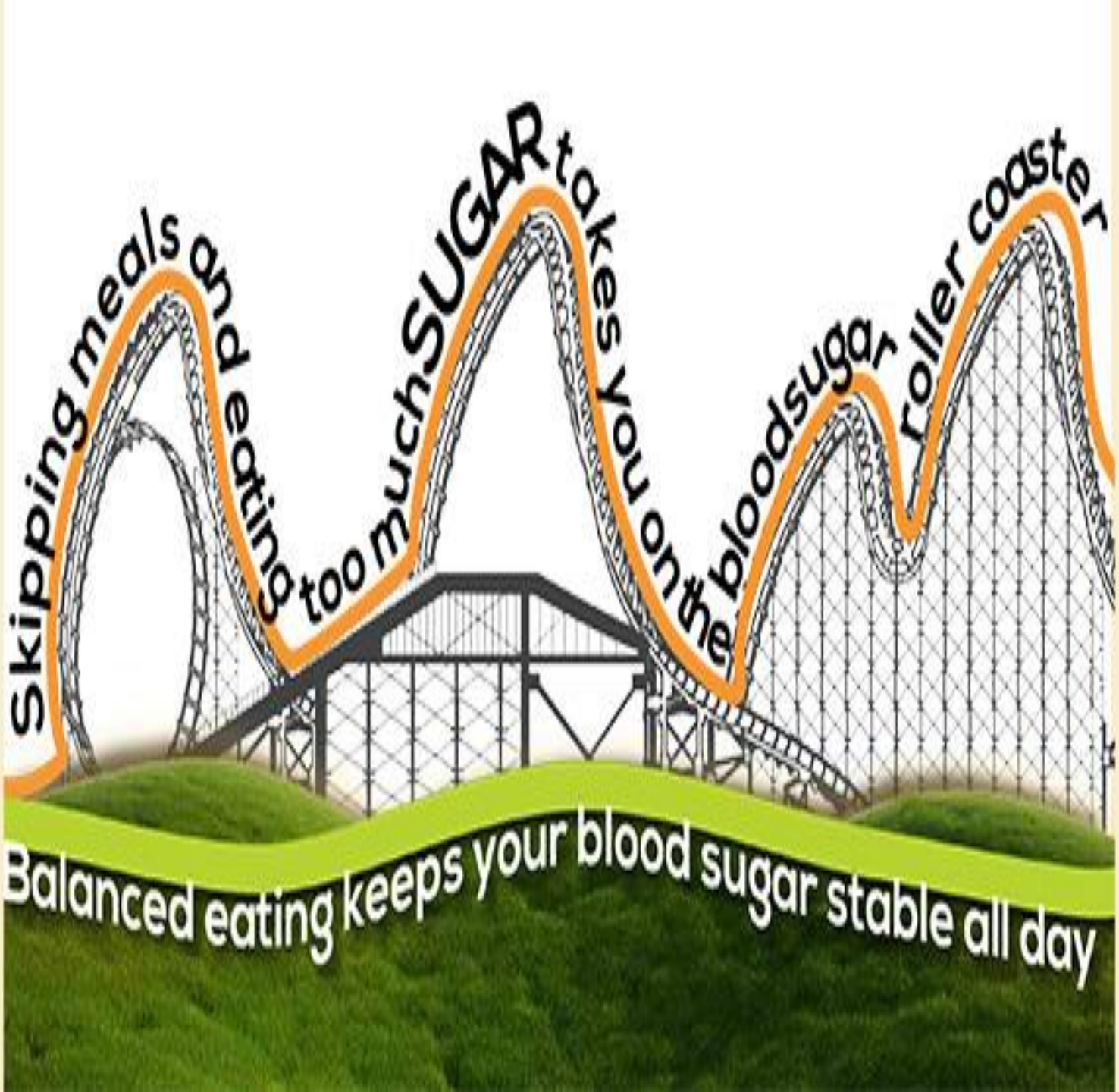
Glycemic Index

Low GI (<55), Medium GI (56-69) and High GI (70>)

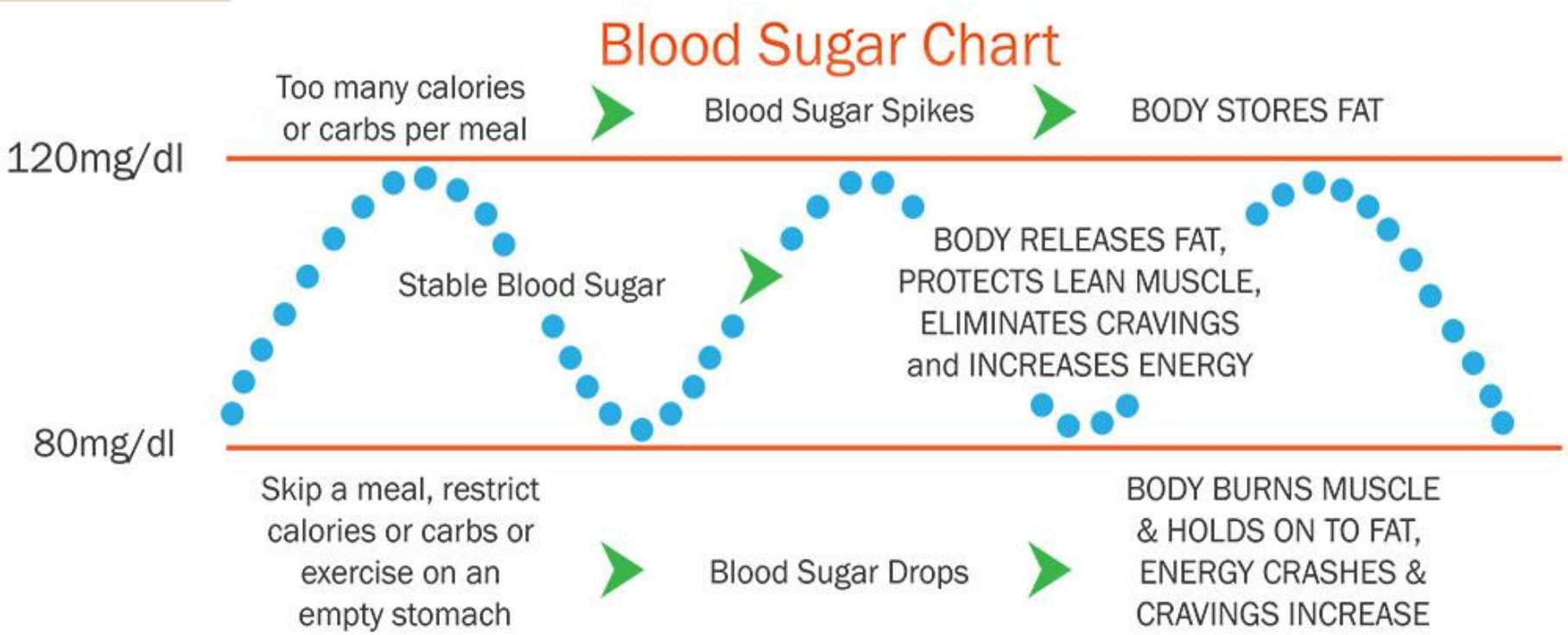
Grains / Starchs		Vegetables		Fruits		Dairy		Proteins	
Rice Bran	27	Asparagus	15	Grapefruit	25	Low-Fat Yogurt	14	Peanuts	21
Bran Cereal	42	Broccoli	15	Apple	38	Plain Yogurt	14	Beans, Dried	40
Spaghetti	42	Celery	15	Peach	42	Whole Milk	27	Lentils	41
Corn, sweet	54	Cucumber	15	Orange	44	Soy Milk	30	Kidney Beans	41
Wild Rice	57	Lettuce	15	Grape	46	Fat-Free Milk	32	Split Peas	45
Sweet Potatoes	61	Peppers	15	Banana	54	Skim Milk	32	Lima Beans	46
White Rice	64	Spinach	15	Mango	56	Chocolate Milk	35	Chickpeas	47
Cous Cous	65	Tomatoes	15	Pineapple	66	Fruit Yogurt	36	Pinto Beans	55
Whole Wheat Bread	71	Chickpeas	33	Watermelon	72	Ice Cream	61	Black-Eyed Beans	59
Muesli	80	Cooked Carrots	39						
Baked Potatoes	85								
Oatmeal	87								
Taco Shells	97								
White Bread	100								

Get Off of the Glycemic Rollercoaster




Skipping meals and eating too much SUGAR takes you on the bloodsugar roller coaster
Balanced eating keeps your blood sugar stable all day

Blood Sugar Chart



Importance of Dietary Fibers:

1-Prevent constipation:

by **normalizing the intestinal transit time**, increase the fecal bulk.

Transit time: is the time of contact of food particles to the wall of the colon.

2-Role in CVS:

By reducing cholesterol, when give large amount of soluble fiber; by **3** mechanisms;

***Binding to the bile salts & cholesterol prevent reabsorption**.

* Increasing the fecal bulk ⟶ reduce the exposure of bile salt to mucosal cells.

*Bacteria in the colon **reduce soluble fibers to short chain fatty acids which block cholesterol synthesis in the liver.**

3-Role in diabetic patients:

The water soluble fibers play a hypoglycemic role by;

*Affecting the **glycemic index** of food.

***Delay gastric emptying** time, slow starch hydrolysis & glucose absorption.

*Shortening intestinal transit time & **reduce glucose absorption.**

*Slow starch hydrolysis → decrease glucose absorption.

4-Protective role against Ca colon, by:

*Decrease concentration of carcinogen

*Reduce the intestinal transit time.

5-Stimulate chewing, saliva flow& gastric juice (beneficial effect on digestion).

6-Benifitial role in management of obesity, by;

*Filling the stomach & providing a sense of satiety

.

*Delay gastric emptying& slows the rate of digestion & absorption of nutrients.

7-Prevention of diverticulitis

Note:

-**Excessive fibers intake may interfere with the absorption of Ca & Zn esp. in children& elderly.**


THANK
YOU!