

# Sugar 101, or What is a Carb and Why am I Addicted?

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Sugar's power is based on two main effects--on our brain and on our metabolism. Because it is sweet, sugar is central to most celebrations. In the 1950's scientists were leading us into a "fat is bad" era. Atkin's work in the 60's demonstrated that carbohydrates can be worse than fat! While some of Atkin's work was inaccurate, it is true that across the globe we abuse carbohydrates. While carbs and fats are essential for life, sugar is a form of carb that is over consumed.

Ask someone purchasing a low-carb product "what is a carb"; and the typical answer will be "something that I am willing to pay more to get less of". That answer benefits the food and related industries, but not those seeking optimal health.

## Definitions

The major building blocks of food, or macro-nutrients, are proteins, fats and carbohydrates. Sugars are (typically) carbohydrates that taste sweet. There are also sweet-tasting molecules that are not carbo-hydrates, such as glycine, an amino acid, xylitol, an alcohol, and aspartame, a peptide.

Carbohydrates, assembled like building blocks, mostly start with three single mono-saccharides. They are combined in pairs to form di-saccharides such as sucrose (table sugar) and lactose (milk sugar), and then larger structures (polymers) which include starches, fiber and other more complex molecules.

Carbohydrates combine with proteins and other molecules to form hybrids that are used for structure and signaling. The delicious rigid crust of a bread is made by the interaction between sugar and protein; that's rigidity is what allows trees to stand tall, and what damages the walls of our blood vessels when blood sugar is high, especially in diabetes. The stickiness of certain linked sugars, like caramel, when imbalanced in our bodies contributes to cataracts and other diseases (see table).

## Sweetness

Sweet is one of the five flavors (besides salt, sour, bitter and umami) for which we have receptors in our tongue, nose, and other places including the gut and brain. Taste began when the first single-celled organisms needed to detect good and bad molecules in the environment. Our responses to certain tastes and smells, while encoded in the genes, are also programmable. Orange juice every morning and candy, cake, ice cream and cotton candy on happy occasions since youth program an emotional reaction to sugar. Without sugar, we are unhappy.

## Sugar Processing

A delicious pastry, even before it touches our tongue, causes our brain to prepare for the sugar load by mobilizing certain powerful chemicals including dopamine and insulin.

Dopamine is a major feel-good neurotransmitter, by activating our brain's pleasure center. Dopamine is central in addictions, including food, nicotine, opiates, cannabis, gambling and sex. Rats given a choice between opium and sugar chose sugar. Recovered addicts are often addicted to sugar.

Insulin is one of many hormones that manage sugar levels in our body. Diabetes is medically managed with insulin or drugs that alter its release or receptors.

When we eat sugars in ways that did not occur during evolution, such as pineapple in the winter, a sugar load during a party, high-fructose corn syrup in processed foods, and even lactose (milk sugar), programmed only for infants, the confused responses eventually lead to imbalances in dopamine, insulin, and other molecules. Certain yeasts and bacteria naturally occurring in our gut can be over-fed by sugar, producing toxic waste products and signal molecules that cause further carbohydrate craving.

## Where to Start

Like fat, sugars are not inherently good or bad. However, we confuse our brains and metabolisms in the way we eat sugar. One definition of addiction is "who's in charge". If sugar is in charge of your life, then the first step is to recognize its power, then to learn how to gradually and persistently limit sugar in forms that are not natural.

## IMPORTANT NOTES:

1. **This educational material may not be used to influence medical care without supervision by a licensed practitioner.**
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3. Dr. Cheikin's website has related articles such as "Carb Misuse," "Sugar Blues," "Weight Loss Resistance" and many others.

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## Sugar Definitions and Examples

Sugar or Saccharide	a sweet tasting carbohydrate
<b>Carbohydrate</b>	a "hydrated carbon", in which the ratio of hydrogen to oxygen is the same as water i.e. 2:1
Mono-saccharide	a single sugar molecule, such as glucose, fructose, and galactose
Di-saccharide	two single sugars attached to make a larger molecule, such as sucrose (table sugar) and lactose (milk sugar).
Oligo- & Poly-saccharides	three or more linked sugars that can be in a single chain or branched
Starch	a polysaccharide used for storage of energy, such as potato or corn starch
Fiber	a polysaccharide that cannot be easily broken into its building blocks, such as the soluble and insoluble fibers in greens and grains
Sugar Alcohol	an alcohol (not a carbohydrate) that has a sweet taste
Glyco-protein	a hybrid molecule that combines sugar and protein for structure and signaling.
Glycation	when excess sugar attaches to internal molecules creating toxic compounds