

**Reprinted from Glow: The Dermatologist's Guide to a Whole Foods Younger Skin Diet ©Rajani Katta MD**

## **THE SCIENCE BEHIND GLYCATION**

Fine lines and wrinkles. A deepening of smile lines. A softening of the jawline. These are common signs of aging skin, and they reflect collagen damage. And one of the major threats to your collagen is sugar. Specifically, excess sugar in your bloodstream.

Excess sugar can combine with proteins in your body and create collagen-damaging molecules. That's why one of the keys to eating for younger skin is "stop sugar spikes."

### **Collagen Is Strong, Flexible, And Extremely Resilient**

Collagen is one of the major skin proteins, and it's what makes our skin so strong and at the same time so flexible and resilient. Your skin is an amazing organ, especially when you think about all of the functions that it has to perform. It maintains a protective skin barrier, and it helps our skin move with us and then bounce right back. The collagen fibers in your skin are able to accomplish that, partly because of the fact that they're arrayed in the skin so well. I think of collagen fibers as similar to a net: closely and carefully arrayed, so that they can be strong yet flexible.

That strong flexible foundation, though, can be damaged. Ultraviolet radiation is one of the biggest threats to your collagen. Sun exposure, over time, causes cumulative damage to collagen on a microscopic level. But UV radiation isn't the only threat to your collagen. Sugar is another.

### **Higher Blood Glucose Levels Threaten Collagen**

When you experience higher levels of sugar in your bloodstream (known as blood glucose), some of that sugar attaches to proteins. In a process known as glycation, excess sugar attaches to proteins and creates new molecules known as AGEs (advanced glycation end products).

### **AGEs Are Sugar-Protein Molecules That Act Like Caramel Tangling Up A Collagen Net**

I think of AGEs as similar to caramel. If you combine sugar and butter, you end up with gooey, sticky, golden caramel. As that caramel hardens, it becomes hard and brittle. AGEs, just like caramel, are sticky: they act to cross-link your collagen fibers. That ultimately leads to wrinkling and sagging of your skin.

Think of what would happen if you added caramel to a net: you'd end up with a tangled mess that wouldn't function very well. It's the same with your collagen fibers, with the effect being a loss of resiliency. To make things worse, your collagen, once it's been cross-linked by AGEs, becomes more brittle and harder to repair. That "harder to repair" part is important, because it accelerates the aging process. As your skin loses its resiliency, you'll start to see more wrinkling and sagging.

## **Sugar Sag Is Irreversible, But It Is Preventable**

This process is known as sugar sag, and it's irreversible. Once your collagen becomes cross-linked, there's no way to undo that process.

That's why it's so important to focus on prevention. And it's the reason "stop sugar spikes" is one of my key tenets of eating for healthy skin: it's important to keep your blood sugar levels stable so that they can't contribute to making more AGEs.

## **AGEs Impact Many Organ Systems**

Eating for skin health means eating for health. AGEs don't just impact the collagen in your skin. They impact many other organs, such as your blood vessels. That's important, because once your blood vessels lose their flexibility, they put you at higher risk for diseases such as hypertension and heart disease.

## **To Protect Your Collagen, Protect Against Sugar Spikes**

This is one of the reasons why that bedtime bowl of ice cream isn't the best choice. Foods with added sugars, or foods that contain refined carbohydrates, or even too large a serving of whole grains, can all lead to rapid increases in your blood sugar levels. These are known as "sugar spikes", and they're problematic. If you want to protect your collagen, it's important to limit those sugar spikes.

In one study, strictly controlling blood sugar levels over a 4-month period resulted in a 25% reduction of glycated collagen formation.

Chapter 18 goes over the tweaks that you can make that limit these damaging elevations in blood sugar. Surprisingly, some foods actually contain high levels of pre-formed AGEs; the next chapter discusses these foods.