Could Sugarcane Prevent Diabetes?

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When sugar is refined we are discarding antioxidants that not only temper metabolic diseases but can also restore insulin production.

According to the World Health Organisation, rates of obesity across the globe have tripled since 1975. The increase in obesity has also produced a rise in associated disorders such as type 2 diabetes and cardiovascular disease.

While these are multifactorial diseases, no factor receives more attention than sugar intake. Refined sugar consumption also increased dramatically in this time, and governments are now scrambling to curb this consumption by introducing taxes.

Many consider sugarcane the root of all this evil, as it is the major source of sucrose in Australia and many countries around the world. However, some surprising research in the *Journal of the American College of Nutrition* (doi: 10.1080/07315724.2019.1587323) indicates that sugarcane may be the unlikely hero in the fight against obesity and diabetes.

Our study demonstrated three key findings about sugarcane and how it may be useful in preventing disease:

- the sugarcane plant is a valuable source of antioxidants;
- these antioxidant compounds can assist the healthy metabolism of various carbohydrates; and
- the antioxidants are capable of restoring the insulin production of beta-cells.

These are significant findings for public health, and it is therefore important to explore the detail and wider context of these findings.

The refinement of pure white sugar discards many valuable components of the sugarcane plant. One example of this is the large quantities of antioxidant polyphenols that are removed due to their undesirable colour. Polyphenols are the compounds that put foods such as dark chocolate, berries and red wine in the headlines as healthy contributors to a longer, healthier life. Sugarcane has been previously reported to contain antioxidants, but our study provides the most detailed evidence of their antioxidant capacity and biological action to date.

Studying antioxidants can be tricky. The difficulty in measuring bioavailability accurately and comparing antioxidant values between different foods and testing methods has tainted the opinion many people have of antioxidants. However, the evidence is clear that control of oxidative stress is essential for optimal cellular function. Our study addressed these challenges with a multi-pronged approach.

Of all the methods for assessing a food's antioxidant capacity, most people are familiar with the oxygen radical absorbance capacity method, which challenges the food with a single free radical oxidant. However, just as one key does not open every door, no single antioxidant quenches every oxidant. Measuring antioxidant capacity in this way only tells part of the story, and does not capture the complexity of oxidants that will be encountered in the body.

Our study therefore challenged polyphenols extracted from sugarcane with five of the major radicals that contribute to oxidative stress to see how they performed in each situation. We found that the mix of polyphenols extracted from sugarcane have antioxidant activity against all of the radicals we tested. Seventy-three per cent of the antioxidant capacity was derived from the hydroxyl radical, 12% from the peroxyl radical, 10% from singlet oxygen, 2% from superoxide anion and 1% from peroxynitrate. The sum total of this antioxidant activity is nearly six times higher than dried blueberry powder tested in the same way.

Disorders such as obesity are associated with an increased level of inflammation and oxidative stress. The ability of sugarcane to quench a variety of oxidant radicals could therefore make a significant impact on the damage done by these disorders.

Our result was confirmed further by a cellular antioxidant assay, which estimates the bioavailability and action of an antioxidant in a living cell. Again, we found that the sugarcane extract has a higher antioxidant capacity than dried blueberry. Considering the status of blueberries as a "superfood" it is surprising to see it outperformed by sugarcane, which is typically described as if it's a "villainfood".


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All plants have some concentration of antioxidant compounds. Therefore the most important factor is what functions they have in the body, which is very efficient at transporting sugars to fuel vital processes. The issue is that damage occurs when the body is overloaded with sugars due to the typical intake of the modern western diet.

We found that the sugarcane polyphenols were able to inhibit key enzymes for carbohydrate metabolism as well as glucose and fructose transporters. This means that the supply of carbohydrates slows down, which provides the body with a steadier supply of energy.

Sugarcane therefore comes naturally prepacked with compounds that safely metabolise the sugar present. This phenomenon is typical of foods that are naturally rich in sugar, such as berries.

Because humans have been on a long path of co-evolution with plants such as sugarcane and berries, it is not entirely surprising that the plants we are drawn to for food contain both the carbohydrates that are useful for cellular processes and the polyphenols that help run the system efficiently. The problem arises when too much focus is on one side of this equation, for example if the polyphenols are omitted. Our results are showing that a spoonful of sugarcane helps the sugar go down.

The final discovery reported in our paper is that these sugarcane polyphenols can restore insulin production in beta-cells after they have been damaged by exposure to very high levels of glucose. Our study was designed to replicate what happens in advanced type 2 diabetes, where glucose toxicity causes insulin resistance and ultimately shuts down insulin production entirely. We found that insulin production was up to 40% higher than controls in the cells treated with sugarcane polyphenols.

Because our initial study was performed in cell culture, many more laboratory and clinical trials will be needed to fully understand this result. However, this proposed ability of phytochemicals from sugarcane to mitigate the damage done by sugar could lead to a revolution of how disorders such as obesity and diabetes are prevented and managed.

The antioxidant polyphenols reported in our paper are already found in food products, such as brown sugar. The challenge is delivering them at the optimum dosage. A little bit may not have an effect, but too much can be counter-productive. Because of the efficient extraction of these compounds during sugar refinement there is a range of options for how these compounds can be included in our lives at the exact dose required to give the desired effect.

These extracts could be delivered in a capsule just like existing vitamin and mineral supplements, and since they are prepared using food-grade techniques they can be added directly to any food imaginable. The consistent, low dosage of these protective compounds included in a variety of foods is a useful option to block the gradual onset of chronic disease such as type 2 diabetes and obesity.

Media reports on nutrition are typically very black and white. Nutrients like sugar are discussed as either poison or all-powerful health cures, and seemingly swap between the categories with little scientific rigour. In the case of sugar, the truth lies much closer to the middle: the right amount of sugar and the right amount of antioxidants is the balance that needs to be maintained. These biological benefits from the neglected and colourful parts of sugarcane further demonstrate that food was never meant to be just black or white.

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