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Fructose and its Contribution to Cardiovascular Disease and Metabolic Syndrome

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Abstract

The incidence of obesity, cardiovascular disease, and combination of symptoms classified as "metabolic syndrome" that eventually leads to type 2 diabetes have risen dramatically over the past few decades. The current dietary guidelines that advised patients to avoid dietary fats were originally developed in the 1960s. This led the way for food manufacturers to remove fats in processed foods and replace them with sugars, particularly fructose. At the time there was no clinical trial data that definitively supported these guidelines.

• The increased use of fructose as a food additive has dramatically increased the per-capita consumption of this sugar. More recent research has found that the unique structural and metabolic differences of fructose compared to glucose lead to specific pathophysiologic changes in the body that promote obesity, hypertension, atherosclerosis, dyslipidemia and glucose intolerance. Other studies have also found that consumption of certain fats may be beneficial and protective, actually preventing some of the previously mentioned conditions.

• It is evident that fructose consumption, as compared to glucose or fat consumption, leads to a higher incidence of cardiovascular disease and metabolic syndrome in the population. New dietary guidelines, strategies, and changes to food production are necessary to combat this problem, however the reversal of rules that have been in place for decades will be difficult and take many years. Therefore, to have the most impact, patient education needs to start at the primary care level.

Introduction

• 33% of American adults are considered obese; CV disease and metabolic syndrome increasing
• Dietary guidelines focus on lowering fat intake without supportive clinical trial data
• Food processors remove fats from foods and replace them with sugars, mainly fructose, as a way to preserve taste and texture

Statement of the Problem

• Time trend data over the past 30-40 years correlate increased sugar intake with incidence of obesity and diabetes
• 75% of all processed foods contain added sugar
• Fructose is the added sugar of choice due to its low cost and availability

Research Question

Does fructose consumption, as compared to glucose or fat consumption, contribute to the incidence of cardiovascular disease and metabolic syndrome?

Literature Review

THEME 1: FRUCTOSE CONSUMPTION AND PRESENCE IN THE FOOD SUPPLY
• US consumption is 50 times higher than it was in the 1800's
• Average adult consumption is 97 grams per day with less than 20 grams coming from fruits and vegetables
• High fructose corn syrup (HFCS) is a common sweetener used because it is inexpensive

THEME 2: DIETARY GUIDELINES FOR FAT AND SUGAR CONSUMPTION
• 1950's: Research showed an increase in serum lipids when high fat foods were consumed; same foods also had a high sugar content
• 1960's: Current dietary guidelines were developed but were not based on randomized clinical trial data; fat limited to <30% of calories but no limitations on sugar intake

THEME 3: STRUCTURAL AND METABOLIC DIFFERENCES BETWEEN GlUCOSE AND FRUCTOSE
• Same chemical formula, structurally and metabolically different

THEME 4: PATHOPHYSIOLOGY OF CARDIOVASCULAR DISEASE AND METABOLIC SYNDROME AND CORRELATION TO FRUCTOSE CONSUMPTION

Glucose and Fructose Molecules

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Discussion

• Fructose appears to have adverse effects on cardiovascular and metabolic health
• It would take a diet with 40% saturated fat to induce an LDL similar to that seen with today's average fructose intake
• New dietary guidelines limiting added sugar intake need to be implemented
• Alternatives to fructose need to be used in the food manufacturing process

Applicability to Clinical Practice

• Primary care may be the most successful place to educate patients on nutrition
• Reducing fructose intake from sugar sweetened foods and beverages may be the key to weight loss and disease reduction in some patients
• Encourage patients to eat a diet with minimally processed foods—whole grains, fruits, vegetables and unprocessed meats. Simply changing the composition of a patient's diet can have huge benefits.

References


