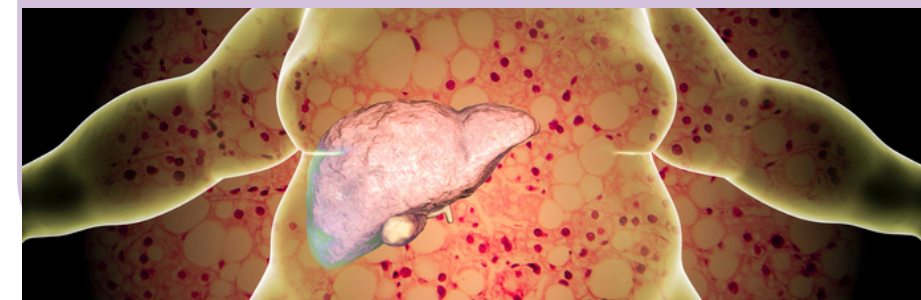


## DIETARY FRUCTOSE AND THE METABOLIC SYNDROME

Taskinen, MR ; Packard, CJ ; Borén, J  
Nutrients. 2019;11(9)

Fructose is a naturally occurring sugar in carbohydrate foods and is often used as an ingredient in foods and sugar sweetened beverages (SSB) such as sport and energy drinks. The consumption of these drinks accounts for up to 15-17% of calorie intake in the modern western diet. Excessive sugar consumption is becoming a major public health issue with high sugar intake linked to Metabolic Syndrome (MetS), cardiovascular disease, type II diabetes and non-alcoholic fatty liver disease. Fructose is largely absorbed in the small intestines however the liver is considered the major organ for fructose metabolism.

Too much fructose in the diet appears to stimulate the liver to produce more sugars and triglyceride fats which can raise cholesterol levels and promote insulin resistance. This partially explains the role of fructose in promoting a build-up of fat around the liver leading to non-alcoholic fatty liver disease and central obesity. Too much fructose is also linked to unfavourable changes in gut bacteria which may contribute to obesity and MetS. Overall the study concludes that too much fructose contributes to an unhealthy lifestyle and is a risk factor for metabolic disturbances.



## ACUTE RESPONSES OF HEPATIC FAT CONTENT TO CONSUMING FAT, GLUCOSE AND FRUCTOSE ALONE AND IN COMBINATION IN NON-OBESSE NON-DIABETIC INDIVIDUALS WITH NON-ALCOHOLIC FATTY LIVER DISEASE

Kovar, J ; Dusilova, T ; Sedivy, P ; Bruha, R ; Gottfriedova, H ; Pavlikova, P ; Pitha, J ; Smid, V ; Drobny, M ; Dezortova, M ; Hajek, M

Journal of physiology and pharmacology : an official journal of the Polish Physiological Society. 2021;72(1)

Non-alcoholic fatty liver disease (NAFLD) is often associated with obesity or conditions related to obesity, such as type 2 diabetes. Steatosis is one of the four stages of NAFLD, where there is a small layer of fat build-up on the liver. Currently, one in three people in the UK has simple fatty liver or steatosis. A fascinating aspect of this study is exploring the long-term cumulative effects of daily fat intake when consumed with glucose or fructose and in the pathogenesis of steatosis. In this randomised controlled study, the researchers examined the immediate impact of high-fat loads on hepatic fat content (HFC) when administered with glucose or fructose in eight healthy overweight males with NAFLD.

The experiments lasted only eight hours. HFC was only transiently elevated by co-administration of glucose and high-fat loading. However, fructose co-administration with multiple high-fat loads promoted HFC.

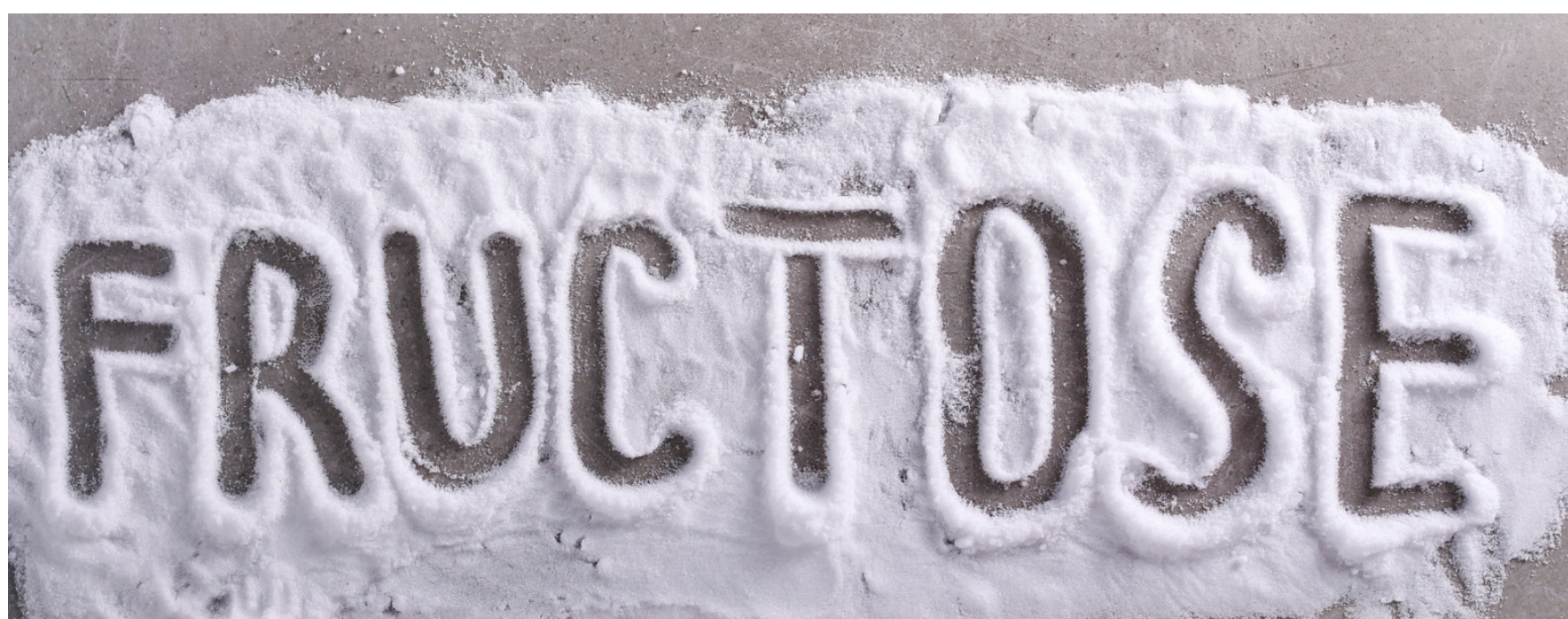
Small sample size and short duration are the limitations of this study. Long-term robust studies are needed to confirm the findings. Yet, healthcare professionals can use this study to distinguish between the immediate effects of fructose or glucose when combined with multiple doses of high fat on HFC in healthy and NAFLD subjects.

## NUTRIENTS, GENETIC FACTORS, AND THEIR INTERACTION IN NON-ALCOHOLIC FATTY LIVER DISEASE AND CARDIOVASCULAR DISEASE

Lombardi, R ; Iuculano, F ; Pallini, G ; Fargion, S ; Fracanzani, AL

International journal of molecular sciences. 2020;21(22)

Non-alcoholic fatty liver disease (NAFLD) and heart disease are influenced by diet and genetics. NAFLD cannot be managed with drugs and so lifestyle modification is the main recommendation, which is also advised in heart disease. The aim of this large review of 176 papers was to discuss the role of nutrients and genetics in NAFLD and heart disease. Amongst the main nutrients, excess fructose (a simple sugar) and high saturated and trans-fats were all shown to contribute to the development of both diseases. The influence of protein on NAFLD is controversial. Animal studies suggest that protein can be of benefit, but studies on humans have failed to support this. This is similar for heart disease where large scale trials in humans are not definitive. The role of fibre in NAFLD and heart disease appears to be beneficial. Several micronutrients were also reviewed including vitamins D, K, curcumin, plant chemicals and caffeine. The complex interplay involving genetics was also discussed and although fairly new science, evidence is mounting in support of genetic considerations when making dietary recommendations. It was concluded that diet and genetics influence the development of NAFLD, and heart disease and dietary recommendations need to reflect this. This study could be used by health care professionals to understand the interaction between diet and genetics and the importance of making personalised nutrition recommendations to individuals with NAFLD or heart disease.



## EFFECTS OF FRUCTOSE RESTRICTION ON LIVER STEATOSIS (FRUITLESS); A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL

Simons, N ; Veeraiah, P ; Simons, PIHG ; Schaper, NC ; Kooi, ME ; Schrauwen-Hinderling, VB ; Feskens, EJM ; van der Ploeg, EMCL ; Van den Eynde, MDG ; Schalkwijk, CG ; Stehouwer, CDA ; Brouwers, MCGJ  
The American journal of clinical nutrition. 2021;113(2):391-400

The use of fructose in the food industry may have contributed to the increase in non-alcoholic fatty liver disease (NAFLD) in the general population. Consequently, obesity and associated comorbidities like type 2 diabetes, dyslipidaemia, NAFLD, and cardiovascular disease have increased. Although glucose and fructose are both sugars, they are metabolised differently by the body. The overfeeding of fructose may contribute to steatosis or accumulation of fat in the liver than glucose. The aim of this randomised, double-blind trial was to measure intrahepatic lipid content in 44 overweight subjects with high fatty liver index following fructose restriction for six weeks. In this study, fructose restriction resulted in a small but significant reduction in intrahepatic lipid content with a small effect size of 0.7% point.

Fructose restriction did not seem to affect glucose tolerance, serum lipid concentration or HOMA-IR, variables related to intrahepatic lipid content. As a supplement, fructose may have a different metabolic profile than when taken as a food component. The study found no effect on glucose tolerance or serum lipid levels. The results of this study may help healthcare professionals to comprehend the role of fructose in steatosis and NAFLD.

