

noor

Nutritionist

Dietetics and human nutrition

High-Performance Nutrition · The Human Body

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"Science is but a perversion of itself, unless it has as its ultimate goal the betterment of humanity." -- Nikola Tesla

Current Research (2019)

The Ketogenic Diet

The ketogenic diet can be helpful in weight loss, as well as helpful in reducing LDL cholesterol ('bad cholesterol'), increasing HDL cholesterol ('good cholesterol') - these improvements occur on any weight loss diet!! In a keto diet, to result in cholesterol level improvement, the diet must be carefully designed to ensure that saturated fat consumption remains below 10% of consumption as consumption over 10% of intake increases LDL (bad) cholesterol and increases risks of cardiovascular diseases including heart disease and stroke.

However a low-carbohydrate diet is typically higher in saturated fat than conventional weight-loss diets ². It must also be carefully designed to ensure all vitamins and mineral requirements are met as a low carbohydrate diet tends to promote large restrictions causing low-carbohydrate diets to be low in fibre, thiamin, folate, vitamins A, E, and B6, calcium, magnesium, iron, and potassium ².

Little fruit and vegetable consumption and a large increase in meat consumption increases risks of cancer, especially colon cancer ². Ketosis also leads to break down of skeletal and heart muscle via gluconeogenesis (creation of more glucose from skeletal and heart muscle) ². To ensure a keto diet is well managed to try reduce impact, a dietician should be consulted. Nevertheless, regardless of a well managed diet, keto diets have other risks

that occur as a direct consequence of ketosis (ketones causing an acidic environment)

Risks of ketosis include increased risk of kidney stones, osteoporosis (porous, weak and brittle bones), and hyperlipidemia (high levels of fat in the blood) which causes other issues such as cardiac arrhythmia (malfunctioning of heart electrical signals causing irregular heart beat).

Kidney stones

Renal stones are a significant complication of the ketogenic diet. First, hypercalciuria (high calcium in excreted urine) can develop due to chronic metabolic acidosis (acidic metabolism due to ketones produced). This metabolic acidosis not only decreases calcium reabsorption in the renal tubules (in the kidneys) thus increasing urinary calcium excretion, but also increases bone demineralization because bone phosphate acts as an acid buffer (i.e. bone is broken down to provide phosphate to combat the acidic nature caused by ketosis).

Furthermore, Ketosis causes increased citrate reabsorption from the kidneys into the body - normally citrate will bind to calcium in the kidneys to reduce free calcium but the decreased level of available citrate means more calcium is excreted, these along with the acidic environment caused by ketosis and the dehydration as ketosis interferes with thirst mechanisms all promote kidney calcium stone formation ¹.

This means that 3-10% of people on ketogenic diets develop kidney stones compared to 1 in several thousand in the general population who are not on a ketogenic diet ¹.

Osteoporosis

The aforementioned bone demineralization (bone break down) and the lack of calcium reabsorption from the kidneys back into the body also increase risk of osteoporosis (weak brittle bones). Furthermore, low-carbohydrate diets promote the restriction of dairy products, particularly milk and yoghurt, which are the main sources of calcium in the diet.

As peak bone mass is an important factor in determining long-term fracture and osteoporosis risk, adoption of dieting practices that restrict calcium intake (particularly in those under the age of 30) have the potential to compromise the attainment of peak bone mass and therefore increased osteoporosis risk.

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Hyperlipidemia

Ketogenic diets result in an increase in plasma free fatty acids (fats) due to increased lipolysis (fat breakdown) while prolonged elevation of free fatty acids has been linked with cardiac arrhythmias (malfunctioning of heart electrical signals causing irregular heart beat) ²

Increased cancer risk

There is overwhelming evidence for a protective effect of fruits and vegetables in almost all major cancers afflicting western society today including colorectal, breast, pancreatic, lung, stomach, oesophageal, and bladder cancer. Fruits and vegetables contain a vast array of compounds that are implicated in providing protection against cancer. For examples, such substances such as antioxidants, fibre, isothiocyanates (in cruciferous vegetables), allyl sulphides (in onions and garlic), flavonoids, and phenols have all been linked to augmenting the body's protective mechanism against cancer promotion.

The nature of a low-carbohydrate diet, however, is one that is low in fruits, vegetables and grains thus potentially placing an individual at an increased cancer risk if the diet is followed long term. The potential link between increased intakes of meat (typically seen on low-carbohydrate diets) and bowel cancer risk can not be ignored as it has been suggested that the link between meat and the consumption of animal protein with cancer is as strong as the association of fat with cancer.

In a recent review of prospective cohort studies on meat consumption and colorectal cancer risk, it was found that daily increases of 100 g of all meat or red meat is associated with a significant 12-17% increased risk of colorectal cancer ². A significant reduction in dietary fibre is typically seen when an individual follows a low-carbohydrate diet and this may explain reports of constipation in people following these type of diets as dietary fibre is only found in foods of plant origin such as cereals, fruits and legumes.

Dietary fibre can have a myriad of benefits in the colon such as diluting carcinogenic compounds (compounds that promote cancer growth), increasing stool transit time, production of beneficial fermentation products such as butyric acid and a lowering of pH, all of which have been proposed as being protective against colon cancer ².

Gluconeogenesis

Gluconeogenesis also occurs in very low carbohydrate diets, where skeletal and cardiac muscle is broken down and converted to create glucose. This is the bodies way in trying to make up for the glucose deficit as glucose is typically derived from carbohydrates ²

Summary

In terms of weight loss, the simple fact of energy balance can not be ignored; any diet that is hypoenergetic (a diet that has an energy deficit) will result in weight loss. When using loss of body fat as a true measure of weight loss, then low-carbohydrate diets present no significant advantages to the dieter over nutritionally balanced, hypoenergetic diets.

Based on the available evidence, the reverse may in fact be true, in that long-term compliance to a low-carbohydrate may put an individual at greater risk of an array of diseases including kidney stones, osteoporosis, hyperlipidemia, increased cancer risk, without the achievement of sustainable weight loss.

A comprehensive recent review of popular diets concluded that a diet that is high in fruit and vegetables, whole-grains, legumes, and low-fat dairy products as well as being moderate in fat and kilojoules will result in the greatest chance of weight loss and maintenance. Such diets are also associated with fullness and satiety and have been shown to reduce risk of chronic disease.²

Advice should be given to an individual following a low-carbohydrate diet to help avoid some of the potential metabolic consequences known to be associated with this diet. For example, advice would include: to increase the intake of water to help prevent dehydration; ensure an adequate intake of fibre from non-starch containing foods (fruits/vegetables/legumes/grains); and to consume an adequate amount of calcium either from the consumption of low-fat dairy products, canned fish with bones or from the use of supplements. The use of a general multivitamin formulation would also seem prudent in light of the array of vitamin and mineral deficiencies that may potentially exist due to vast elimination of fruit and vegetables

Selected Publications

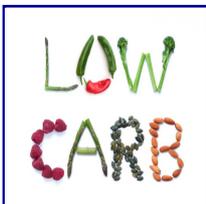
[\[Full publication list\]](#)

RESEARCH



1. Renal Stone Associated with the Ketogenic Diet in a 5-Year Old Girl with Intractable Epilepsy

Ji Na Choi, Ji Eun Song, Jae Il Shin, Heung Dong Kim, Myung Joon Kim, and Jae Seung Lee, Yonsei Medical Journal, 2010



1. Low-carbohydrate diets: What are the long-term health implications?

Shane Bilsborough, Timothy Charles Crowe, Asia Pacific Journal of Clinical Nutrition, 2003

Resources

Various Nutrition related resources

- [How to search](#)