

The Ketogenic Diet and Epilepsy: Does It Really Work?

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En Español (Spanish Version)



There are few things more dramatic and frightening to watch than a seizure. Imagine you are at home with your young child when suddenly he begins to twitch or move uncontrollably, drool, cry out, or even lose consciousness. Now, imagine it happening two or three times a day, every day. For the parents of children with intractable epilepsy, this is a constant reality. Even with medicines, seizures may continue. For some of these children, the ketogenic diet may be effective in helping to control their seizures.

Epilepsy is a condition of spontaneously recurring seizures (a sudden change in movement, behavior, sensation, or consciousness produced by an abnormal electrical discharge in the brain).

For more than half of those who have epilepsy, the cause of the condition is unknown. The remainder show evidence of some sort of injury to the brain, either as a result of severe trauma, stroke, tumor, lack of oxygen, infection, birth defect, or some other cause. Epileptic seizures occur when large numbers of brain cells all send electrochemical messages (or they “fire”) at the same time. This sudden burst of electrical activity in the brain disrupts normal behaviors and causes abnormal movements, confusion, and other signs and symptoms of seizures.

Most people with epilepsy manage to control their seizures using one or more of a number of anti-epileptic drugs. However, some will continue to have seizures despite the best possible medical treatment. For those who remain resistant to drug treatment, the ketogenic diet may offer hope. The diet is used most commonly in infants and children, but there is increasing interest in the diet's usefulness in adolescents and adults.

What Is the Ketogenic Diet?

This is a high-fat, low-carbohydrate diet to manage epilepsy. The diet can dramatically reduce or even end seizures in some children with severe epilepsy. It was first developed in the 1920s when it was discovered that fasting could alleviate seizures, but it became less popular with the advent of effective anti-epileptic drugs.

The classical ketogenic diet is based on a 4 to 1 ratio of fat to carbohydrate in the diet. There is also a modified form of the diet that uses medium chain triglycerides (MCTs) as the primary fat source in the diet.

How Does It Work?

The diet works by mimicking some of the effects of fasting on the body. When you fast, the body first burns its stored supplies of glucose (which we get from the carbohydrates we eat) for the energy it needs to maintain normal body functions. When these energy stores become depleted, the body begins to break down stored body fat for energy. This process produces ketones, substances derived from fat that can be used for energy by many of our vital organs. Along with providing energy to our muscles and brain, for reasons not yet entirely understood, ketones may help alleviate seizures.

What Are the Benefits?

Research has shown that in some cases, the diet can be used to reduce or end seizures in children who have certain types of epilepsy. While only some children who try the diet may become seizure-free, others may have

less seizures.

Is the Diet Difficult?

The diet should be thought of as a form of medical treatment, and therefore adhered to as closely as possible. Some people consider it difficult because it requires strict adherence to an unusual and limited range of foods. Therefore, the diet must be used under the guidance of your child's doctor and, usually, an experienced dietician. However, with the right level of guidance and support, many families say the diet can quickly become routine.

If your child is a candidate for the diet, you will need to keep a diary. This diary will record the number and type of seizures your child experiences each day as well as their mood, alertness, and overall behavior. Your child will also have regularly scheduled visits with his doctor, who will monitor your child's growth, overall health, side effects, blood and urine tests, and frequency of seizures. The diary can greatly help your doctor make decisions about changing the diet or medicines your child may still be taking. You may need to test your child's urine to confirm that the diet is effectively leading to ketosis (buildup of ketones in the body).

What Will My Child Eat on the Diet?

The exact composition of your child's diet will depend on the type of ketogenic diet he is following and your child's individual prescription. There are two main versions of the diet. The classical version focuses on the consumption of fats from foods like heavy cream. The medium-chain triglyceride (MCT) version focuses on the addition of a certain type of fat (MCTs) to the diet.

A typical breakfast on the classical diet might include heavy cream, eggs, butter, and a small serving of fruit or vegetables. A typical breakfast on the MCT version of the diet would be similar, but it would allow for the inclusion of a starch carbohydrate as well, such as a small serving of bread or cereal. A special MCT supplement would also be taken with each meal, and this could be easily mixed into either milk or food.

A typical lunch on the classical diet might include a serving of meat, fish, or cheese for protein, a small serving of either vegetables or fruit, and fat in the form of butter, heavy cream, oil, or mayonnaise. On the MCT form of the diet, the fat would be replaced with the MCT supplement.

If your child happens to be allergic to dairy products, he may still be a candidate for the diet. However, it may be more difficult to implement when there are food limitations.

What Are the Side Effects of the Diet?

In general, the diet has side effects that are temporary and manageable. Nausea or constipation are the most common. While these symptoms may occur when a child first starts the diet, they generally improve or disappear with time. A few children may feel sleepy and irritable while adjusting to the diet. However, this will generally pass in time. Dehydration can occur and requires prompt treatment to avoid the need for hospitalization. Diarrhea is a side effect of the MCT form of the diet.

Two unusual complications are delayed growth due to nutritional deficiency and a buildup of uric acid in the urine, which can lead to kidney stones. Rarely the diet can be associated with inflammation of the pancreas — a complication that may be very serious, or even fatal. While these complications are rare, they highlight the importance of administering this diet under the close supervision of your child's doctor.

The biggest unresolved concern related to treatment with the ketogenic diet is its potentially harmful effect on blood fats (cholesterol, triglycerides, and other lipoproteins). Studies show that following the diet leads to significant elevations of fatty substances in the blood, changes which *could* lead to increased risk of heart disease in adult life. While there is as yet no evidence that the diet is dangerous, long-term studies have not yet proven its safety. However, based on current understanding, for many patients with intractable epilepsy, the benefits of good seizure control outweigh the still-theoretical risk of harm developing later in life.

How Quickly Does the Diet Work?

Some children will demonstrate dramatic improvement within a week of going on the diet. Still others may require as many as three months before they start to respond. If it has been more than three months and your child is still not responding to the diet, you should speak with your child's doctor to see if the diet should be modified or stopped.

How Long Will My Child Have to Remain on the Diet?

This will depend on the extent to which your child is benefiting from the diet and how easy or difficult it is for your child and your family to maintain the diet. If your child responds well to the diet and remains seizure free for two years, most doctors will suggest moving your child slowly back to a more normal diet.

RESOURCES:

The Epilepsy Foundation of America
<http://www.epilepsyfoundation.org/>

National Institute of Neurological Disorders and Stroke
<http://www.ninds.nih.gov/index.htm/>

CANADIAN RESOURCES:

The Center for Epilepsy and Seizure Education
<http://epilepsy.cc/>

Epilepsy Ontario
<http://www.epilepsyontario.org/>

REFERENCES:

About epilepsy. The Johns Hopkins Epilepsy Center website. Available at:
<http://www.neuro.jhmi.edu/Epilepsy/info.html>. Accessed October 24, 2003.

Frequently asked questions about epilepsy. Texas Department of State Health Services website. Available at:
<http://www.dshs.state.tx.us/epilepsy/faq.shtm#how>. Updated April 5, 2005. Accessed January 18, 2009.

Frequently asked questions (FAQs) about the ketogenic diet. Stanford University Medical Center website. Available at:
<http://www.stanford.edu/group/ketodiet/FAQ.html>. Accessed August 25, 2005.

Ketogenic diet in children. EBSCO DynaMed website. Available at:
<http://www.ebscohost.com/dynamed/what.php>. Updated December 10, 2008. Accessed January 18, 2009.

Kwiterovich P, Vining E, Pyzik P, et al. Effect of a high-fat ketogenic diet on plasma levels of lipids, lipoproteins, and apolipoproteins in children. *JAMA*. 2003;290:912-920.

Lefevre F, Aronson N. Ketogenic diet for the treatment of refractory epilepsy in children: A systematic review of efficacy. *Pediatrics*. 2000;105:e46.

Menkes JH, Sankar R. Paroxysmal disorders. In: Menkes JH, Sarnat HB, eds. *Child Neurology*. Philadelphia, PA: Lippincott Williams & Wilkins; 2000:919-1026.

Nephrolithiasis. EBSCO DynaMed website. Available at:
<http://www.ebscohost.com/dynamed/what.php>. Updated January 12, 2009. Accessed January 19, 2009.

Prasad AN, Stafstrom CF, Holmes GL. Alternative epilepsy therapies: the ketogenic diet, immunoglobulins, and steroids. *Epilepsia*. 1996;37(Suppl 1):S81-S95.

Soterode Menezes MA, Gilman S, ed. Ketogenic diet in the treatment of epilepsy. MedLink Neurology website.

Available at: <http://www.medlink.com>. Accessed September 30, 2007.

Stafstrom C. Dietary approaches to epilepsy treatment: Old and new options on the menu. *Epilepsy Curr.* 2004;4:215-222.

Trescher WH, Lesser RP. The epilepsies. In: Bradley WG, Daroff RB, Fenichel GM, Jankovic J, eds. *Neurology in Clinical Practice*. 5th ed. Philadelphia, PA: Butterworth-Heinemann/Elsevier; 2008:1909-1946.

Veech RL, Chance B, Kashiwaya Y, et al. Ketone bodies, potential therapeutic uses. National Institute on Alcohol Abuse and Alcoholism website. Available at: <http://www.niaaa.nih.gov>. Accessed October 24, 2003.

5/14/2008 DynaMed's Systematic Literature Surveillance <http://www.ebscohost.com/dynamed/what.php>: Neal EG, Chaffe H, Schwartz RH, et al. The ketogenic diet for the treatment of childhood epilepsy: a randomised controlled trial. *Lancet Neurol.* 2008 May 2. [Epub ahead of print]

Last reviewed December 2010 by Brian Randall, MD
Last updated: 12/13/2010