



# Metabolic Switching: Even Better Than Ketosis (And A Whole Lot Easier)

From Terry Wahls MD, FACP- Author of The Wahls Protocol®

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I encourage you to include more evolutionary principles such as metabolic switching in your toolbox as you work with patients to improve their diet and health behaviors. In this handout I will discuss the evolutionary benefits of metabolic switching and why I encourage my patients to adopt this principle.

You can experience metabolic switching without a high fat diet, either by intermittently engaging in an endurance physical activity that depletes your glycogen (usually for 2 to 3 hours) or by extending the time you consume zero calories (i.e. fasting). Several small clinical trials have shown that ketogenic eating is associated with a variety of health benefits, and more studies are in progress.

There are considerable benefits to ketosis. The ketogenic low carbohydrate high fat diet has been around for only 100 years. But humans have been experiencing ketosis without a high fat diet for hundreds of thousands of years, using metabolic switching. This route to ketosis offers more benefits than the dietary approach.

In this handout I will give you an overview of how ketosis improves how our cells conduct the chemistry of life and how metabolic switching provides even more benefits. Then I will give you a few suggestions on how to enhance your metabolic switching.

Many adults and children around the world are now suffering from insulin resistance, pre-diabetes, or overt diabetes. Many of your patients will have these issues. Even if your patient is not overweight, they may have insulin resistance. And those who are overweight or obese are more likely to have insulin resistance, pre-diabetes, and diabetes. Ketogenic diets are being investigated to treat these conditions. Studies have consistently demonstrated that blood sugars lower and insulin sensitivity improves in those who adopt a ketogenic diet. More physicians and patients are turning to ketogenic diets, with favorable results.

I and others study ketogenic diets in the setting of multiple sclerosis. They can be very helpful in treating insulin resistance, obesity, and autoimmunity.

Ketogenic diets are high in fat and low in carbohydrates. This causes the mitochondria to burn fat instead of glucose, which is a more efficient method of generating the energy that our cells need to run the chemistry of life. When our mitochondria burn fat, blood sugar levels go down and our responsiveness to insulin improves. But there is an even more potent strategy: metabolic switching.

Let me explain.

Metabolic switching is when your mitochondria cycle between burning fat and sugar as fuel. As our ancestors evolved, those who functioned more effectively in a state of fasting or extended physical activity would be more likely to have greater success at procuring food and reproducing. Our ancestors often did hours of physical activity to get enough food to sustain the clan, which put their bodies in ketosis.

For hundreds of thousands of years, humans were in ketosis as a result of depletion of glycogen through exercise. Periods of intense activity were followed by resting and refeeding. As a result, their mitochondria switched between burning ketones and glucose. Evolution favored this switching. On a cellular level, cycling between ketones and glucose improves cellular adaptation and performance.

During the ketone phase of metabolism, there is decreased insulin, increased nerve growth factors (brain-derived neurotrophic factor), decreased inflammatory cytokines, decreased protein synthesis, increased autophagy and recycling of cellular contents, and cellular repair throughout the body and central nervous system. Genes that increase resistance to stress and improve neuroplasticity and repair are activated.

During the glucose phase of metabolic switching, cell growth and repair occurs. The mitochondria increase in number and size, increase in synapses, and repair neural and muscle tissue. Switching between glucose and ketones improves resistance to stress, speeds recovery from injury, and improves cognitive performance. Metabolic switching is what our ancestors more consistently experienced and is likely superior for increasing resistance to neurodegeneration and development of insulin resistance and decreasing inappropriate inflammation.

You can experience metabolic switching without a high fat diet, in one of two ways. You can intermittently engage in an endurance physical activity that depletes your glycogen (usually 2 to 3 hours) or extend the time you are consuming zero calories. You can begin to work toward more metabolic switching with whatever dietary pattern you are currently following.

Options to increase metabolic switching:

1. **Time-restricted feeding.** Extending the time period of consuming zero calories will increase time in ketosis. Many individuals deplete glycogen stores after 12 hours of zero calorie consumption and begin switching to burning ketones.
2. **Fasting patterns.** This could include alternate day fasting, a periodic fast, or periodic calorie restriction of 200 to 1000 kcal/day. This also depletes glycogen, forcing the body to switch to burning ketones.
3. **Endurance physical activity without additional calories.** This would need to be long enough and of sufficient intensity to deplete glycogen and switch to ketone burning.
4. **Cycling between ketogenic eating and a low glycemic index diet.** Switching to a diet slightly higher in protein and carbohydrates that excludes simple sugars or other foods that dump a lot of glucose into the bloodstream is preferable.

Most of the chronic diseases afflicting adults and children are the result of a conflict between the environment in which our DNA evolved and the diet, lifestyle, and environment in which we currently live. If we incorporated more evolutionary principles into health care, we could likely stabilize and regress many of the cellular dysfunctions that lead to insulin resistance, early cognitive decline, autoimmune processes, and many of our chronic diseases. Metabolic switching is a powerful tool which can be added to whatever dietary pattern you are currently following.

References: Intermittent Metabolic Switching, Neuroplasticity and Brain Health Nat Rev Neurosci. 2018 Feb;19(2):63-80. doi: 10.1038/nrn.2017.156. Epub 2018 Jan 11