



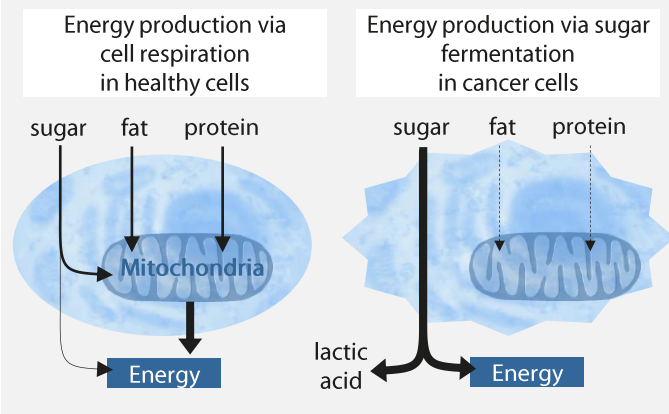
# Ketogenic diet in cancer therapy

The ketogenic diet is a dietetic treatment approach to support conventional cancer therapies. It's based on changes in the cancer cell metabolism, especially on their specific type of energy production, which is connected with a high sugar (glucose) consumption.

## What's the difference in cancer metabolism?

Many cancer cells, especially aggressive and metastasizing cancer cells, ferment sugar (glucose) to produce energy instead of using the normal energy formation way in the "powerhouses of cell", the mitochondria. But the energy production by sugar fermentation is less efficient than by cell respiration, however the energy need for growing and proliferation is much higher.

This difference compared to "normal" Cell metabolism leads to a very high sugar consumption by the cancer cell and a atypical high formation of lactic acid.



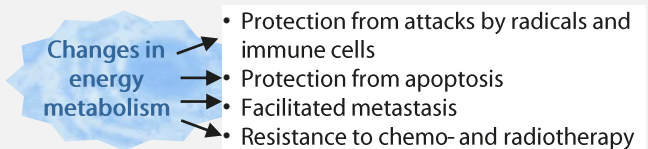
## Survival advantages and Achilles' heel

Sugar fermentation instead of cell respiration:

- blocks the formation of destructive radicals in the mitochondria and the initiation of the programmed cell death (apoptosis)
- produces lactic acid, which encases the cancer cells, protect them from immune cells and destroys the surrounding tissue to facilitate metastasizing
- promotes resistance to chemo- and radiotherapy

A high sugar intake:

- supplies cancer cells the energy they need
- encourages high blood levels of insulin and insulin-like growth factor 1 (ILG-1), two hormones that promote cancer cell growth

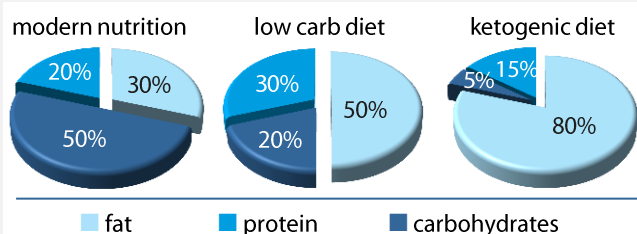


But

- this makes cancer cells addictive to sugar, while healthy cells can use fat for energy production.

## What is ketogenic diet?

The ketogenic diet was initially developed for the treatment of epilepsy, but it is now becoming more and more important for many other health problems. Typical for this nutritional approach is a very high fat intake, a moderate protein intake and a very low carbohydrate content. Expressed as energy distribution, 75-80 % of the daily calorie intake hails from fat, 15-20 % from protein and only about 5 % from carbohydrates.



Under this diet, the body switches to a so called ketogenic metabolism, where the most of the healthy cells are using fat as their main energy source. This metabolic state is similar to the condition under a therapeutic fasting cure – but with energy and nutrient intake.

## What are the benefits of a ketogenic diet?

Ketogenic diet is "fasting with energy".

Ketogenic diet

- is safe,
- supplies the energy and nutrients that cancer patients need,
- restricts the main fuel of cancer cells,
- can help to lessens some side-effects of the therapy<sup>1,2</sup>,
- could possibly improve the outcome of a conventional therapy and could potentially support the inhibition of cancer progression and metastasis (hopeful results from animal studies)<sup>3</sup>.

Sources

1. Oliveira, Camila L.P. et al. (2017): A Nutritional Perspective of Ketogenic Diet in Cancer. A Narrative Review. Journal of the Academy of Nutrition and Dietetics.
2. Tan-Shalaby, J. (2017): Ketogenic Diets and Cancer. Emerging Evidence. Fed Pract 34 (supp 1)375-425.
3. Lv, M. et al. (2014): Roles of caloric restriction, ketogenic diet and intermittent fasting during initiation, progression and metastasis of cancer in animal models: a systematic review and meta-analysis. PLoS One 9 (12)e115147.