

There are many ways in which individuals can use more natural treatments to combat cancer. This review explores the theory and evidence for a normal calorie, yet restricted, diet in the context of cancer care.

There are eight essential amino acids that are present in the human diet. Amino acids are what make up protein in the body. Methionine (Met) is one of those amino acids. It is commonly found in eggs, grains, nuts, and seeds.⁵⁹ Although “essential” to a human diet, you can be deprived of Met in your diet over the long-term and still sustain your life.¹ One unique thing of this amino acid is that it does not need to be ingested. There are ways for normally functioning cells to produce methionine with the appropriate variables in place. This becomes important regarding the manipulation of cells and how that can impact cancer treatment.

Most cancer cells differ from healthy cells in that they must have Met available in the diet for growth. Healthy cells have an advantage over cancer cells with the absence of Met in the diet. This is an opportunity to target cancer cells over normal healthy cells in restricting growth. Non-cancerous cells should be capable of surviving without Met while cancer cells would not. This has been demonstrated in animal models of various cancers.^{3,4}

There are many steps within the carcinogenic processes in which Met plays a role. Met is necessary for several steps in cancer cell growth including protein and RNA synthesis and nucleus development. These processes are influenced by the availability of methionine.^{7,8,9,10}

Furthermore, Met is needed for the production of polyamines, which are involved in cellular division and are found in higher concentration in tumors.¹¹ Polyamines are involved in the creation of cancer cells.¹² Inhibiting polyamines has been tested in men with metastatic prostate cancer by limiting polyamines through diet restriction. The testing suggested that depriving human cells of Met may delay cancer mortality.^{14,15}

A study of breast cancer cells found that Met deprivation reduced growth of tumor initiating cell (TIC) niche, a.k.a. tumor stem cells. It is possible that depriving the cancer cells of Met can block anabolic processes since Met is required for protein synthesis. There may be a benefit of caloric restriction, intermittent fasting, and vegetarian diet, by reducing protein synthesis in TICs.¹⁶

Met restriction disrupts anabolic pathways like inhibition of insulin-like growth factor (IGF) signaling and reduction in mitochondrial oxidation. These anabolic pathways are necessary for cell life. This disruption has been shown in diets containing adequate calories, but restriction of methionine. Cancerous growth pathways are well-defined and Met restriction through dietary changes may disrupt those known pathways.²²

Met restriction leads to selective death of cancer cells versus normal cells.^{23,24} Some cancer cells cannot survive without methionine. They undergo cell cycle arrest and cells may begin to be removed by the body due to a process where the body cleans out damaged cells.^{26,27} The body can discriminate against damaged cells, but not cancerous living cells.