

A Whole-Food Vegan Ketogenic Diet for Treatment of Cancer

Avoidance of high-quality animal protein can slow the growth of some cancers, likely by down-regulating plasma levels of IGF-I, which often promotes cancer growth.¹⁻³ Another dietary strategy capable of slowing the growth of some cancers is a ketogenic diet; this exploits the phenomenon that, owing to the Warburg effect, glucose is the preferred food for many aggressive cancers.⁴⁻¹¹ The low insulin associated with ketogenic diets might also have a growth retardant effect in some cancers, in part by reducing systemic IGF-I bioactivity.³ This raises the possibility that a vegan ketogenic diet – featuring nuts and seeds, olives, avocados, whole soy products (edamame, tofu), and vegetables – consumed as “finger food”, or blended together in salads dressed with medium-chain triglycerides, plant oils, and vinegar – might be of particular merit for cancer control. And such a diet, aside from being monotonous, would likely be sustainable, as it could be high enough in calories to sustain weight, and calorie intake could be *ad libitum*. (A proviso is that soy intake should be moderated, as this would be the highest protein component of the diet, and high soy intake can raise IGF-I in vegans;^{12, 13} intake of isolated soy protein products would be contraindicated.) Jenkins and colleagues have proposed an “Eco-Atkins” diet strategy – a vegan diet low in carbohydrates – as a measure for improving cardiovascular risk factors; the diet suggested here is a more carb-restricted version of this proposal.¹⁴ Although a formula diet could be devised to serve the same purpose, a diet composed of natural whole foods would likely be more acceptable to most patients for long-term use.

A further advantage of this diet should be an improvement in muscle insulin sensitivity that down-regulates diurnal insulin secretion; this follows from the fact that the diet will be very low in saturated fat, and hence have a high ratio of saturated fat, which can be expected to favorably impact insulin sensitivity of muscle.¹⁵ This should interact with the very low carbohydrate content of the diet to maintain low insulin levels throughout the day.

References

- (1) Fontana L, Adelaie RM, Rastelli AL et al. Dietary protein restriction inhibits tumor growth in human xenograft models. *Oncotarget* 2013 November 23.
- (2) Fontana L, Weiss EP, Villareal DT, Klein S, Holloszy JO. Long-term effects of calorie or protein restriction on serum IGF-1 and IGFBP-3 concentration in humans. *Aging Cell* 2008 October;7(5):681-7.
- (3) Pollak M. Insulin and insulin-like growth factor signalling in neoplasia. *Nat Rev Cancer* 2008 December;8(12):915-28.
- (4) Freedland SJ, Mavropoulos J, Wang A et al. Carbohydrate restriction, prostate cancer growth, and the insulin-like growth factor axis. *Prostate* 2008 January 1;68(1):11-9.

- (5) Otto C, Kaemmerer U, Illert B et al. Growth of human gastric cancer cells in nude mice is delayed by a ketogenic diet supplemented with omega-3 fatty acids and medium-chain triglycerides. *BMC Cancer* 2008;8:122.
- (6) Masko EM, Thomas JA, Antonelli JA et al. Low-carbohydrate diets and prostate cancer: how low is "low enough"? *Cancer Prev Res (Phila)* 2010 September;3(9):1124-31.
- (7) Klement RJ, Kammerer U. Is there a role for carbohydrate restriction in the treatment and prevention of cancer? *Nutr Metab (Lond)* 2011;8:75.
- (8) Abdelwahab MG, Fenton KE, Preul MC et al. The ketogenic diet is an effective adjuvant to radiation therapy for the treatment of malignant glioma. *PLoS ONE* 2012;7(5):e36197.
- (9) Caso J, Masko EM, Ii JA et al. The effect of carbohydrate restriction on prostate cancer tumor growth in a castrate mouse xenograft model. *Prostate* 2013 April;73(5):449-54.
- (10) Maroon J, Bost J, Amos A, Zuccoli G. Restricted calorie ketogenic diet for the treatment of glioblastoma multiforme. *J Child Neurol* 2013 August;28(8):1002-8.
- (11) Allen BG, Bhatia SK, Buatti JM et al. Ketogenic diets enhance oxidative stress and radio-chemotherapy responses in lung cancer xenografts. *Clin Cancer Res* 2013 July 15;19(14):3905-13.
- (12) Allen NE, Appleby PN, Davey GK, Kaaks R, Rinaldi S, Key TJ. The associations of diet with serum insulin-like growth factor I and its main binding proteins in 292 women meat-eaters, vegetarians, and vegans. *Cancer Epidemiol Biomarkers Prev* 2002 November;11(11):1441-8.
- (13) Dewell A, Weidner G, Sumner MD et al. Relationship of dietary protein and soy isoflavones to serum IGF-1 and IGF binding proteins in the Prostate Cancer Lifestyle Trial. *Nutr Cancer* 2007;58(1):35-42.
- (14) Jenkins DJ, Wong JM, Kendall CW et al. The effect of a plant-based low-carbohydrate ("Eco-Atkins") diet on body weight and blood lipid concentrations in hyperlipidemic subjects. *Arch Intern Med* 2009 June 8;169(11):1046-54.
- (15) McCarty MF. Dietary saturate/unsaturate ratio as a determinant of adiposity. *Med Hypotheses* 2010 July;75(1):14-6.