The Science of Health, Nutrition and Fitness

The Raspberry Ketone Diet **Author: Carl Conroy**

Unless you have had your head hidden in the proverbial sand in the last couple of years, you could not have failed to hear about the 'raspberry ketone diet' which is being espoused by celebrity and nutritional expert alike as the new weight loss aid on the 'block'. As is natural with such 'fads,' the diet has had its antagonists, and so the validity of the ketone diet is under question and choices are confusing. So let's take a look at this new diet phenomenon and determine, from an objective viewpoint, the science behind its claims and its proven benefits if they indeed exist.

Let us start this account with a discussion of what 'raspberry ketone' actually is? Raspberry ketone also termed rheosmin (4-(4'-hydroxyphenyl)-2-butanone), is part of the molecular structure of a raspberry that gives it that distinct smell. Scientists isolated this molecule in order to use it in products such as soaps and candles. It has also been used for food flavouring and for the colour it provides to some foods. Raspberries, in fact have very low ketone content. Rather, the ketone can be derived from natural sources such as peaches, grapes, apples, rhubarb and the bark of some trees such as pine and maple trees. Another method for raspberry ketone sourcing is synthetically within the laboratory.

Raspberry ketone molecular structure is similar to another molecule called capsaicin. Capsaicin is an irritant that causes the sensation of burning when it comes into contact with tissues. This molecule gives chilli peppers, their heat characteristic. Some studies (Mori, A. *et al*, 2006; and Nakazato *et al,* 2004) have alluded to the premise that capsaicin might have benefits in the treatment of prostate cancers and pain relief. However, more specifically, and returning to our discussion on raspberry ketones, some studies on capsaicin (Kawada et al, 1986; Lejeune *et al*, 2003; Plantenga *et al*, 2004 and Yoneshiro *et al*, 2012) claim that it might have weight gain prevention properties. This of course is quite an interesting consideration where dieting and weight loss is of significance.

So what are the properties that raspberry ketones potentially have; that are proposed to result in weight loss? If it considered that raspberry ketone has a similar sympathomimetic action to capsaicin, then that could be one avenue of exploration. Raspberry ketone could cause the body to produce more adiponectin, which is a protein that helps in the regulation of metabolism and is influential in the breaking down of stored fats. This is perhaps the most common consensus in that raspberry ketones improve and even have the potential to prevent obesity and incidences of

fatty liver by altering lipid metabolism itself. So let us now look at the research that has been carried out with respect to the effectiveness of this new wonder 'drug' in the war against fat.

Research

Morimoto C, Satoh Y, Hara M, Inoue S, Tsujita T, Okuda H. (2005)

Research Method: The research was carried out to determine if raspberry ketone helps in the prevention of obesity and whether it would activate increased lipid metabolism in rodents. The scientists fed one group of rats a high fat diet including 0.5, 1 or 2% of raspberry ketone for 10 weeks. Another group of rats was fed a high fat diet for 6 weeks and then the same diet for a further 5 weeks; but the latter diet contained 1% raspberry ketone.

Results: The scientists concluded that raspberry ketones prevented the high fat diet from causing increases in body weight and the weight of the liver and visceral adipose tissues. The raspberry ketones also reduced these weights and hepatic triacylglycerol in the second rat group, after they had been elevated by the initial high fat diet. Raspberry ketones were also found to significantly increase noradrenaline induced lipolysis. To summarise this study's findings, it determined that raspberry ketones prevent and improve fatty liver and prevent and decrease obesity.

Kyoung S. P. (2010)

Research Method: The research set out to determine a possible mechanism for the anti-obesity action of raspberry ketone and, its effects on the expression and the secretion of adiponectin, lipolysis, and fatty acid oxidation. Raspberry ketone was used *in vitro* with differentiated 3T3-L1 cells (mice cells used in studies on adipose tissue).

Results: It was determined that raspberry ketone increased both the expression and the secretion of adiponectin, an adipocytokine mainly expressed and secreted by adipose tissue. In addition, treatment with 10 μM of raspberry ketone increased the fatty acid oxidation and suppressed lipid accumulation in 3T3-L1 adipocytes. These findings suggest that raspberry ketone holds great promise as an herbal medicine since its biological activities alter the lipid metabolism in 3T3-L1 adipocytes.

Wang L, Meng X, Zhang F.J. (2012)

Research Method: Forty rats with a 1:1 male to female ratio were randomly divided into five groups. The rats were subjected to various nutritional regimes that contained normal diet, a high fat diet and the other groups were fed varying levels of raspberry ketone. This was carried out for 8 weeks and then various tests were carried out to establish factors such as blood lipid content, liver function parameters and blood glucose and insulin levels.

Results: Raspberry ketone was an effective intervention for the rats. It was believed that raspberry ketone had a dual effect of liver protection and fat reduction, and the mechanism was probably mediated by alleviation of fatty degeneration of liver cells, decreased liver inflammation resistance, and improved antioxidant capacity.

Therefore, in general summary of the research outlined above, there were some recorded beneficial effects of the raspberry ketone application to the rodent community. Many of these benefits resulted in the reduction or inhibition of fat storage, among other health benefits. As yet, there have been no significant human trials to affirm this deliberation. It therefore falls to the potential user of raspberry ketone to determine the application of such a dietary aid in pursuit of their weight loss goal. There have been no significant accounts of negative side effects related to

the use of raspberry ketone but again it is very early days to arrive at any significant claims to the drug's safety.

So having determined that raspberry ketone has some benefits how would one apply its use to the weight loss programme? The recommended doses for raspberry ketone is between 100mg and 300mg per day. It is not recommended that you exceed this dose and the recommendation is that you start on the lower dose. Until significant human trials are carried out, the effectiveness of this dose is purely conjecture based but it is a valid starting point for the proposed user and usually equates to about two tablets per day.

If you would like to provide an anecdotal account or put forward your opinion regarding the validity of this new wonder drug, please feel free to provide your viewpoint or experiences in the raspberry ketone blog.

Glossary

Adipose – Of or relating to fat e.g. Adipose tissue is a type of connective tissue consisting of adipose cells.

Adiponectine - Adiponectine is an adipocyte-specific protein, which plays a role in the development of insulin resistance and atherosclerosis and that helps in the regulation of metabolism and the breaking down of stored fats.

Adipocytokine - Cytokines (secreted by certain cells of the immune system and that have an effect on other cells) secreted by adipose tissue.

Capsaicin - Capsaicin is the main active component of chilli peppers, which is taken from the plant's tissues and which gives the chilli is, heated characteristic.

Ketone – An organic compound containing a carbonyl group bonded to two hydrocarbon groups.

Lipids - Any of a class of organic compounds that are fatty acids or their derivatives and are insoluble in water but soluble in organic solvents. They include many natural oils, waxes, and steroids**.**

Lipolysis - The breakdown of lipids which involves hydrolysis of triglycerides into glycerol and free fatty acids.

Metabolism - The physical and chemical processes in the body that sustain life within the cells of living organisms.

Noradrenaline - A neurotransmitter in the catecholamine family that mediates chemical communication in the sympathetic nervous system. Actions include increased glycogenolysis (the conversion of glycogen to glucose) in the liver, increased lipolysis (the conversion of fats to fatty acids) in adipose (fat) tissue, and relaxation of bronchial smooth muscle to open up the air passages to the lungs.

Sympathomimetic – Drugs that mimic the effects of transmitter substances of the sympathetic nervous system such as catecholamine's i.e. adrenaline.

Triacylglycerol (Triglyceride) - An ester derived from glycerol and three fatty acids

References

Gaunt IF, Sharratt M, Colley J, Lansdown AB, Grasso P. **Acute and short-term toxicity of p-hydroxybenzyl acetone in rats.** Food Cosmet Toxicol.1970;8:349-358

Ito, K; Nakazato T, Yamato K et al. (February 2004). **"Induction of apoptosis in leukemic cells by homovanillic acid derivative, capsaicin, through oxidative stress: implication of phosphorylation of p53 at Ser-15 residue by reactive oxygen species".***Cancer Research* (American Association for Cancer Research) **64** (3): 1071–1078

Lejeune, Manuela P. G. M., Eva M. R. Kovacs, and Margriet S. Westerterp-Plantenga. **"Effect of Capsaicin on Substrate Oxidation and Weight Maintenance after Modest Body-weight Loss in Human Subjects**." British Journal of Nutrition 90.03 (2003): 651.

Kyoung Sik Park, **Raspberry ketone increases both lipolysis and fatty acid oxidation in 3T3-L1 adipocytes.** Planta Med 2010;76:1654-8.

Kawada T, Hagihara K I, Iwai K. **Effects of capsaicin on lipid metabolism in rats fed a high fat diet.** J Nutr 1986; 116: 1272—8.

Mori, A; Lehmann S, O'Kelly J et al. (March 2006). "**Capsaicin, a component of red peppers, inhibits the growth of androgen-independent, p53 mutant prostate cancer cells".** *Cancer Research* (American Association for Cancer Research) **66** (6): 3222–3229.

Morimoto C, Satoh Y, Hara M, Inoue S, Tsujita T, Okuda H. **Anti-obese action of raspberry ketone.** Life Sci. 2005;77:194-204

Westerterp-Plantenga, M. S., A. Smeets, and M P G. Lejeune. "**Sensory and Gastrointestinal Satiety Effects of Capsaicin on Food Intake."** International Journal of Obesity 29.6 (2004): 682-88.

Wang L, Meng X, Zhang F.J. **Raspberry ketone protects rats fed high-fat diets against nonalcoholic steatohepatitis.** Med Food. (2012 May);15(5):495-503.

Yoneshiro, Takeshi, Sayuri Aita, Yuko Kawai, Toshihiko Iwanaga, and Mayayuki Saito. **"Nonpungent Capsaicin Analogs (capsinoids) Increase Energy Expenditure through the Activation of Brown Adipose Tissue in Humans."** American Society for Nutrition (2012).