

Capstone Literature Review

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The fact that diets are called into question is due to the rise of obesity in America. In the past 20 years, the average American male weight has risen by 12 pounds and the average American female weight has risen 10 pounds (Cutler, Glaeser & Shapiro, pg. 1, 2003). This is believed to be due to a raise in caloric intake and not a reduction of physical activity (Cutler, Glaeser & Shapiro, pg. 1, 2003). Some of the factors that Cutler, Glaeser & Shapiro suggest in their article are the innovations in food production which have led to the lower cost of prepared foods. So what are the benefits of weight-loss for Americans? There are short term benefits that include improvement in insulin sensitivity, glucose disposal, hypertension, triglyceride levels, and pulmonary function (Pi-Sunyer, pg. 1-4, 1993).

The ever growing popularity of diets is evident by book sales. The Atkins diet books alone have sold well over 45 million copies (Astrup et al, pg 1, 2004). The issues that the Atkins program face are the critiques arguments of nutrition; namely, how can someone who eats meats high in fat, butter and other high-fat dairy products consider it a healthy means of weight-loss? The low-carbohydrate diet restricts a person's intake of carbohydrates to fewer than 30 grams a day (Astrup et al, pg. 1, 2004). It was found that a person who followed the Atkins program versus a low calorie diet actually lost more weight in six months; however, within a year, weight loss between the two groups showed no difference in weight-loss amounts. The issues brought up in this article call into question the long term effects of using the Atkins program. Glycogen stores are severely depleted which leads to excretion of bound water (Astrup, pg. 2, 2004). Also, when limiting carbohydrates, your body goes into a ketogenic

state which has shown that ketosis might also pose a risk of cardiac arrhythmias (Astrup et al, pg. 2, 2004). I have major concerns, as a health minded individual, with a diet that promotes poor nutritional choices. We have seen that a high fat diet leads to many health issues included clogged arteries, obesity, and heart issues; I also feel that this diet doesn't have an "exit" plan or maintenance plan to help people continue living healthy for the long-term.

Studies regarding the safety of low-carbohydrate diets for long-term use have been found inconclusive (Bravata, pg 12, 2003). For obese patients who were on a low-carbohydrate diet, the weight-loss observed was due to a "decrease in caloric intake and increased diet duration but not with reduced carbohydrate content" (Bravata, pg 1, 2003). This makes sense that a person who is obese has now reduced their caloric intake with any diet. This study did not have information regarding risk factors for using a low-carbohydrate diet for longer than 90 days. What the study did find was that the highest amount of weight-loss occurred in participants who had the lowest caloric intake (Bravata, pg 7, 2003). The article references the need for a long term effect of the ketosis state and ketogenic diets. I also would like to add that my brother has personally used low-carbohydrate methods for the past five years. His weight has fluctuated from 230 pounds to 180 pounds, he is currently at 215 pounds; he has also been diagnosed with hypertension. This is in direct comparison to my weight-loss method of caloric deficits within the past 15 months; my weight has gone from 285 pounds to 180 pounds; I have also eliminated my high cholesterol and hypertension.

In a yearlong study, the Atkins diet (low-carbohydrate and high-protein) did not statistically improve LDL cholesterol levels (rather it raised them) and worsened HDL (lowered) cholesterol levels (Dansinger, Gleason, Griffith, Selker, & Schaefer, pg. 8-10, 2005). This is what I fear has affected my brother already in his weight-loss methods.

In trying to treat the epidemic of obesity, many studies have shown that within the six month time frame, low-carbohydrate diets do not have negative effects on important cardiovascular functions (Brehm, Seeley, Daniels, & D'Alessio, pg 1, 2004). The study conducted by Brehm, Seeley, Daniels and D'Alessio also confirms that low-carbohydrate diets do result in greater fat and weight-loss at three and six months when being compared to a very low-calorie diet. It should also be noted that the results of this study are still limited by a six month time frame and should show concern for the diets ability to produce sustained weight loss and improve cardiovascular risk factors (Brehm, pg. 6, 2004). Another issue addressed by the researchers was that of the low intake of fiber and calcium, which could have negative impacts on the long term (Brehm, pg. 6, 2004). Again, I do not disagree with a low-carbohydrate diet as a means of weight-loss and this study helps me understand that negative effects are not seen within a standard window of time frame, but the researchers and I question the safety of this program after six months. The best evidence out there indicates we should be following a diet plan that uses non-hydrogenated unsaturated fats for fat intake and whole grains for carbohydrates (Hu & Willett, pg. 1, 2002). By following a diet with an abundance of fruits and

vegetables, and adequate omega-3 fatty acids, we can develop a method for protection against coronary heart disease (Hu & Willett, pg. 1, 2002).

As parents try to find methods to help their children with weight-loss before it becomes an adult issue, they could turn to popular fad methods such as the Atkins program. It has been shown that in a high-fat ketogenic diet, HDL cholesterol had significantly decreased (Kwiterovich, Vining, Pyzik, Skolasky, Freeman, pg. 1, 2003). Furthermore, participants in the study had significant increase in LDL cholesterol levels after six months on the ketogenic diet and only one in six participants had a cholesterol or triglyceride level in the acceptable range (Kwiterovich, Vining, Pyzik, Skolasky, Freeman, pg. 8, 2003).

So why is it that people who are on a low-carbohydrate diet lose more weight than someone on a reduced calorie diet? After all, a calorie is just a calorie: a unit of energy and is equal to 4.184 absolute J (Buchholz & Schoeller, pg. 1, 2004). What is believed to be one of the culprits for the added weight loss is the process of ketosis itself; after 12 weeks in a study, participants on the low-carbohydrate diet lost about 2.5 kg more than those on the low-calorie diet. This might be due to the loss of glycogen stores and associated water, which can be as great as 2 kg (Buchholz & Schoeller, pg. 6, 2004). The real issue lies with the Atwater factors (the calories each gram of fat, protein, and carbohydrate contain); it has been shown that the energy (calories) we place into our bodies metabolizes differently and the results of greater weight-loss could be due to the influence of satiety of high protein intake (which is common in

low-carbohydrate diets) (Buchholz & Schoeller, pg. 7, 2004). This is interesting to know because we haven't fully explored how the body metabolizes the macro-nutrients (fat, protein, and carbohydrates) differently. What we do know is that we can't destroy energy but only transform it; as Buchholz and Schoeller have explored, some macronutrients when substituted for another (especially protein) can have a "significant effect on the expenditure half of the energy balance equation." If thermodynamics supports inefficiency in metabolic processes than there indeed exists a "metabolic advantage" to high protein diets (Fine & Fineman, pg. 7, 2004). Are the benefits of weight-loss from Atkins (the higher protein is a trade off for the low-carbohydrate intake) worth the disadvantages to cholesterol levels?

There have been two biomarkers of longevity that have been identified within humans that improve when placed on a reduced caloric diet (Heilbronn, Jonge, Frisard, Delany, Larson-Meyer, Rood, et al, Page 1, 2006). It isn't known whether these have a prolonged effect on human aging or are sustained long term benefits but there is proof that there is a decline in DNA damage; also VO₂ levels achieve a "metabolic adaptation" even after weight stability has been achieved (Heilbronn, Jonge, Frisard, Delany, Larson-Meyer, Rood, et al, Page 10, 2006). This is one of the few studies that attempts to look at the other benefits of reduced calorie diets and how they benefit humans in terms of longevity and whether this is more beneficial than a carbohydrate restricted diet. What is more interesting is there are no possible dangers for people down the line with a reduced caloric intake but rather a host of benefits that still need to be explored further. What has been evident for very low-calorie diets (VLCDs) is the

ability to long-term weight-maintenance success (Saris, pg 1, 2001); this is direct contrast to the number of people on ketosis diets being rare among the 3,000 subjects found in the National Weight Loss Registry who have lost at least 30 pounds and kept the weight off for at least six years (Larson & Murray-Davis, pg. 4, 2005).

While there are two diet camps clearly divided among issues, there are some congruencies between them. Mainly the agreement is between a few critical points: “A diet rich in fruits, vegetables, whole grains, low-fat dairy products, lean meats, poultry, and fish” are necessary to promote weight-loss (Larson & Murray-Davis, pg. 1, 2005). Even though these two camps can come to a similar train of thought, the diet business has become more profitable and obesity rates continue to soar higher in the United States (Larson & Murray-Davis, pg. 1, 2005).

References

- Astrup, A., Meinert L., Harper A. (2004). Atkins and other low-carbohydrate diets: hoax or an effective tool for weight loss? *The Lancet*, 364, 897-899.
- Bravata MD, MS, D., Sanders MD, L., Huang MD, J., Krumholz MD, SM, H.M., Olkin PhD, I., Gardner PhD, C., et al (2003). Efficacy and safety of low-carbohydrate diets. *JAMA*, 289 No. 14, 1837-1850.
- Bucholz, A., & Schoeller, D. (2004). Is a calorie a calorie? *American Journal for Clinical Nutrition*, 79, 899S-906S.
- Cutler, D., Glaeser, D., & Shapiro, J.M. (2003). Why have Americans become more obese? *The Journal of Economic Perspectives*, Vol. 17, No. 3 (Summer, 2003), pp. 93-118
- Dasinger MD, M.L., Gleason MS, RD, J.A., Griffith PhD, J.L., Selker MD, MSPH, H.P., Schaefer MD, E.J. (2005). Comparison of the atkins, ornish, weight watchers and zone diets for weight loss and heart disease risk reduction. *JAMA*, 293, 43-53.
- Fine, E. & Feinman, R. (2004). Thermodynamics of weight loss diets. *Nutrition & Metabolism* 2004, 1:15.
- Heilbronn PhD, L.K., De Jonge PhD, L., Frisard PhD, M.I., Delany PhD, J.P., Larson-Meyer PhD, D.E., Rood PhD, J., et al (2006). Effect of 6-month calorie restriction on biomarkers of longevity, metabolic adaptation, and oxidative stress in overweight individuals. *JAMA*, 295 No. 13, 1539-1548.
- Hu MD, PhD, F.B., Willett, MD, DrPH, W.C. (2002). Optimal diets for prevention of coronary heart disease. *JAMA*, 288 No. 20, 2569-2578.
- Kwiterovich, Jr, MD, P.O., Vining, MD, E.P., Pyzik, BA, P., Skolasky, Jr, MA, R.S., Freeman, MD, J.M. (2003). Effect of a high-fat ketogenic diet on plasma levels of lipids, lipoproteins, and apolipoproteins in children. *JAMA*, 290 No. 7, 912-920.
- Larsen, D. & Murray-Davis, M. (2005). A tale of two diets: what can we learn from the diet wars? *The Health Educator*, 37 No. 1, 22-27.
- Pi-Sunyer, F.X. (1993). Short-term medical benefits and adverse effects of weight loss. *Annals of Internal Medicine*, 119 Issue 7 Part 2, 722-726.

Saris, W.H.M. (2001). Very-low-calorie diets and sustained weight loss. *Obesity Research*, 9 Suppl. 4, 295S-301S.