Low Carbohydrate Diets in Weight Management
A position statement by DOM UK

12th April 2005

1. Effective dietary approaches are necessary for weight management (comprising weight loss & weight maintenance) to challenge the world-wide epidemic of obesity [1].

2. Low carbohydrate dietary advice, defined as 20-40 g carbohydrate daily during the weight loss phase, and most often promoted as the "Atkins diet", has generated huge international interest since publication of the books "Dr Atkins diet revolution" in 1972 and the updated Dr Atkins new diet revolution" in 1998 [2].

3. Dietary principles of the low carbohydrate diet are to achieve weight loss, weight maintenance and good health by limiting carbohydrate intake, whilst consuming foods rich in protein and fat in unlimited quantities[2]. However, the official recommendation for daily carbohydrate intake for healthy males and females is approximately 50% of food energy [3]. Atkins, the most well known low carbohydrate diet, claims to "efficiently switch your body from a carbohydrate-burning metabolism to a primarily fat-burning one (your fat!)" [4]. Foods to be eaten freely on a low carbohydrate diet include red meat, fish, poultry, eggs and fats. Foods severely restricted are most fruits, some vegetables, sugar, rice, pasta and other grain products. Saturated fat intake is frequently around 23% of food energy and total fat can exceed 50%.

4. The initial 1-2 kg weight loss achieved with a low carbohydrate diet is mostly due to glycogen and associated fluid losses[5]. The satiating effects of protein seem to help control appetite and have been shown to enhance weight loss over 6 months[6].

5. A 1-year randomised controlled study of 63 overweight and obese subjects [7] compared advice to either consume a high carbohydrate diet (60% energy) or follow the "Atkins diet" in a 12 month study. Atkins involved consuming 20g carbohydrate daily for 2 weeks and then gradually increasing carbohydrate intake until "a stable and desired weight was achieved". A significantly greater percentage weight loss was achieved with the low carbohydrate approach at 3 months (–6.8 SD 5.0 vs –2.7 SD 3.7 %), and at 6 months (-7.0 SD 6.5 vs –3.2 SD 5.6 %), but at 12 months no between treatment differences were apparent (-4.4 SD 6.7vs –2.5 SD 6.3 %)[7]. Attrition was greatest in the conventional diet at 3 months, however, at 12 months there was around a 40% attrition from the study overall, leaving only 20 in the Atkins group and 17 in the conventional group.

6. Yancy et al [8] compared a low carbohydrate diet with standard low fat advice with a 500 kcal daily energy deficit, (30% energy from fat) over a 24 week period. Low carbohydrate subjects achieved a greater weight loss (–12.9 vs –6.7%, $p<0.001$). However the weight loss predicted with 100% compliance with dietary advice was also different between groups: 12.9% in the low carbohydrate diet and only 6.7% in the low fat group. Attrition was 14% in the low carbohydrate and 43% in the low fat group.

7. Brehm et al [9] carried out a study of 53 obese women randomised to either an *ad libitum* very low carbohydrate diet or a calorie restricted low fat diet. At six months 42 people completed the study, the low carbohydrate diet group lost more weight (8.5 SD 1.0 kg vs. 3.9 SD 1.0 kg) than those in the low fat group. Attrition from the intervention was 7 from the low fat group and 4 from low carbohydrate diet.

8. A six month study in obese subjects with metabolic syndrome randomised 68 subjects to low fat and 64 to low carbohydrate approaches [10]. Results showed those advised to follow a diet where carbohydrate intake was restricted to 30g daily lost 5.8 SD 8.6 kg compared to 1.9 SD 4.2 kg in those following a low fat 500kcal daily energy deficit diet. Again as in the study by Yancy [8], the predicted weight loss on the low carbohydrate diet was greater than on low fat. Attrition was high in both groups, 47% in the low fat and 33% in low carbohydrate group. However, the restricted carbohydrate group showed greater improvements in cardiovascular risk factors even after adjustments for amount of weight lost [10].

9. Stern et al (2004) [11] report data on the same individuals [10] but at one year. Low carbohydrate subjects maintained their 6 month weight loss at 1 year, whereas the low fat group continued to lose weight for the year. Overall the 2 kg difference in weight loss between the groups (5.1 SD 8.7 vs 3.1 SD 8.4) was not significant (p=0.195).

10. Two one-year studies reported results of advice to consume a high protein intake in which the level of carbohydrate intake varied [13,14]. These studies are relevant as they directly highlight the role of increased protein diets in weight management. Brinkworth et al [12] compared lower and higher carbohydrate diets, 40% energy from carbohydrate and 30% protein against 55% carbohydrate and 15% protein. No significant differences in weight loss according to dietary treatment were observed at week 68 (-4.1% vs –2.9%). Due et al [14] examined the effects of high protein (25% energy) and medium protein (12% energy) consumed on an *ad libitum* basis. At 12 months weight loss was not significantly different between groups (6.2 vs 4.3 kg). However, the high protein group showed a 10% greater reduction in abdominal fat. At 24 months both groups tended to maintain their weight loss, but attrition from the study as a whole was high (50%).

11. Efficacy and safety of low carbohydrate diets were considered in a recent systematic review (1966-2003) [12]. Weight loss was associated with longer diet duration and reduction in calorie intake, but not with low carbohydrate intake. The authors concluded that there was insufficient evidence to make recommendations for or against this approach, particularly among participants older than age 50 years, for use longer than 90 days, or for diets of 20 g/d or less of carbohydrates [12].

12. Weight maintenance appears no more assured by low carbohydrate diets than conventional approaches. Furthermore, a low carbohydrate diet is likely to compromise glycogen stores and affect the ability to be physically active [15]. Increasing physical activity is a cornerstone of obesity treatment and a tool to improve weight maintenance [16]. Interestingly physical activity of study participants is not reported in the majority of studies considered here [7-11].

13. No studies have reported any clear negative health effects of a low carbohydrate diet in terms of cardiovascular risk factors in the short term. A low carbohydrate approach does not adversely affect serum lipids, fasting serum glucose or insulin[12]. Evidence that low carbohydrate diets effectively facilitate long term weight loss (a year or more) is sparse [16].

Conclusion

- Evidence from randomised trials suggests marginally improved weight loss over the short term with low carbohydrate diets. However, studies are small and attrition is high[17].
- Some study designs incorporate a higher predicted weight loss in the low carbohydrate group than the comparator diet. The improved weight loss on the low carbohydrate diet may then be attributed to a greater energy restriction rather than differences in diet composition.
- The long-term (> 1 year) health effects of low carbohydrate diet, so at odds with international dietary guidelines[18], are unknown in terms of cardiovascular health, renal function, bone health and cancer risk[19], especially in those with obesity related diseases. Evidence of nutritional shortfalls have been recorded[20].
- At present DOM (UK) consider that there is insufficient evidence to advocate the routine use of a low carbohydrate diet in weight management.

References

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Low carbohydrate diets: questions and answers

1. What is a low carbohydrate diet?

Usually this is 20-40g carbohydrate daily.

2. Does a low carbohydrate diet agree with current dietary guidelines?

A low carbohydrate diet is largely opposed to current dietary guidelines and encourages high consumption of saturated and total fat, discourages or restricts consumption of whole grains, many fruits and pulses and some vegetables. Folate, calcium and dietary fibre intakes are likely to be well below recommendations.

3. How effective is a low carbohydrate diet in achieving weight loss?

A) Short term (3 months): a weight loss of around double that of a low fat energy deficit diet was achieved with a low carbohydrate diet.
B) Medium term (6 months): weight loss was better with a low carbohydrate diet than a conventional low fat approach.
C) Longer term (12 months) Weight loss was no better with the low carbohydrate than with the comparator diet.

4. Are there any negative health effects from following a low carbohydrate diet?

No negative health effects have yet emerged from following a low carbohydrate diet in terms of blood pressure, fasting insulin, glucose or lipids.

5. Long term health effects from consuming a diet at odds with international dietary guidelines are as yet unknown.

Conclusion

At present DOM (UK) consider that there is insufficient evidence to advocate the routine use of a low carbohydrate diet in weight management.