

Long- and Short-Term Cardiometabolic

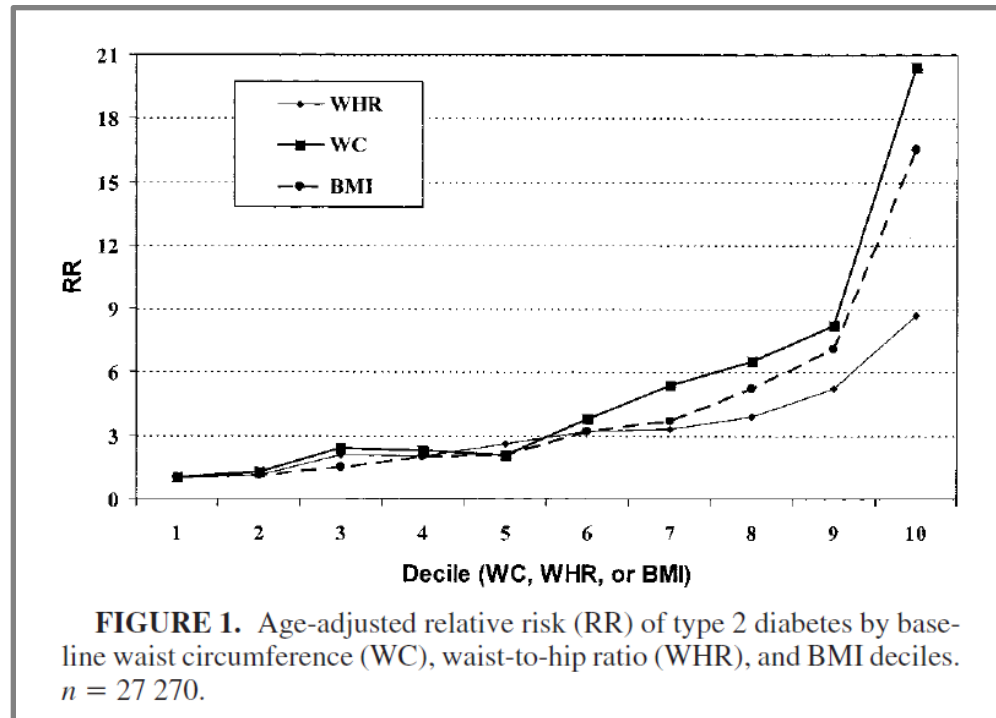
Health Effects of Diets

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Obesity increasing in epidemic proportions

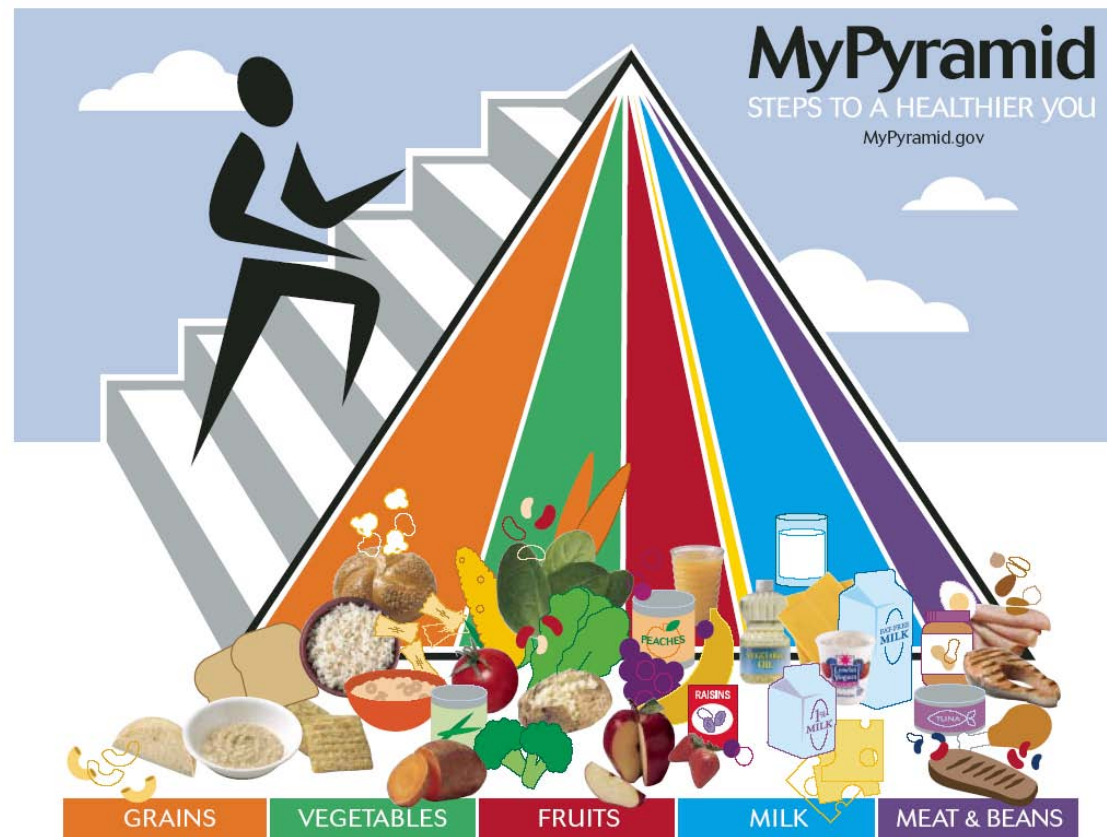
Predisposes to type 2 diabetes



From: Wang et al. Am J Clin Nutr 81:555-563, 2005

Mainstream lifestyle recommendations for maintaining a healthy body weight based on:

- healthy balanced diet (moderate-high carbohydrate)
- sufficient physical activity



While mainstream lifestyle recommendations are effective for weight management, many people have difficulty complying

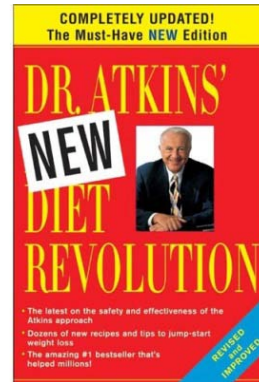
People are looking for “easier options”



**“unconventional” diets emerging which
promise greater benefits for less effort**



Low-carb diets one of the most popular



From: http://www.sapienstrade.com/WM15.php?psps_page=26

Dr Atkins Diet Books

2nd edition (2002) sold >50,000

copies in Australia (APA Bestseller Survey)

Hollywood celebrities

Brad Pitt reported using a low-carb diet when preparing for Troy



From: www.strengthfighter.com

Increasing range of low-carbohydrate products entering the market-place



From: www.empowerfoods.com.au/products

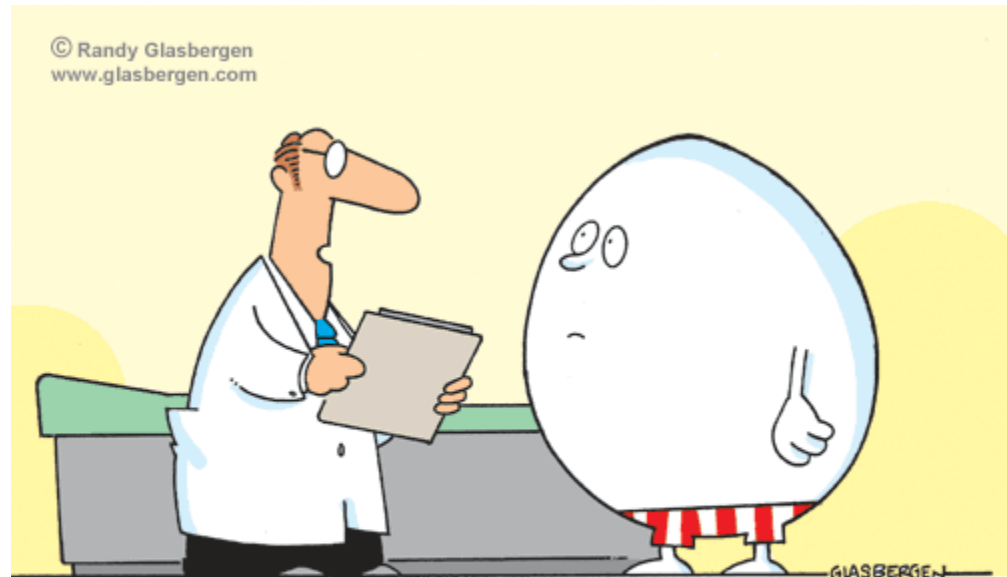


From: www.atkins.com



From: www.fosters.com.au/enjoy/beer/pureblonde.htm

More people asking health professionals about potential benefits of low-carb diet



**"You're very low in carbohydrates, Humpty.
I'm surprised you're not a lot thinner!"**

From: www.glasbergen.com

What is a low-carbohydrate diet?



No standard definition



From: www.vitalifechiropractic.com

Low carbohydrate diet generally considered to be 30 – 130 g CHO/day (~6 – 30% energy intake)¹

Atkins diet

20g CHO/day (~4-5% energy intake) for weight loss

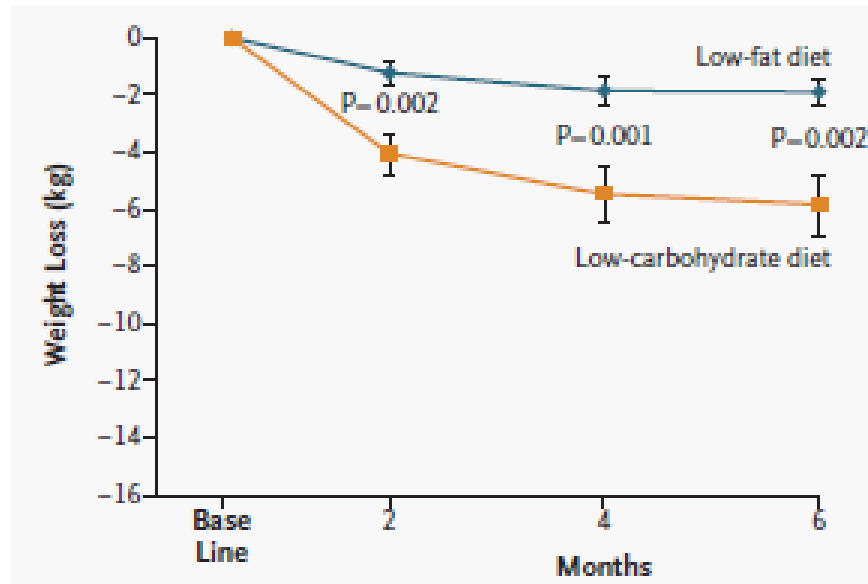
40g CHO/day (~8-10% energy intake) for weight maintenance



From: www.thoss.co.th

**Is there any evidence to support
benefits of low-carbohydrate diets?**

Low-carb *ad libitum* diet vs energy-restricted low-fat diet resulted in greater weight loss over 6 months^{1,2,3}



From: Samaha et al. N Engl J Med 2003;348:2074-2081

Conflicting findings over 12 months^{1,4}

Meta-analysis of RCT's with *ad libitum* intake concluded
greater weight loss over 6 months but not 12 months⁵

¹ Foster et al. N Engl J Med 2003;348:2082-2090, ² Samaha et al. N Engl J Med 2003;348:2074-2081

³ Brehm et al. J Clin Endocrinol Metab 2003;88:1617-1623. ⁴ Gardner et al. JAMA 2007;297:969-977.

⁵ Nordmann et al. Arch Intern Med 2006;166:285-293.

Ad libitum approach makes it difficult to interpret mechanism underlying greater initial weight loss

May be due to:

- voluntary energy-restriction
- “metabolic benefit” of low-carb intake

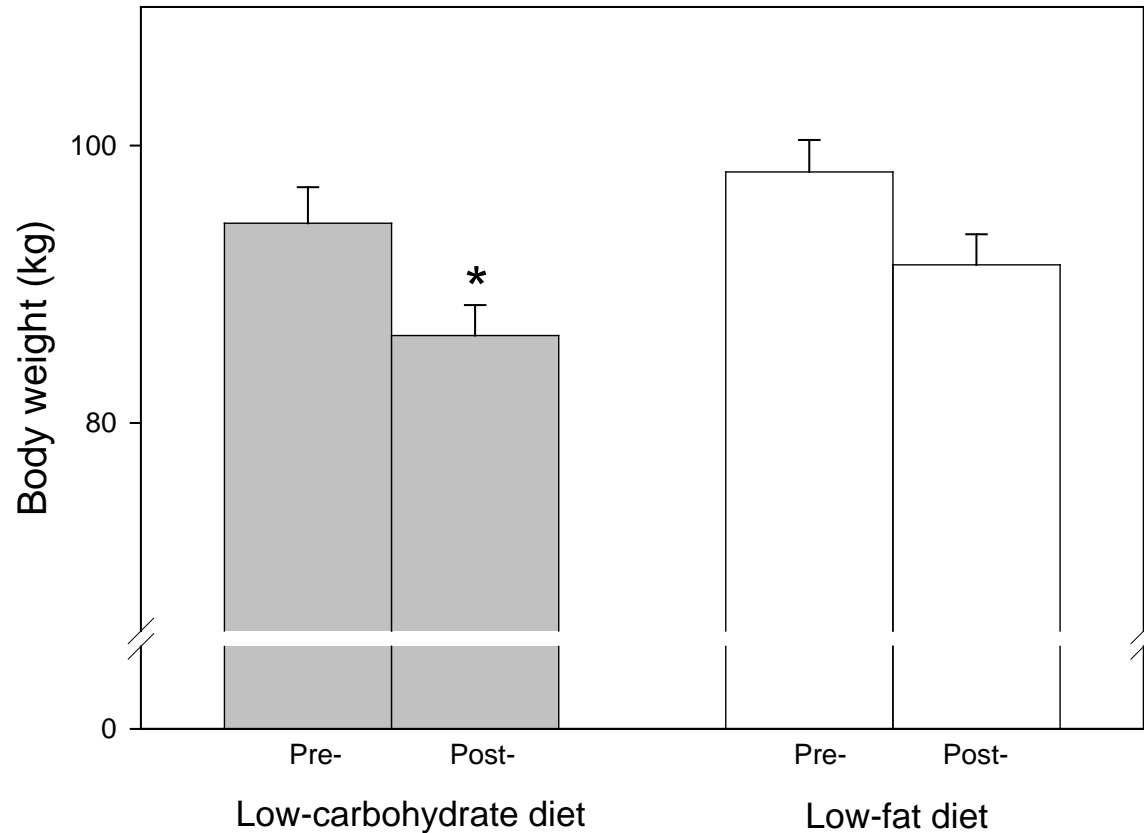


**We sought to examine the effect of a
low-carbohydrate diet without
potential confounding by differences in
energy intake**



- 118 overweight/obese adults
- 12 month intervention
- **Low-carbohydrate, high-saturated-fat diet (Atkin's Diet)**
 - 4% carbohydrate
 - 35% protein
 - 61% fat (20% saturated fat)
- **Low-fat moderate-carbohydrate diet**
 - 46% carbohydrate
 - 24% protein
 - 30% fat (<8% saturated fat)
- **Diets were isocaloric (6-7 MJ/d, 30% energy-deficit)**

Greater weight loss (8.1 vs 6.7 kg) over 8 weeks¹ but not over 6 months² or 12 months³



Adapted from: Brinkworth et al. Obesity 17:1916-1923, 2009

¹ Brinkworth et al. Obesity 17:1916-1923, 2009, ² Tay et al. J Am Coll Cardiol 2008;51:59-67

³ Brinkworth et al. Am J Clin Nutr 2009;90:23-32

Summary of weight loss effects

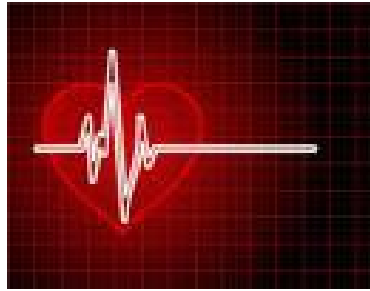
Low-carbohydrate diets (ad libitum or isocaloric) promote greater weight-loss than conventional diets over the short-term

Does not appear to be due to differences in energy-intake

Most evidence favours no greater weight-loss over the longer-term

But continue to lose as much weight as with conventional diet

Other
benefits?



From: www.heart-valve-surgery.com

**Are there other health benefits of a
low-carbohydrate diet?**



From: www.calmainefoods.com



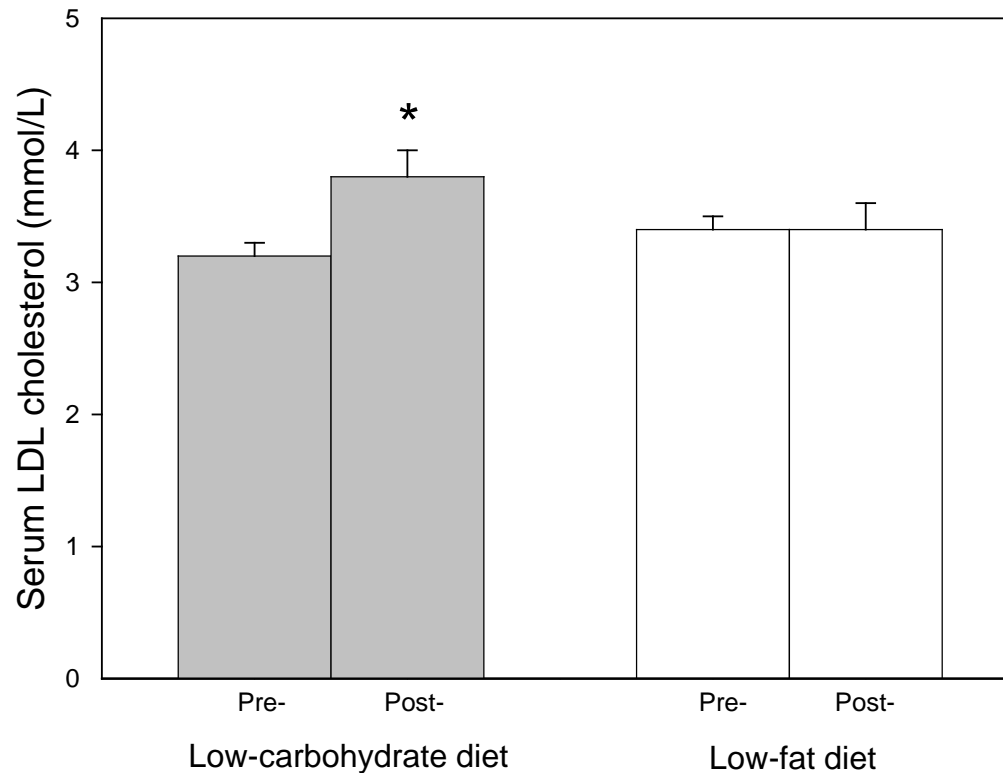
We showed short-term effects (2 mo) of low-carbohydrate diet on traditional CVD risk factors similar to low-fat diet ¹ except:

- greater improvements in:
 - HDL
 - triglycerides
- lesser improvements in:
 - Total cholesterol
 - LDL

Long-term effects similar to low-fat diet except¹:

- greater improvements in
 - HDL
 - triglycerides

- increased :
 - Total cholesterol
 - LDL



**Other
benefits?**

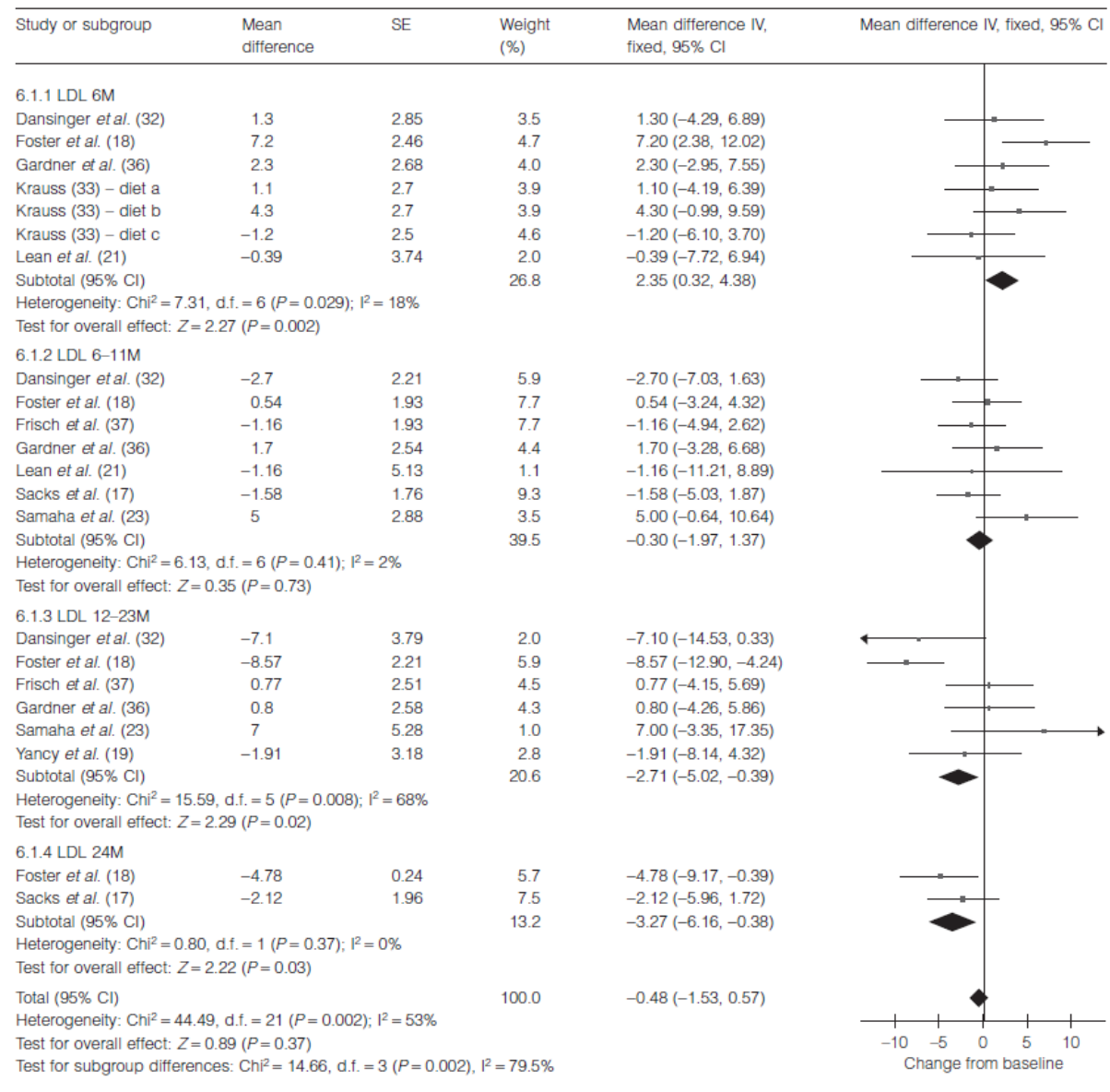
**Increase in LDL raised concern of longer-term
adverse effect on CVD risk.**



Other benefits?

Recent meta-analysis showed increase in LDL over 6 months, but decrease over longer term¹

Table 10 Forest plot for LDL-cholesterol change associated to low-carbohydrate diets (mg per dL)



¹ Santos *et al.* *Obes Rev* 13:1048-1066, 2012.

**Meta-analysis allayed some fears in relation
to long term adverse effects of low-CHO
diets on CVD risk¹**

Summary of cardiometabolic effects

Similar benefits for traditional CVD risk factors as other diets, except for:

- short term increases in LDL
- greater increases in HDL
- greater decreases in triglycerides

Other
benefits?

HOWEVER!

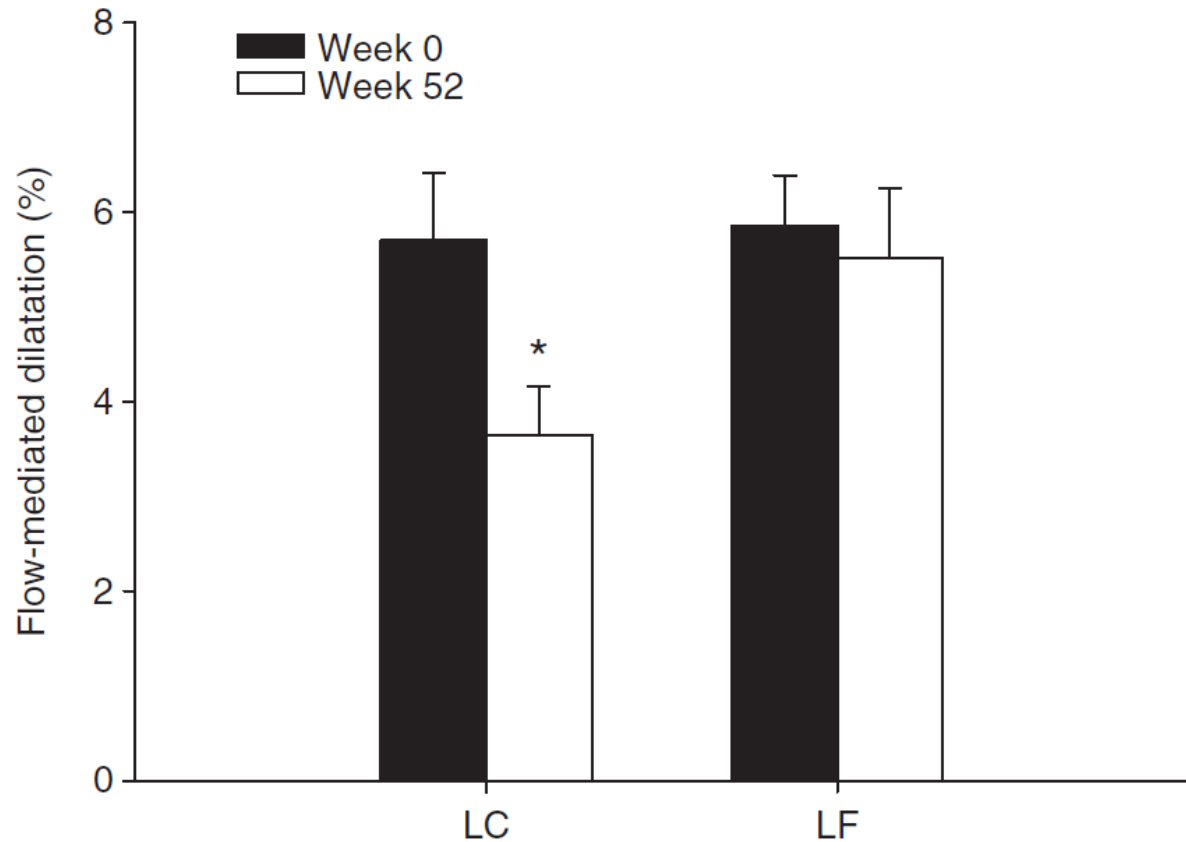


From: www.clipartpal.com



University of
South Australia

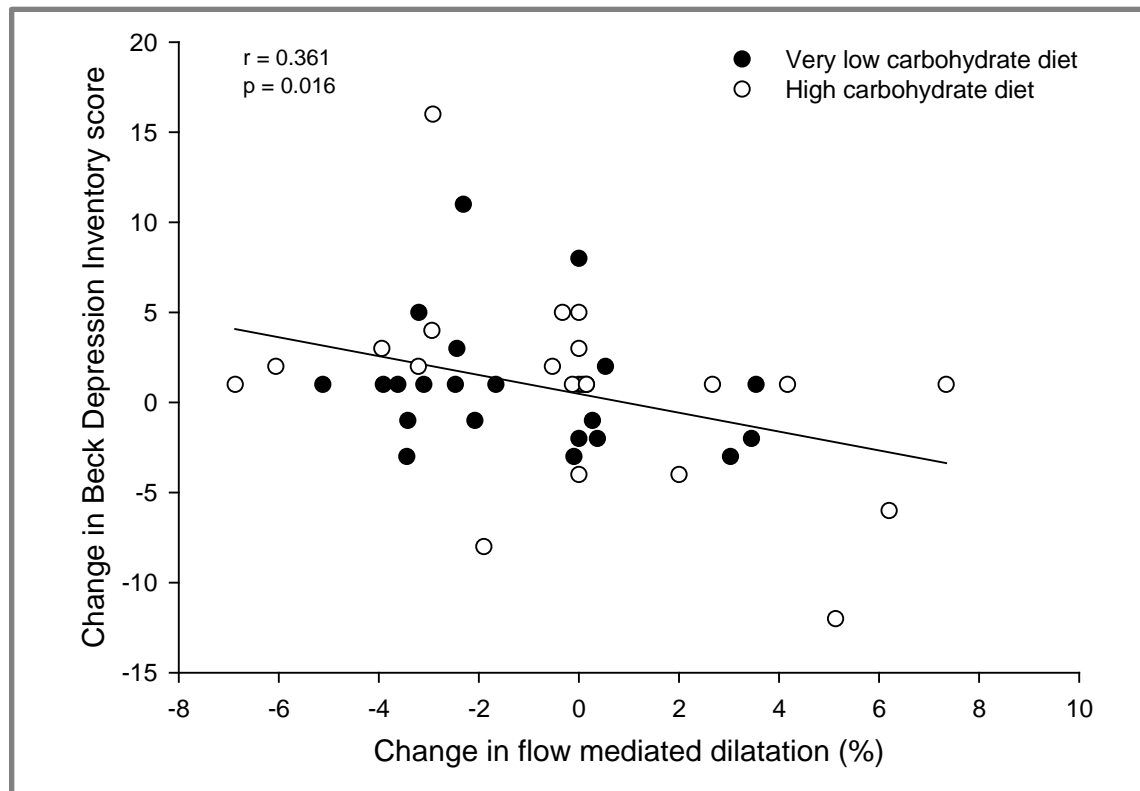
12 months of low-carbohydrate diet impaired brachial artery flow-mediated dilatation¹



Prognostic marker for future cardiac events^{2,3}

Other
benefits?

Impairment of FMD associated with increase in depression scores

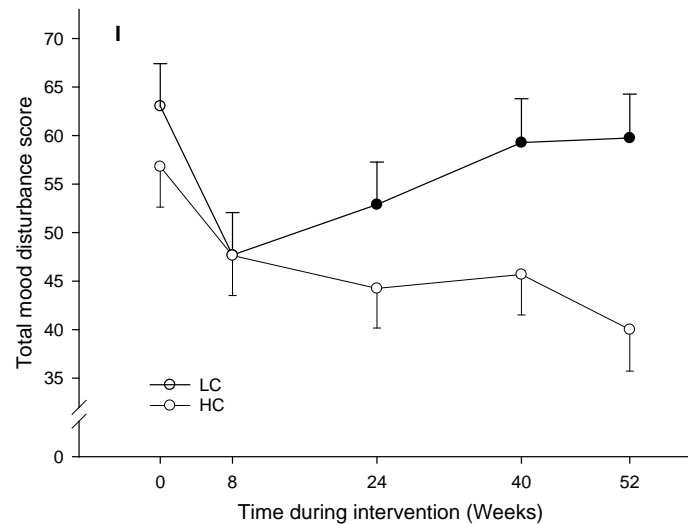
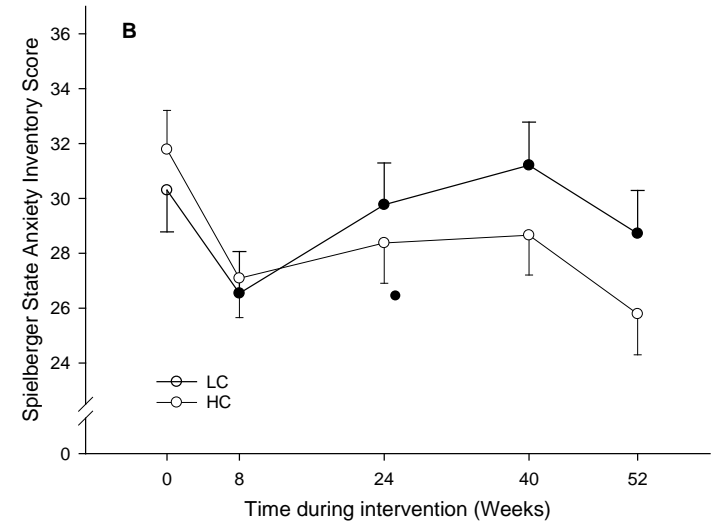
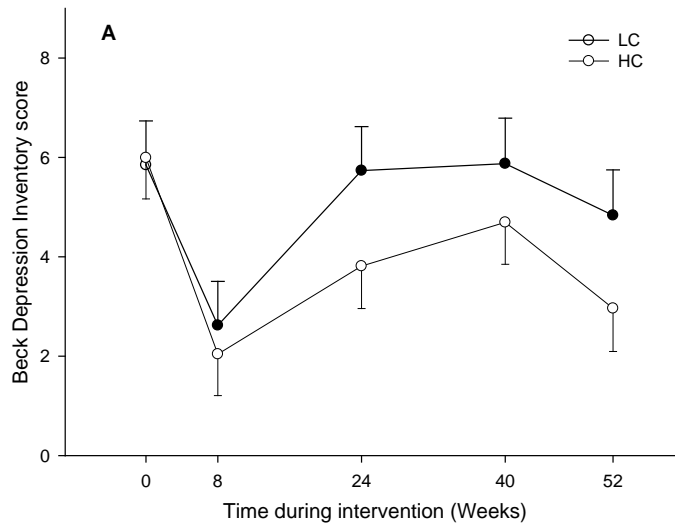


From: Moran et al. Nutrition 2013;in press.



Other benefits?

Improvements in anxiety, depression and mood attenuated on a low-carb diet ¹



¹ Brinkworth et al. Arch Intern Med 2009;169:1873-1880.

Other
benefits?

Impaired FMD also prognostic marker for future cardiac events^{1,2}



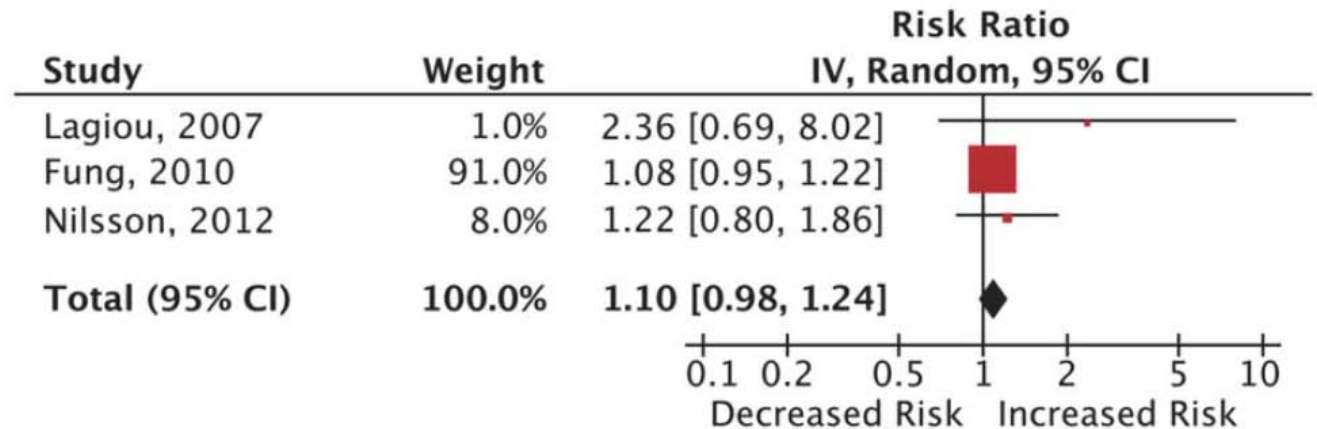
From: www.whatisaheartattack.net



Other benefits?

Despite adverse effect on FMD, recent meta-analysis of observational studies indicated low-carb intake not associated with increased incidence of CVD or risk of CVD mortality¹

(A) Low-carbohydrate score



Heterogeneity: $\text{Tau}^2 = 0.00$; $\text{Chi}^2 = 1.81$, $\text{df} = 2$ ($P = 0.41$); $I^2 = 0\%$
Test for overall effect: $Z = 1.55$ ($P = 0.12$)

Weight loss with low-carb diet

- slightly better than conventional diet over short-term
- similar over the longer-term

Traditional CVD risk factors improved

- greater improvements in HDL
- greater improvements in triglycerides

**Some evidence of adverse effects on FMD
and mood, but no increase in CVD incidence
or mortality**



From: www.annedroid-annedroid.blogspot.com

Jury still out on some aspects of low carbohydrate dietary pattern

**Likely to remain popular
due to food choices available**



From: www.fosters.com.au/enjoy/beer/pureblonde.htm

CSIRO–Animal, Food and Nutritional Sciences



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