A Physicians' Guide to the Atkins Diet

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Atkins Puts Patients in the Fat-Burning Zone

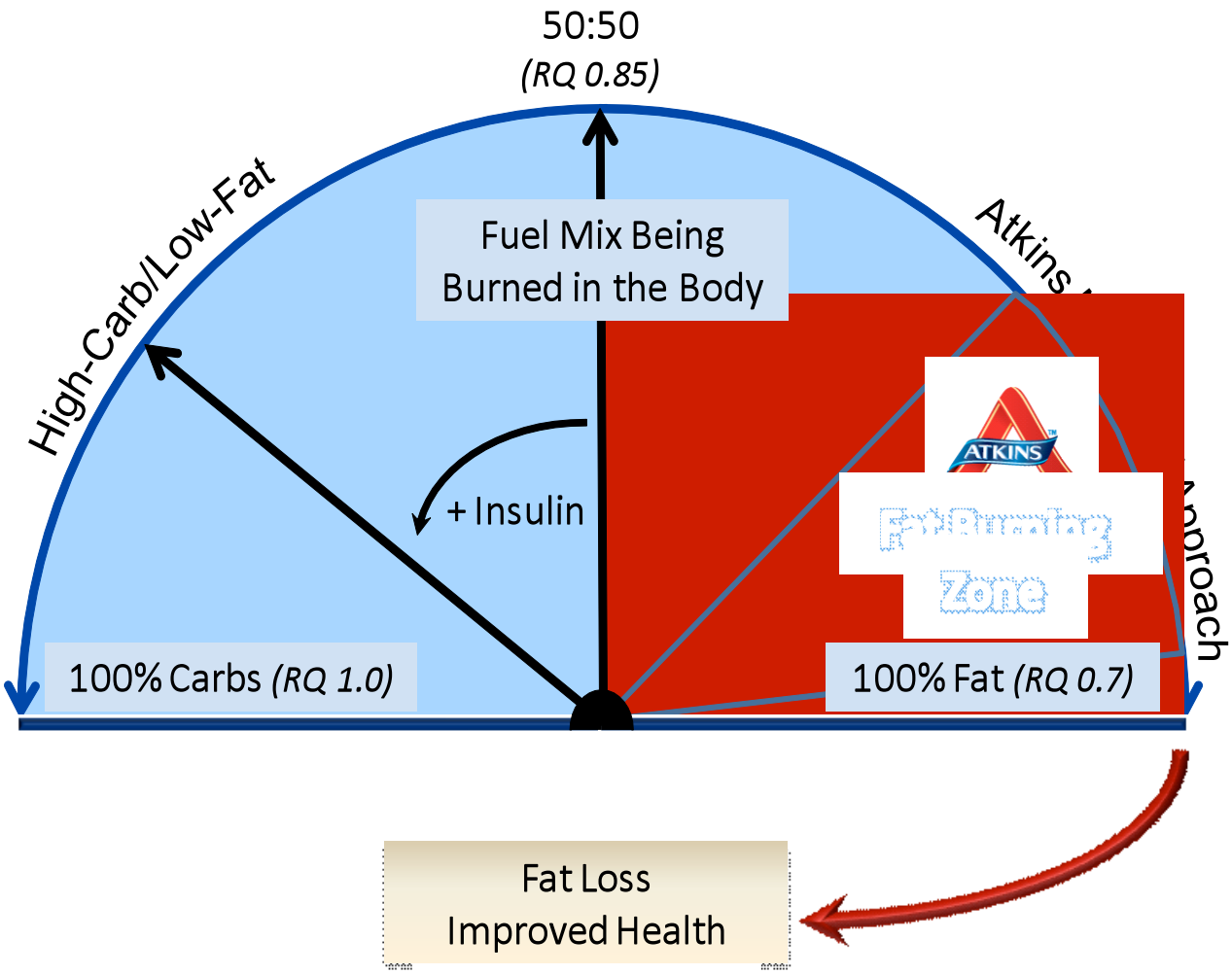


Fig 2. *The Atkins Diet puts people in the fat burning zone.*

Results After Three Months on Subjects with Metabolic Syndrome

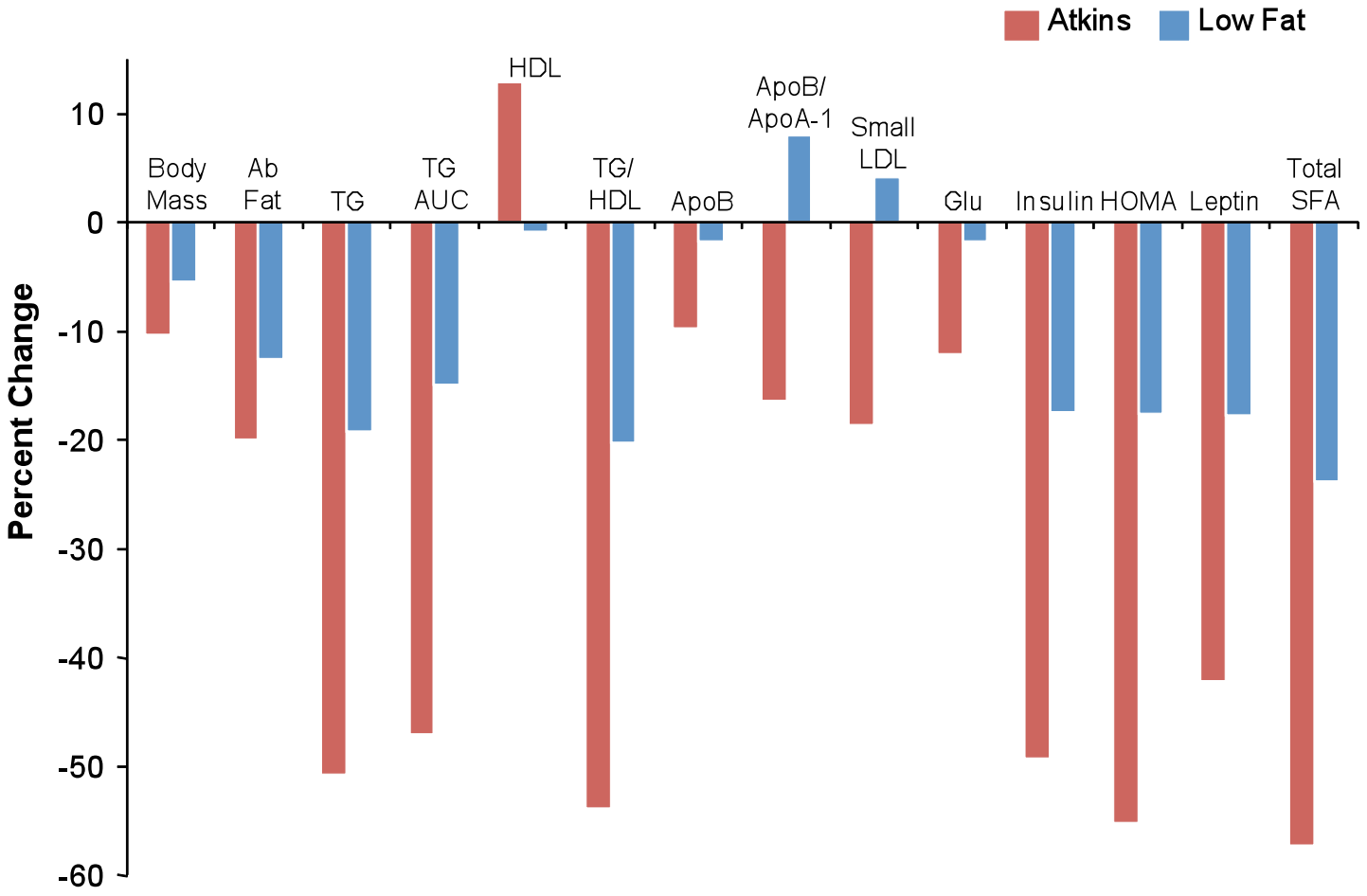
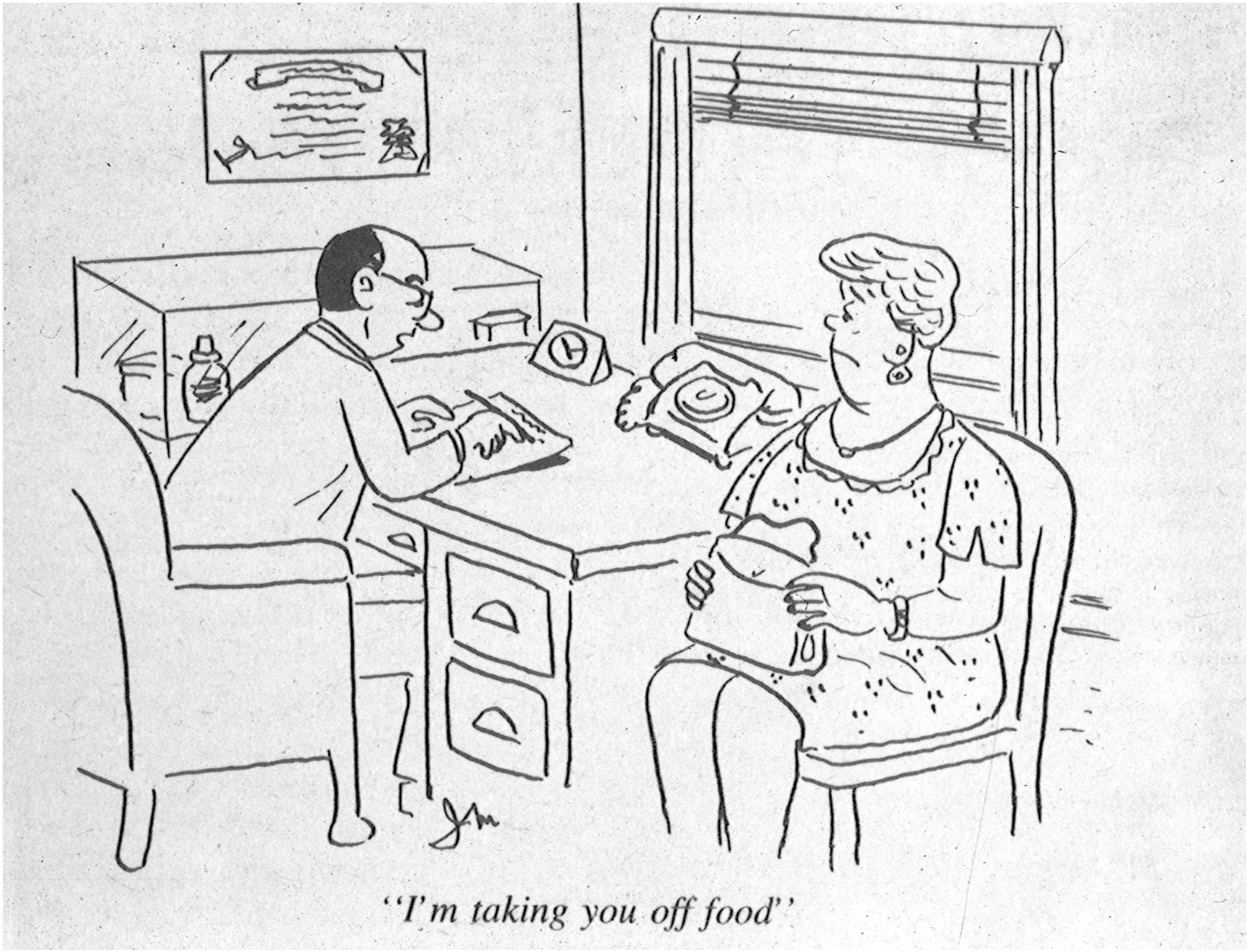


Fig 3. *Results after 3 months in 40 subjects with metabolic syndrome randomized to either the Atkins Diet or a low fat calorie restricted diet (Forsythe et al. 2008).*



"I'm taking you off food"

Low-Glycemic Carbs

High-Glycemic Carbs

What Do You Eat on the Atkins Diet?

Eat from All Macronutrient Groups

- Low-glycemic, nutrient-dense, fiber-rich carbohydrates
  - A variety of protein sources
    - All natural fats

ALL HAVE LOW GLYCEMIC IMPACT

Four Phases of Atkins

- **Phase 1, Induction**
  - 20 grams of Net Carbs (total carbs minus fiber) per day
- **Phase 2, Ongoing Weight Loss (OWL)**
  - Each week or several weeks, add 5 daily grams of Net Carbs, as long as weight loss continues
- **Phase 3, Pre-Maintenance**
  - Every week or several weeks, add 10 daily grams of Net Carbs, as long as weight loss continues
- **Phase 4, Lifetime Maintenance**
  - Continue to consume the number of grams of Net Carbs that enables weight maintenance and appetite control

Primarily Low-Glycemic Carbohydrates

Salad Greens: Any leafy vegetable, such as lettuce, spinach, parsley, watercress, seaweed (if it is a leaf—you can eat it), and other salad vegetables, including bean sprouts, bell peppers, celery, celery root, cucumber, jicama, mushrooms, onions, scallions and radishes. Also fruits generally thought of as veggies: avocados, tomatoes and olives

Vegetables that are usually cooked: artichoke, asparagus, bamboo shoots, string beans, beet greens, bok choy, broccoli, Brussels sprouts, cabbage, cardoon, cauliflower, chard, collard or dandelion or mustard greens, eggplant, escarole, fennel, hearts of palm, kale, kohlrabi, leeks, mushrooms, okra, onion, bell peppers, pumpkin, rhubarb, sauerkraut, shallots, sorrel, snow peas, zucchini and other summer squash, spaghetti squash, tomatillo, white turnips, water chestnuts

12–15 daily grams of Net Carbs must come from foundation vegetables.

Vegetables *not* on this list should not be consumed in Phase 1 Induction. Vegetables such as celery root, kohlrabi, leeks, mushrooms, onions, and pumpkin, are higher in carbs than most, so keep portions small.

Other Acceptable Phase 1 Carbohydrate Foods

Dairy foods high in fat and low in carbs: cream or half-and-half or sour cream (up to 1.5 ounces a day), aged cheeses (up to 4 ounces a day) such as Swiss, Cheddar and mozzarella and soft cheeses such as cream cheese, brie and Camembert

Lemon or lime juice: up to 3 ounces a day

Herbs, spices and seasonings (as long as they have no added sugar), plus any condiments without added sugar or flour, cornstarch or other carb-filled thickeners. They include ancho chili pepper, anchovy paste,, capers, chipotle en adobe, clam juice, enchilada sauce, fish sauce, garlic, ginger, horseradish sauce, jalapeño and other chiles, miso paste, Dijon mustard, yellow mustard, olives, pesto, dill or kosher pickles, roasted red pepper (pimentoes), salsa with no added sugar, soy sauce, tabasco or other hot sauces, taco sauce, tahini, tamari, wasabi paste.

Carbohydrate Foods Off Limits in Phase 1

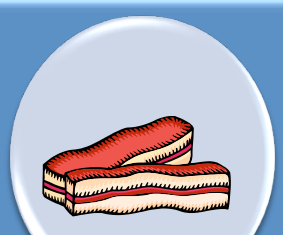
In later phases, add the following carbohydrate foods* in this order:

1. Nuts and seeds and their butters and meals (not chestnuts)
2. Berries, cherries and melon (not watermelon)
3. Plain whole-milk yogurt, cottage cheese, ricotta and other fresh cheeses
4. Legumes, including chickpeas, lentils, edamame and the like
5. Tomato and vegetable juice "cocktail" and more lemon and lime juice
6. Other fruits (not fruit juices or dried fruits)
7. Starchy vegetables such as winter squash, carrots, peas in pods
8. Whole grains (not refined grain products)

*Not everyone can tolerate these foods at any point or can handle only small amounts.

A Variety of Protein Sources

Have 4–6 ounces of protein at every meal. Tall men can have up to 8 ounces if they wish. Pick from the following:



Meat: beef, lamb, veal, pork, ham, bacon or any game meat, but no processed meats made with fillers such as some salami, pepperoni, hot dogs, meatballs or meatloaf. Also no ham or bacon cured with sugar

Poultry: chicken, turkey, duck and game birds, but no breaded or processed products

Fish or shellfish: fresh, canned, smoked or dried, including salmon, halibut, cod, crab, shrimp, clams, oysters, mussels, squid, octopus or roe, but no products cured with sugar, pickled herring with added sugar, artificial crab or other processed or breaded products. No more than 4 ounces of oysters or mussels a day

Eggs: whole eggs cooked in any style

Vegetarian: Quorn products (unbreaded), seitan, shirataki soy noodles, soy or rice "cheese," tempeh, tofu and tofu meat analogs, vegan "cheese," veggie burgers, crumbles and meatballs

A Variety of Natural Fats

You can consume the following fats and oils:

Butter and the following oils: canola, coconut, flaxseed, grape seed, olive, high-oleic safflower, sesame and walnut, preferably cold pressed or expeller pressed

Salad Dressings: Any dressing with no more than 2 grams of Net Carbs per 2-tablespoon serving, but no dressings with sugar, honey, maple syrup or other caloric sweeteners

Avoid corn, soy, sunflower seed and other vegetable oils, which tend to be high in omega-6 fatty acids.

Also avoid “lite” or “low-fat” products and all margarines and shortening products, which may contain small amounts of trans fats.

How Much Fat to Consume in a Day

It's essential to consume enough natural fats to provide satiety, encourage lipolysis and make foods tasty. But there's no need to overdo it. A typical day's intake might include the following:

- 2 tablespoons oil for dressing salads and cooking
- 1 tablespoon butter
- 1 ounce cream
- 2–3 eggs
- 2–3 servings of meat, poultry, fish or shellfish
- 10 olives and/or half a Haas avocado
- 2 ounces nuts or seeds (after first 2 weeks on Phase 1)

Example of an Atkins Phase 1, Induction, Meal Plan (20 grams of Net Carbs Per Day)

- *Breakfast:* Asparagus-cheese omelet, coffee with cream

- *Snack:* String cheese and half a cucumber

- *Lunch:* Chicken Caesar salad with Caesar dressing

- *Snack:* Half a Haas avocado

- *Dinner:* Grilled salmon, steamed broccoli, sliced tomatoes with blue cheese dressing and olives

Acceptable Beverages in Phase 1

- **You can drink the following beverages:**

  - Club soda, plain or flavored seltzer (must say “no calories”)
  - Caffeinated or decaffeinated coffee and tea
  - Diet soda sweetened with non-caloric sweeteners
  - Herb tea (without added barley or fruit sugars)
  - Unsweetened, unflavored soy or almond milk or unsweetened, unflavored coconut dairy beverage
  - Broth/bouillon (not low sodium and without added sugars, hydrogenated oils or MSG)

Acceptable Sweeteners

The following are acceptable in moderation:

- Splenda (sucralose)
- Truvia or SweetLeaf (stevia)
- Sweet 'N Low (saccharin)
- Xylitol

Have no more than 3 packets a day and count each as 1 gram of Net Carbs

Foods to Avoid in Phase 1, Induction

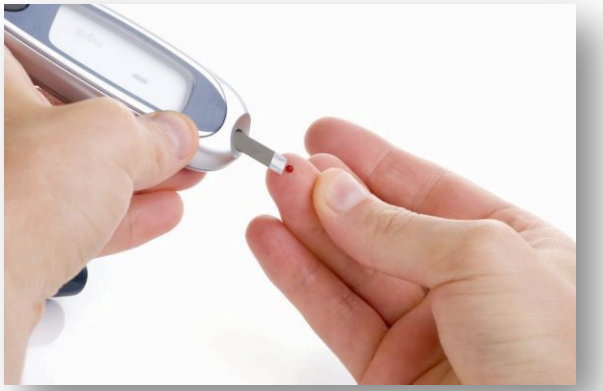
In addition to any foods cited above, avoid the following:

- Fruits other than those considered vegetables in the vegetable list
- Fruit and vegetable juice other than lemon and lime juice
- Regular sodas (with sugar or corn syrup) and alcohol of any sort
- Any food made with flour or other grain products
- Any food with added sugar such as evaporated cane juice, glucose, dextrose, honey and corn syrup
- Nuts and seeds, nut and seed butters (acceptable after two weeks)
- Grains, including whole grains, and legumes
- Dairy products other than hard cheese, cream, sour cream and butter, including cow or goat milk of any kind, yogurt, cottage cheese, or ricotta
- "Low-fat" products
- "Diet" products, unless they have no more than 3 grams of Net Carbs per serving

The Evidence

- **Obesity, metabolic syndrome**

- Type 2 diabetes mellitus



The Goal of a Low-Carb Diet Is to Reduce Serum Insulin Levels

- Low-carb diets reduce the dietary contribution to serum glucose, which then lowers insulin levels.

- Because insulin is a potent stimulator of lipogenesis and inhibitor of lipolysis, lowering insulin levels allows an individual to use his stored body fat for energy.

Taubes, G.T., *Good Calories, Bad Calories,* Knopf, 2007.

Outpatient LCKD Randomized Controlled Trials: Design

Reference	Design	Setting	Patients	Duration	Visits
Sondike 2003	RCT	Clinic	Healthy teens	3m	q2Wk
Brehm 2003	RCT	Clinic	Healthy adults	6m	q2Wk x 6, then @ 6mo
Samaha 2003 Stern 2004	RCT	Clinic	Outpt adults	6m 12m	qWk x 4, then monthly
Foster 2003	RCT	Clinic	Healthy adults	12m	q2Wk x 2, q4Wk x 4, then Wk 26, 34, 42, 52
Yancy 2004	RCT	Clinic	Healthy adults	6m	q2Wks x 6, then monthly
Brinkworth 2009	RCT	Clinic	Healthy adults	12 m	q2Wks x 4, then monthly

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

Outpatient LCKD RCTs: Weight Loss and Serum Lipids

		Low Fat				Low Carbohydrate			
Ref	**Duration**	**Weight**	**LDL**	**Trig**	**HDL**	**Weight**	**LDL**	**Trig**	**HDL**
Sondike n=30	3 mo	-4.1kg	-17%*	-6%	+2%	-9.9kg*	+4%	-48%*	+4%
Brehm n=42	6 mo	-3.9kg†	-5%	+2%	+8%	-8.5kg*†	0%	-23%*	+13%
Samaha/ Stern n=132	6 mo 12 mo	-1.9kg† -3.1kg	+3% -3%	-4% +2%	-2% -12%	-5.8kg*† -5.1kg	+4% +6%	-20%* -29%	0% -2%
Foster n=63	6 mo 12 mo	-5.3kg† -4.5kg†	-3% -6%	-13% +1%	+4% +3%	-9.7kg*† -7.3kg†	+4% +1%	-21% -28%*	+20%* +18%*
Yancy n=119	6 mo	-6.5kg	-3%	-15%	-1%	-12.0kg*	+2%	-42%*	+13%*
Brinkworth N=40	12 mos	-11.5kg	+3%	-12%	0%	-14.5kg	+3%	-35%	+21%

* $p<0.05$ for between-groups comparison

Popular Diet Effects on Weight Cardiac Risk Among Women

"Each diet group attended 1-hour classes led by a registered dietician once per week for 8 weeks and covered approximately one eighth of their respective books per class...Efforts to maximize retention included email and telephone reminders…and incentive payments."

2 months ("efficacy")

Group	n	kcal/d	CHO	PRO	FAT	Weight	LDL	Trig	HDL	DBP
Atkins	77	1381	~62g	97	84	-4.3 kg	+2.3	-52.3	-0.4	-2.9
Zone	79	1455	152	87	57	-2.0 kg	-5.3	-24.8	-0.5	-2.1
LEARN	79	1476	180	73	49	-2.8 kg	-7.3	-17.2	-3.8	-1.4
Ornish	76	1408	220	60	33	-2.8 kg	-10.1	-10.9	-5.3	-0.4

12 months ("effectiveness")

Group	n	kcal/d	CHO	PRO	FAT	Weight	LDL	Trig	HDL	DBP
Atkins	77	1599	~140g	84	78	-4.5 kg	+0.8	-29.3	+4.9	-4.4
Zone	79	1594	179	80	62	-1.5 kg	0	-4.2	+2.2	-2.1
LEARN	79	1654	194	79	61	-2.5 kg	+0.6	-14.6	-2.8	-2.2
Ornish	76	1505	195	68	50	-2.4 kg	-3.8	-14.9	0	-0.7

Gardner CD et al., *JAMA*, 2007;297:969-977.

Popular Diet Effects on Weight Loss and Cardiac Risk Factors

"To approximate the realistic long-term sustainability of each diet, we asked participants to follow their dietary assignment to the best of their ability to their 2 month assessment, after which time we encouraged them to follow their assigned diet according to their own self-determined interest level."

2 months ("efficacy")

Group	n	kcal/d	CHO	PRO	FAT	Weight	LDL	Trig	HDL	L/H
Atkins	40	1736	137g	93.5	89.5	-3.6 kg	+1.3	-32.3	+3.2	-0.18
Zone	40	1434	157	90.4	54.5	-3.8 kg	-9.7	-54.1	+1.8	-0.33
W Watchers	40	1615	191	80.5	54.5	-3.5 kg	-12.1	-9.2	-0.2	-0.42
Ornish	40	1393	230	70.0	27.5	-3.6 kg	-16.5	-0.4	-3.6	-0.21

12 months ("effectiveness")

Group	n	kcal/d	CHO	PRO	FAT	Weight	LDL	Trig	HDL	L/H
Atkins	40	1886	190g	86.0	80.5	-2.1 kg	-7.1	-1.2	+3.4	-0.39
Zone	40	1757	173	90.4	71.5	-3.2 kg	-11.8	-2.5	+3.3	-0.52
W Watchers	40	1832	208	82.5	64.0	-3.0 kg	-9.3	-12.7	-3.4	-0.55
Ornish	40	1819	218	76.5	64.0	-3.3 kg	-12.6	+5.6	-0.5	-0.31

Dansinger ML et al., *JAMA*, 2005;293:43-53.

Effect of Diet Programs on Metabolic Syndrome Parameters from Baseline to 12 Months

	Atkins	Zone	LEARN	Ornish	P
	(n=77)	(n=79)	(n=79)	(n=76)	value
BMI, kg/m²	-1.65	-0.53	-0.92	-0.77	.01
Waist-hip ratio	-0.019	-0.013	-0.009	-0.012	.10
HDL-C, mg/dL	+4.9	+2.2	+2.8	0.0	0.002
Triglycerides, mg/dL	-29.3	-4.2	-14.6	-14.9	0.01
Non-HDL-C, mg/dL	-5.1	-0.5	-4.0	-6.8	0.36
Insulin, mU/mL	-1.8	-1.5	-1.8	-0.2	0.17
Glucose, mg/dL	-1.8	-1.6	+0.5	-0.8	0.54
Diastolic b.p., mmHg	-4.4	-2.1	-2.2	-0.7	0.009
Systolic b.p., mmHg	-7.6	-3.3	-3.1	-1.9	<0.001

Gardner CD et al., *JAMA*, 2007;297:969-977.

Low-Carbohydrate Ketogenic Diet Mechanism

- When dietary carbohydrate is restricted, appetite is suppressed .[1]
- Appetite suppression leads to a Calorie deficit state. [1]
- In a Calorie-deficit state, the body draws on stored fat for fuel (lipolysis). [1]

<u>Possible but as yet unproven mechanisms:</u>

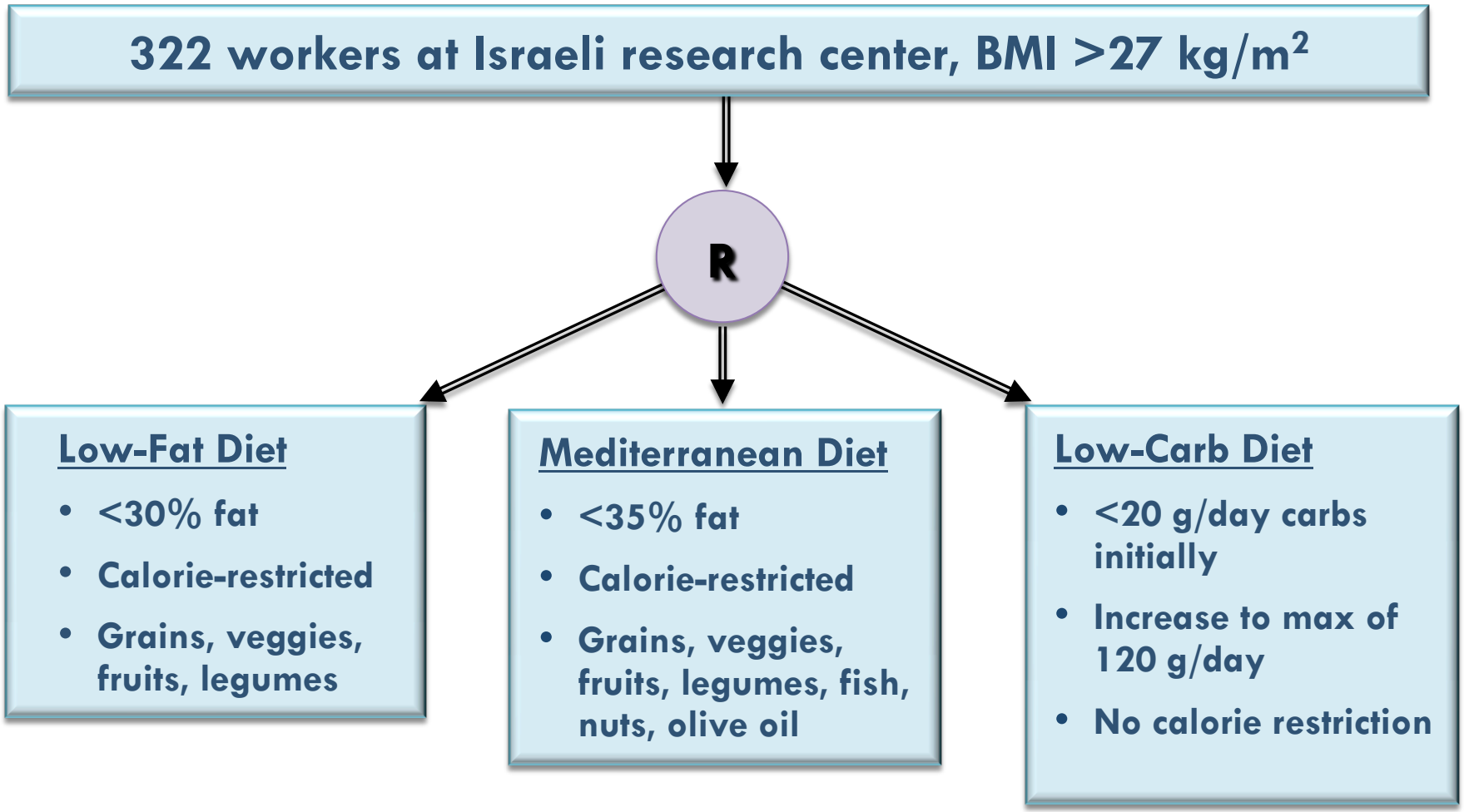
- Inefficiency of protein- and fat- processing leads to extra energy loss. [2]
- Lipolysis is maintained despite calorie excess state because glycerol from fat is needed as a gluconeogenic precursor. [3]

1. Boden, G. et al.," Effect of a low-carbohydrate diet on appetite, blood glucose levels, and insulin resistance in obese patients with type 2 diabetes," *Ann Intern Med,* 2005;142:403-411.

2. Feinman, R.D., Fine, E.J., "Thermodynamics and metabolic advantage of weight loss diets," *Metabolic Syndrome and Related Disorders,* 2003;1:209-219.

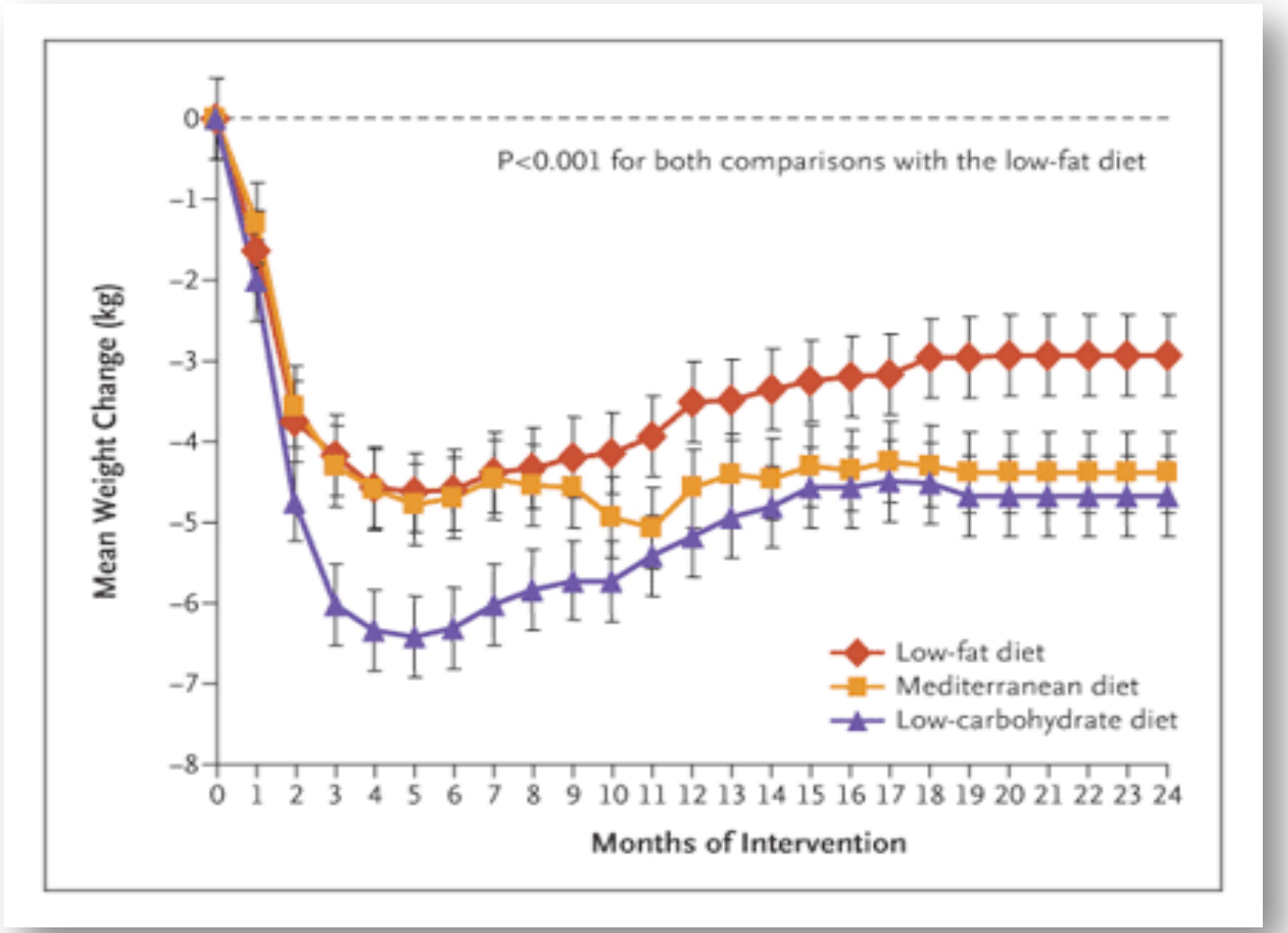
3. Klein, S., Wolfe, R.R., "Carbohydrate restriction regulates the adaptive response to fasting," *Am J Physiol,* 1992;262:E631-E636.

Workplace Diet Trial



Shai I, NEJM, 2008

Weight Changes Over 2 Years by Diet Group



Weight Changes Over 2 Years by Diet Group (cont.)

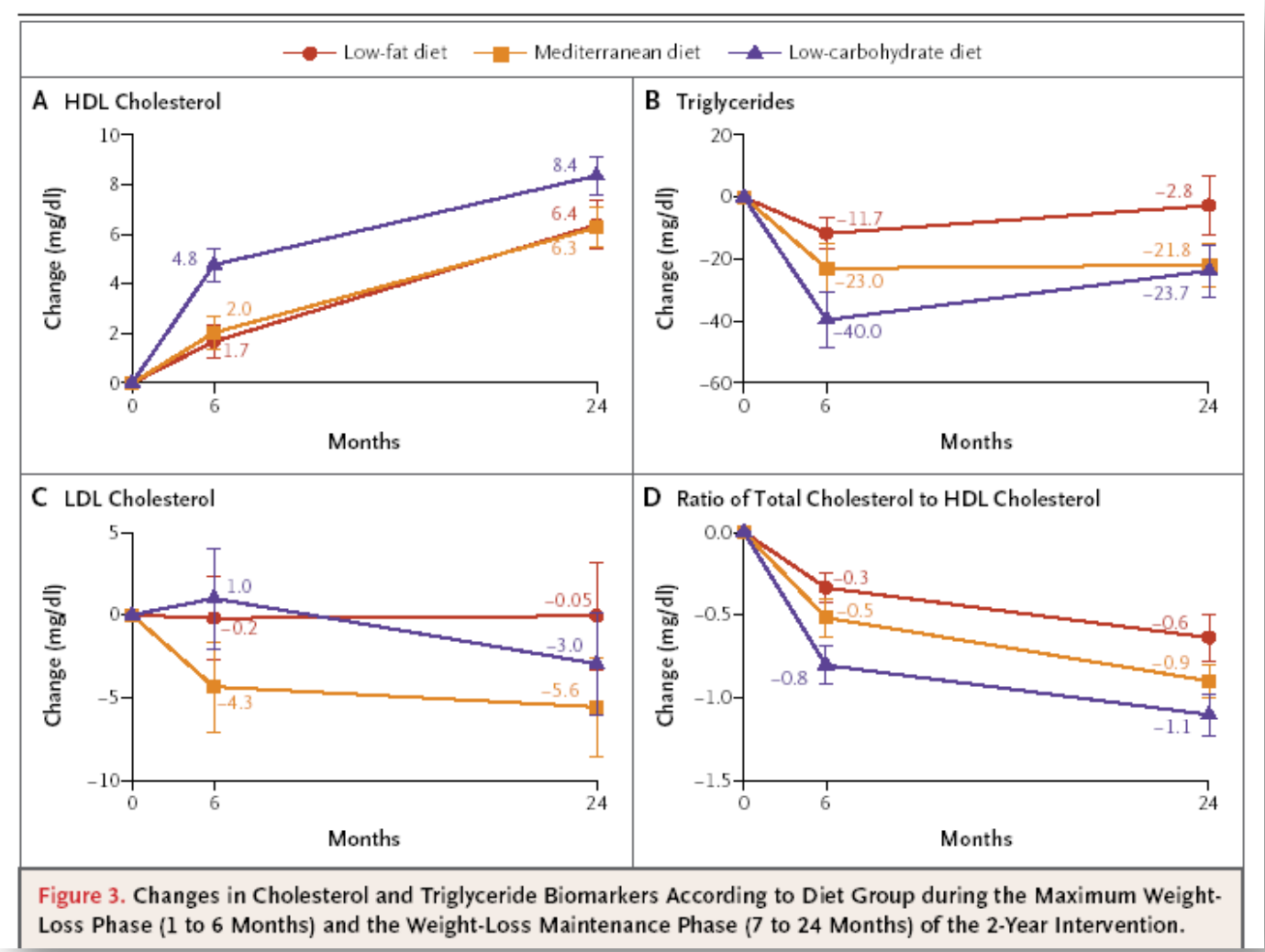


Figure 3. Changes in Cholesterol and Triglyceride Biomarkers According to Diet Group during the Maximum Weight-Loss Phase (1 to 6 Months) and the Weight-Loss Maintenance Phase (7 to 24 Months) of the 2-Year Intervention.

Recent Meta-Analysis of RCTs Comparing Low-Carb to Low-Fat Diets

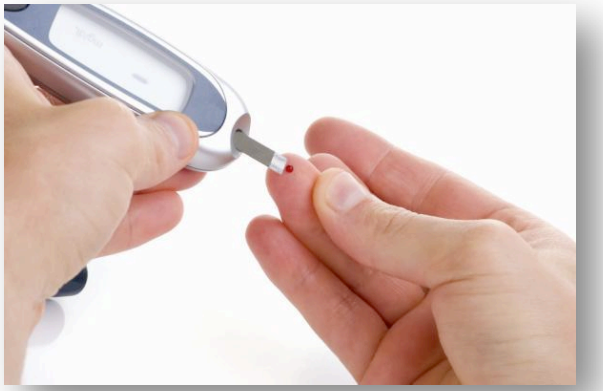
- "Low-carbohydrate/high-protein diets are more effective at 6 months and are as effective, if not more, as low-fat diets in reducing weight and cardiovascular disease risk up to 1 year."

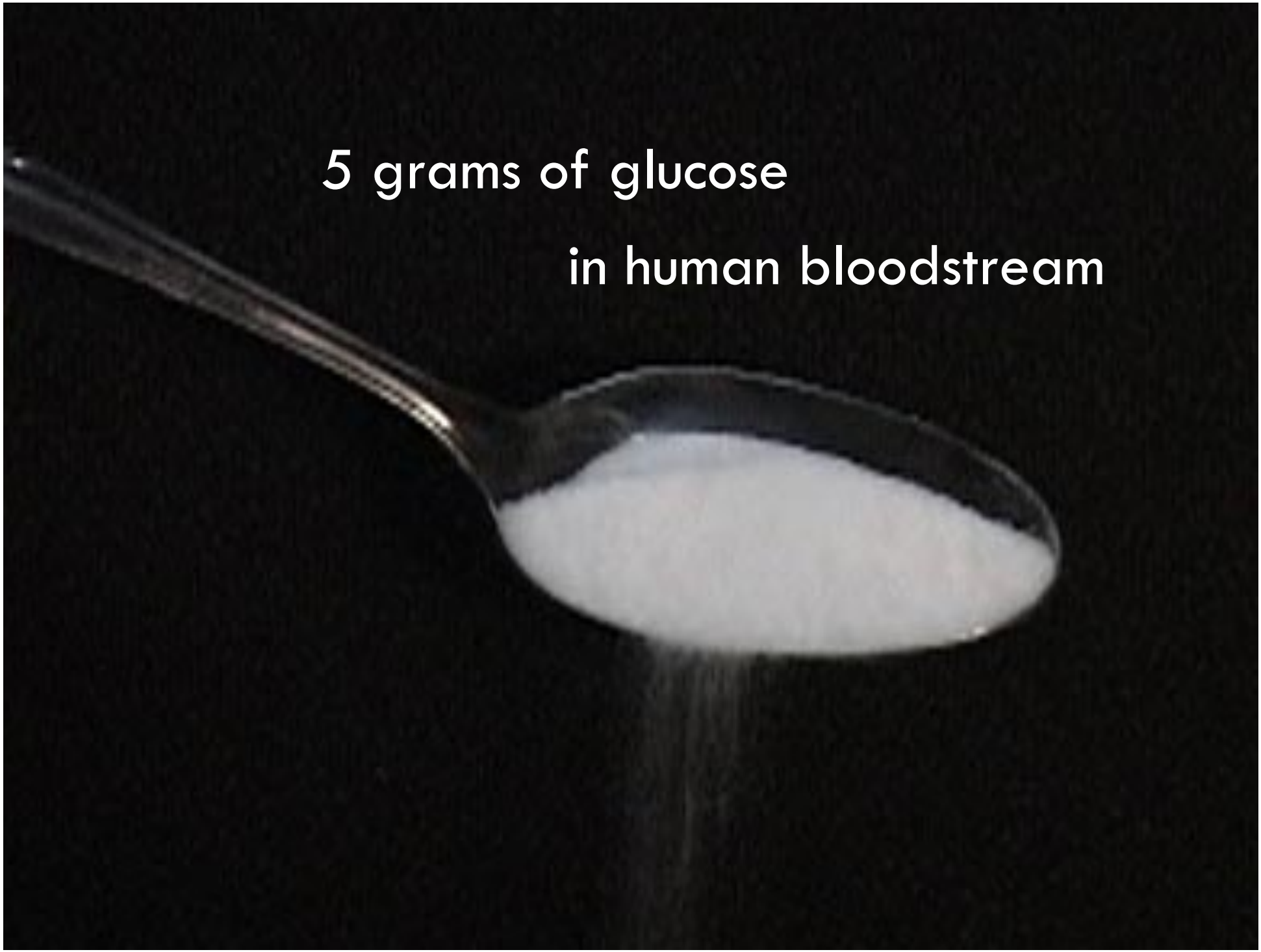
Hession, M., Rolland, C., Kulkami, U., Wise, A., Broom, J., "Systematic review of randomized controlled trials of low-carbohydrate vs. low-fat/low-calorie diets in the management of obesity and its comorbidities," *Obes Rev,* 2008

The Evidence

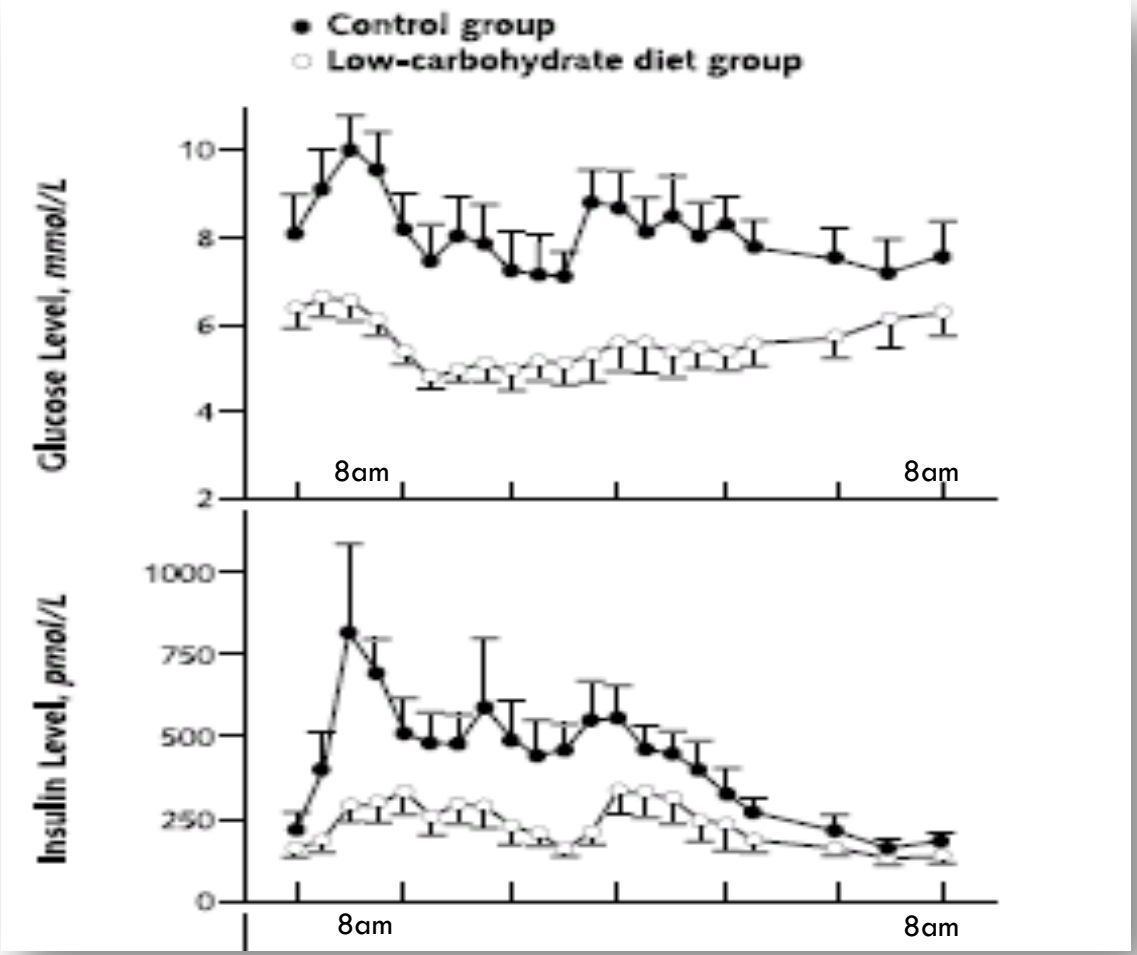
- Obesity, metabolic syndrome

- **Type 2 diabetes mellitus**




5 grams of glucose
in human bloodstream

Very Low-Carbohydrate Diet Decreases Postprandial Glycemic/Insulin Response



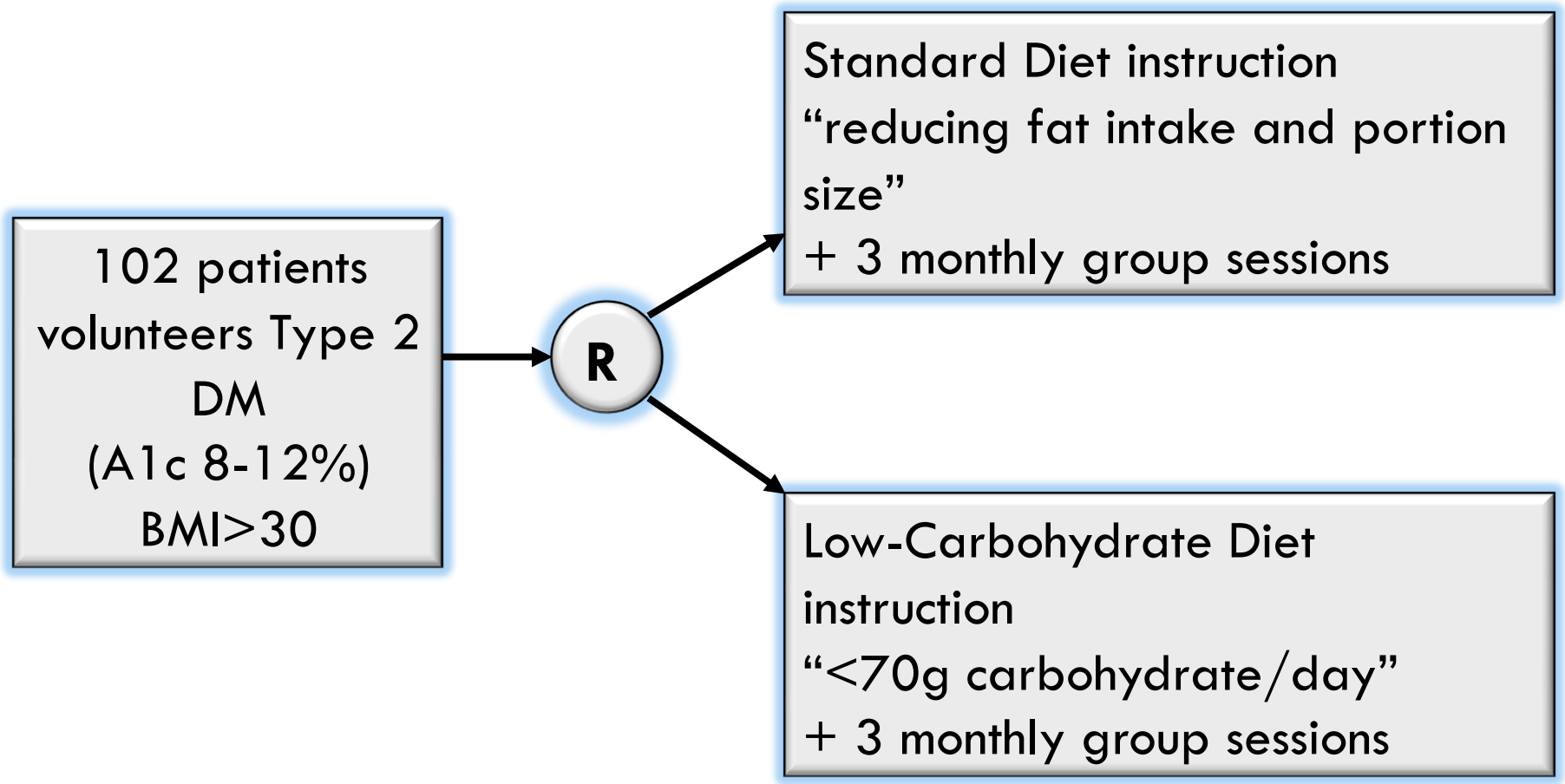
Boden, G. et al., *Ann Intern Med*, 2005;142:403-11.

Low-Carbohydrate Diets for Type 2 Diabetes Pilot Studies

Reference	n	Weight kg	CHO	Follow-up	HA1c	Pre HAlc %	Post Wt Diff %	%
Vernon 2003	14	123.2	~10%	8 months	10.0	5.9	-9.7	
O'Neill 2003	20	82	~10%	10 months	8.4	5.8	-6.7	
Nielsen 2005	16	100	~20%	12 months	8.0	6.6	-11.9	
Yancy 2005	28	131.4	~7%	16 weeks	7.5	6.3	-6.6	

Vernon, M.C. et al., *Metabolic Syndrome and Related Disorders*, 2003;1:233-238.
O'Neill, D.F. et al., *Metabolic Syndrome and Related Disorders*, 2003;1:291-298.
Nielsen, J.V. et al., *Upsala J Med Sci*, 2005;109:179-184.
Yancy, W.S., Jr. et al., *Nutrition & Metabolism*, 2005;2:34.

Short-Term Effects of Severe Dietary Carbohydrate-Restriction Advice in Type 2 Diabetes: a Randomized Controlled Trial



Daly et al., *Diabetes Medicine,* 2006;23:15-20.

Results

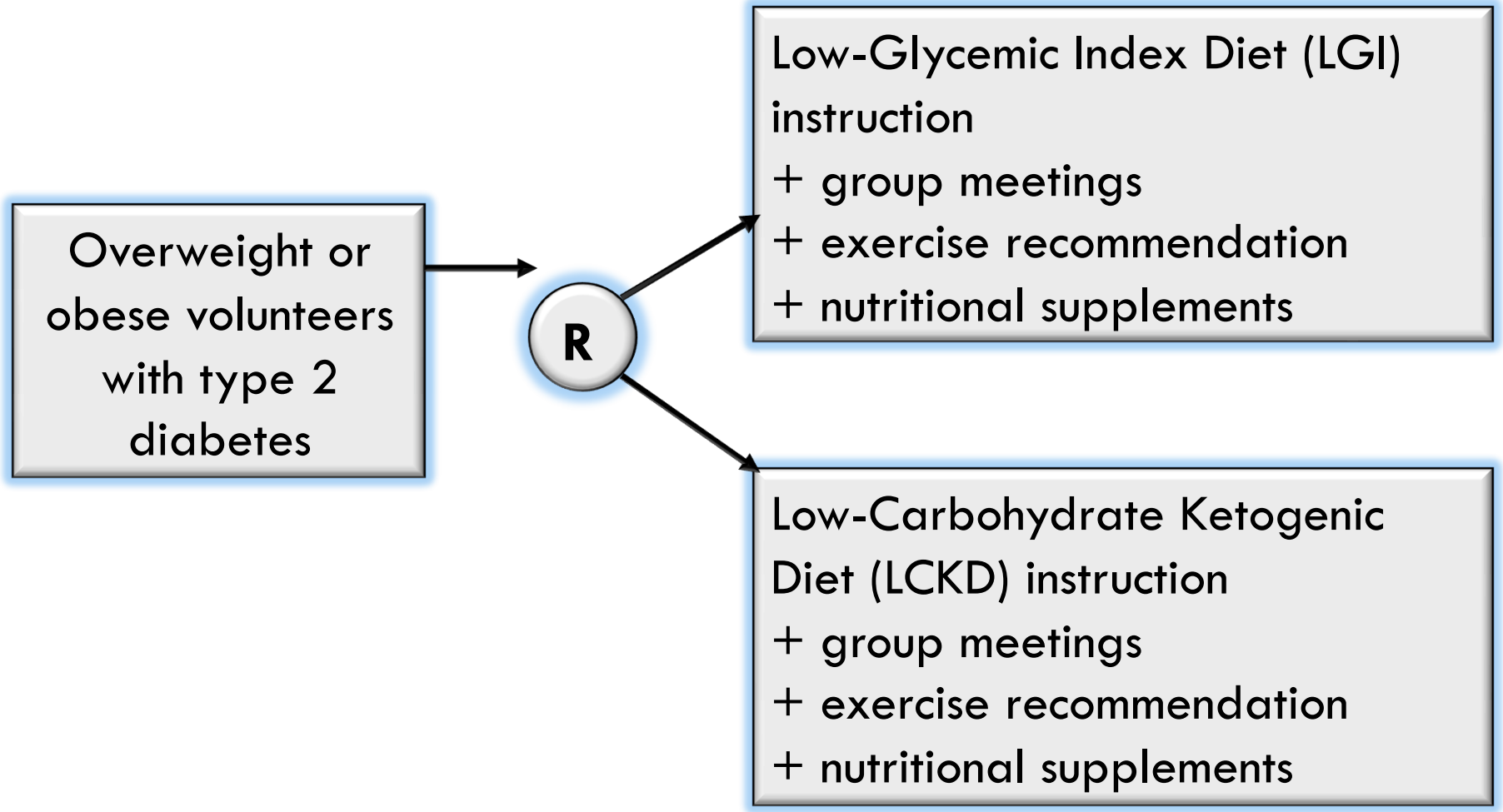
Table 2 Changes from baseline in body weight, glycaemic control, lipids and blood pressure

Variable	Absolute change	SEM	95% CI	*P*-value
Weight (kg)			1.16–4.09	0.001
Low carbohydrate	−3.55	0.63		
Low fat	−0.92	0.40		
Total cholesterol/HDL ratio			0.09–0.68	0.011
Low carbohydrate	−0.48	0.11		
Low fat	−0.10	0.10		
Triglycerides (mmol/l)			−0.27–1.13	0.223
Low carbohydrate	−0.67	0.23		
Low fat	−0.25	0.26		
Systolic BP (mmHg)			−2.10–13.80	0.147
Low carbohydrate	−6.24	2.96		
Low fat	−0.39	2.64		
HbA_{1c} (%)			−0.10–0.75	0.132
Low carbohydrate	−0.55	0.17		
Low fat	−0.23	0.13		

BP, blood pressure; SEM, standard error of the mean.

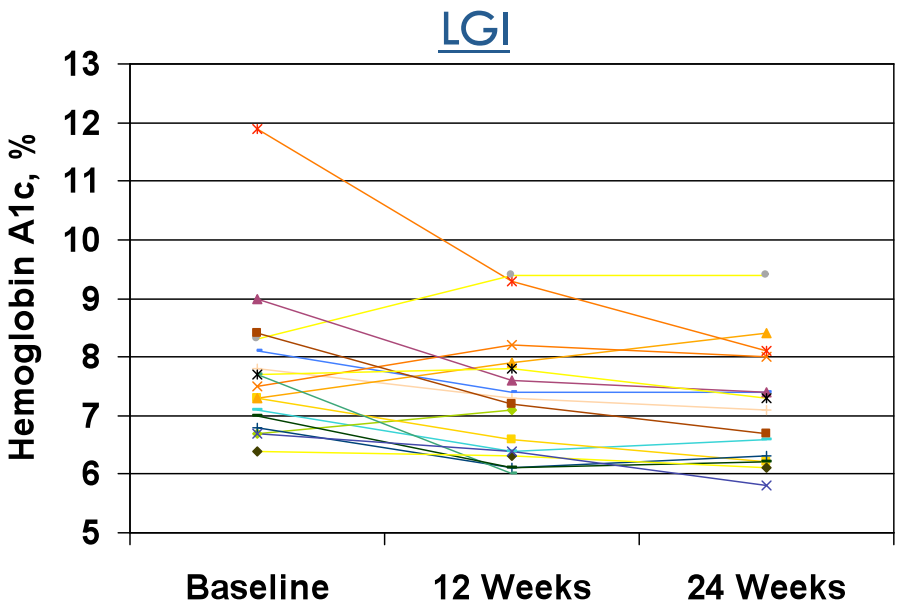
Daly et al., *Diabetes Medicine,* 2006;23:15-20.

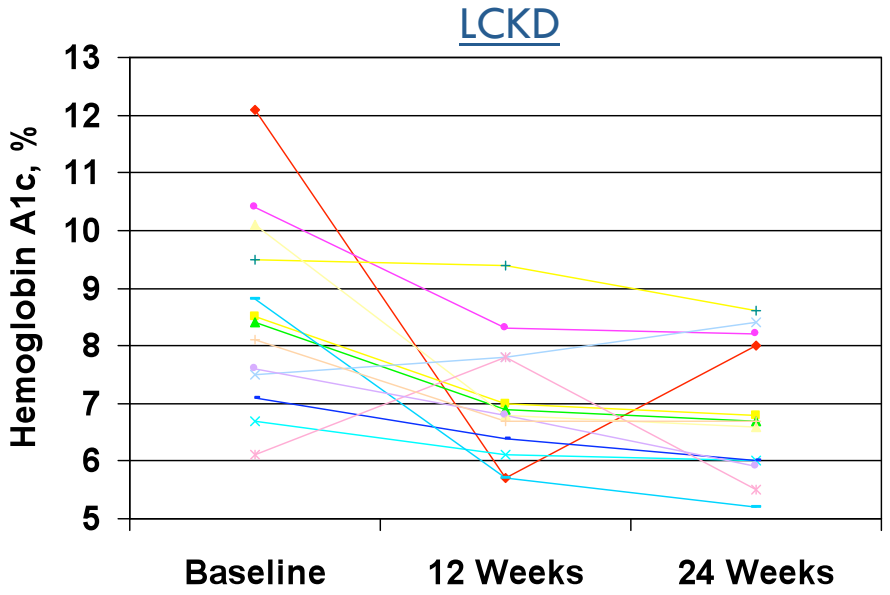
Study Design



Westman et al., *Nutrition & Metabolism*, 2009;5:36.

Primary Outcome: Hemoglobin A1c





	Baseline	12 Weeks	24 Weeks	Base→24
LGI (n=29)	mean (sd)	mean (sd)	mean (sd)	change, %
HgbA1c, %	8.3 (1.9)	7.5 (1.7)	7.8 (2.1)	-0.5 (-6.0%)*
LCKD (n=21)				
HgbA1c, %	8.8 (1.8)	7.2 (1.2)	7.3 (1.5)	-1.5 (-17.0%)*

*p <0.05 between groups

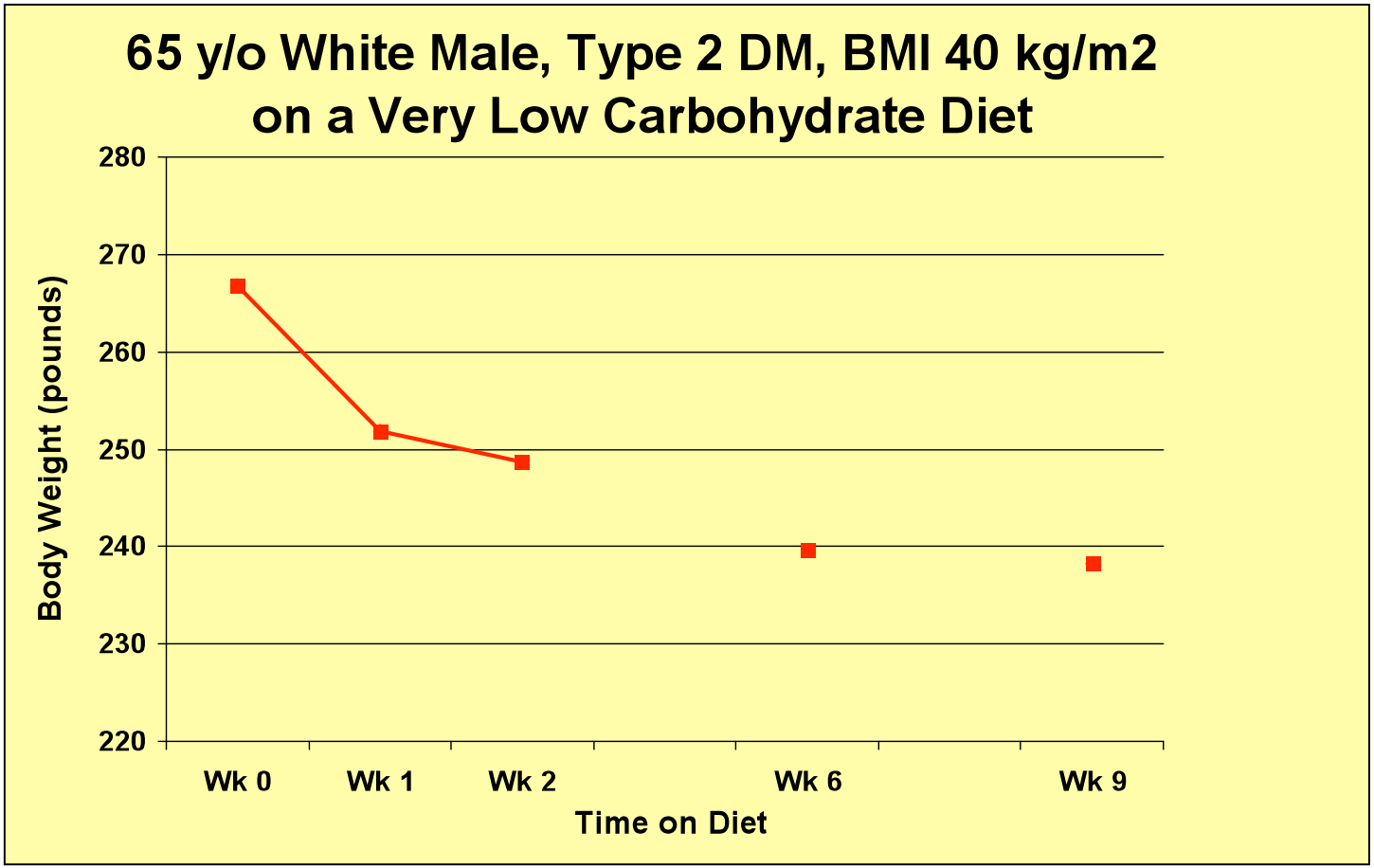
Westman et al., *Nutrition & Metabolism*, 2009;5:36.

Effect of Diet Programs on Metabolic Syndrome Parameters

	LGI (n=29)			LCKD (n=21)		
	Week 0	Week 24	Change	Week 0	Week 24	Change
	mean	mean	mean	mean	mean	mean
Fasting glucose, mg/dL	166.8	150.8	-16.0*	178.1	158.2	-19.9*
Waist circumference, in.	47.0	42.4	-4.6 *	47.1	41.8	-5.3 *
Triglycerides, mg/dL	167.1	147.8	-19.3	210.4	142.9	-67.5 *
HDL cholesterol, mg/dL	48.7	48.7	-0 †	44.0	49.6	+5.6 * †
Systolic blood pressure, mmHg	140.8	130.1	-10.7 *	144.4	127.8	-16.6 *
Diastolic blood pressure, mmHg	84.1	78.5	-5.6 *	83.9	75.8	-8.1 *
Body mass index, kg/m^2	37.9	35.2	-2.7 * †	37.8	33.9	-3.9 * †

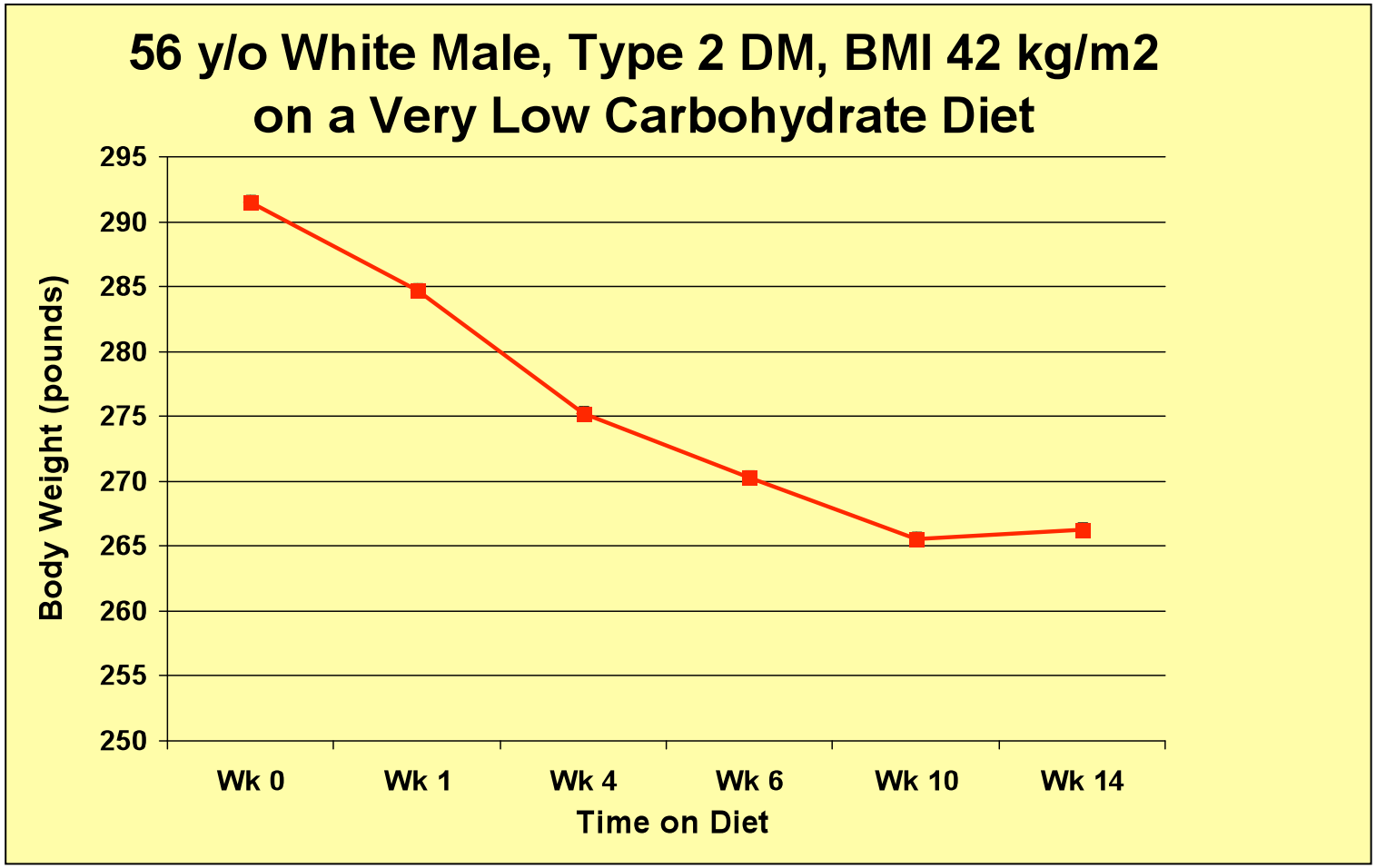
* $p < 0.05$ for within-group change from Week 0 to Week 24.
† $p < 0.05$, for between groups change from Week 0 to Week 24.

Case Study



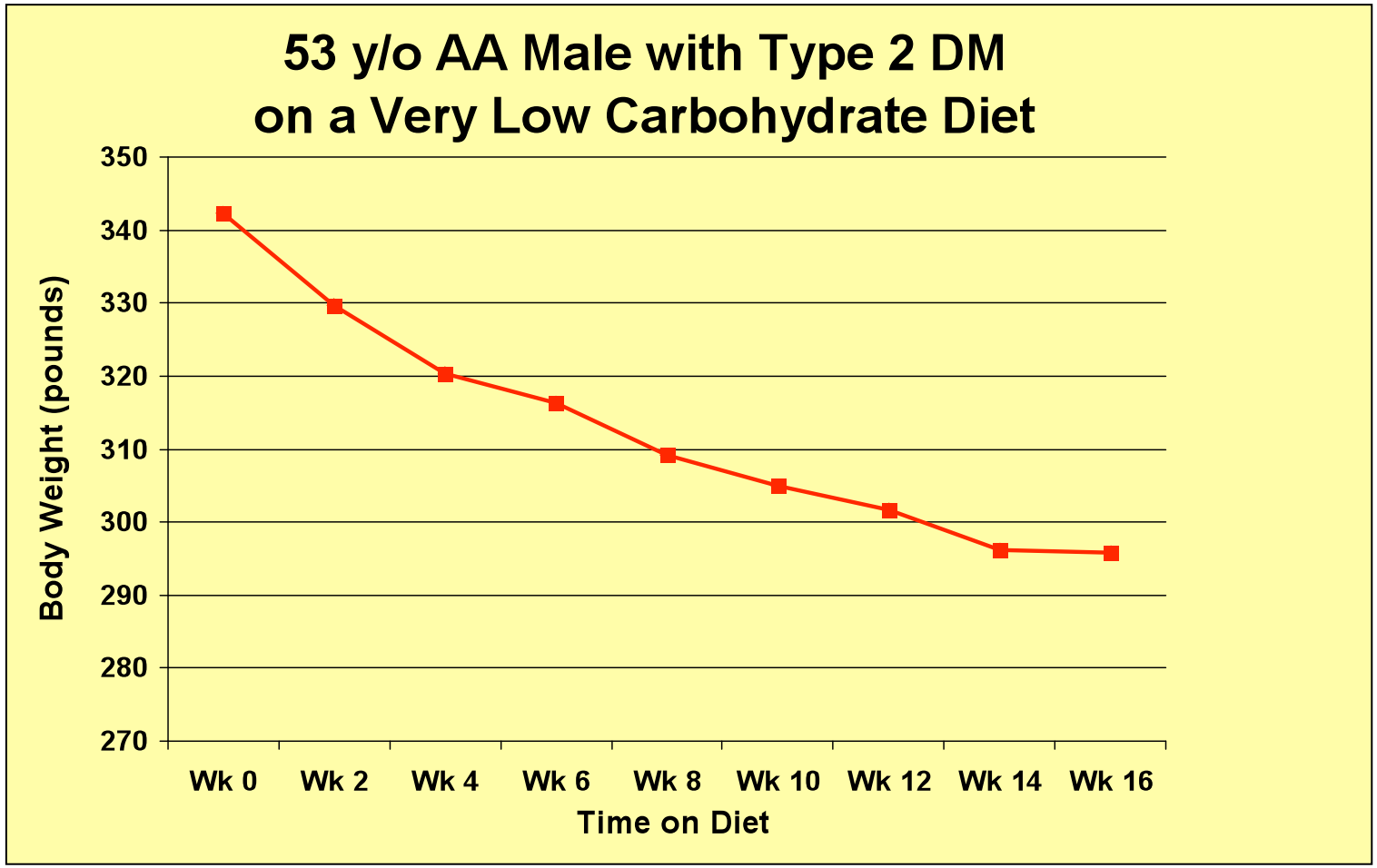
Hgb A1c	7.4%	6.0%
Insulin	120 units/day	off
Glipizide XL	20 mg	Glipizide
Metformin	1000 mg qd	Metformin
Lisinopril	60 mg qd	20 mg qd

Case Study



Hgb A1c	8.2%	5.7%
Lantus	46 units hs	off
Byetta	5 mcg BID	off
Glipizide	20 mg BID	off

Case Study



Hgb A1c	6.5%								5.2%
Insulin dose	50u	25	13	0					0
Metformin	1000mg						1000		

Diabetic Diet in the Pre-Insulin Era 1914-1921

Osler, W., McCrae, T., *The Principles and Practice of Medicine,* NY: Appleton and Co., 1923.
Allen, F.M., "Protein diets and undernutrition in treatment of diabetes," *JAMA*, 1920; 74:571-577

American Diabetes Association, 2008

- In overweight and obese insulin-resistant individuals, modest weight loss has been shown to improve insulin resistance. Thus, weight loss is recommended for all such individuals who have or are at risk for diabetes.

- For weight loss, either low-carbohydrate or low-fat calorie-restricted diets may be effective in the short term (up to 1 year).

- For patients on low-carbohydrate diets, monitor lipid profiles, renal function, and protein intake (in those with nephropathy), and adjust hypoglycemic therapy as needed.

"Nutrition Recommendations and Interventions for Diabetes: A Position Statement of the American Diabetes Association," *Diabetes Care*, 2008;31:S61-S78.

Summary

- Atkins is effective for resolving obesity, metabolic syndrome and type 2 diabetes

- Despite previous concerns, low-carbohydrate diets have been found to be safe in randomized, controlled trials of up to two years duration

- Relatively easy to use:
  - Individuals consume “real” whole foods
  - Appetite is under control
  - No need to count calories
  - Simple to teach

Further Resources

- Atkins.com: The patient site
- Atkins-hcp.com: The healthcare professional site
- *The New Atkins for a New You*
  - *By Eric C. Westman, Stephen D. Phinney and Jeff S. Volek*
- *Obesity: Evaluation and Treatment Essentials*
  - *Edited by G. Michael Steelman and Eric C. Westman*
- Dr. Atkins' Diabetes Revolution
  - *By Mary C. Vernon and Jacqueline A. Eberstein*
- Innovative Metabolic Solutions
  - *Lecture Series, CME Provided, myimsonline.com*