

## An Effective Dietary Intervention For Diabetes and Obesity: Fat Is In And Carbs Are Out!

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[www.MetabolicHealth.ca](http://www.MetabolicHealth.ca)



## Disclosures

- No industry sponsorship or funding
- No associations with commercial weight loss companies
- The ideas, educational material and conclusions herein are informed by medical research and my clinical experience



## Objectives

1. Learn a one-minute intervention designed for your busy office that will help your patients lose weight easily
2. Describe the scientific evidence for **why fat is in and carbs are out** for weight loss and glycemic control
  - Visit [MetabolicHealth.ca](http://MetabolicHealth.ca) to view my companion presentation called "Why we get fat", which examines the relationship between *metabolic sickness*, eating behavior and carbohydrate addiction
3. Appreciate results from my practice prescribing a low-carb, high-fat diet to my patients with insulin resistance



## About Me...

- I am:
  - A Dad to 4 under 6
  - An emergency room physician
  - A family doctor and
  - A nursing home doctor
- I have spent the last 2 years developing and refining the MetabolicHealth Program to help you teach your patients how to recover from Diabetes and Obesity



## A Glimpse At Our Outcomes

- 20 months
- 7% of my total clinical time
- 78 patients have lost between 10 to 66 lbs
- Total weight loss of 1948 lbs
- 45 of the above patients had a baseline HBA1c  $\geq$  6%
  - Their A1c has improved on average by 1.1 %



## 45 Patient With Insulin Resistance With At Least 5 Encounters Since October 2015

Parameter	Outcome	Number in count
Months in program	8 months	43
<b>Waist Circumference (cm)</b>	<b>Down 9cm</b>	<b>40</b>
<b>Weight (kg)</b>	<b>Down 10 kg</b>	<b>44</b>
<b>HbA1c</b>	<b>Down 1.1%</b>	<b>37</b>
Creatinine	Up 1 mmol/L	44
Urea	Up 0.3	30
Malbumin/Cr. Ratio	Down 0.35	18
ALT	Down 9.3	29
Uric Acid	Up by 0.3	27
Total Cholesterol	Up 0.05	37
LDL-C	Up by 0.2	36
Non-HDL-C	Up by 0.1	35
HDL-C	Up by 0.2	37
TG	Down by 0.7	37

## Objective #1

Learn a one-minute intervention designed for your busy office that will help your patients lose weight (and recover from metabolic sickness) easily



## The MetabolicHealth Minute

- The next time you see that patient in the office with insulin resistance...
  - Central obesity
  - Non-alcoholic steatohepatitis
  - HbA1c greater than 6%
  - TG > 1.7
  - HDL < 1.3 in women or 1.0 in men, or,
  - Polycystic Ovarian Syndrome
- Give him or her a **MetabolicHealth Minute**
  - Here's how...

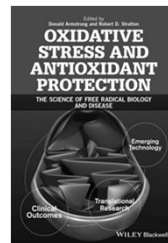


## Objective #2

Describe the scientific evidence for why **fat is in and carbs are out** for weight loss and glycemic control



## How Does Insulin Resistance Cause Cardiovascular Disease?



- Excellent chapter on insulin resistance and its role in **oxidative stress** and cardiovascular disease



## The Insulin Resistant Patient

**Definition: Requiring Greater Amounts of Insulin to Approach Euglycemia**

- Both hyper and hypoglycemia
- Hypertension
- Dyslipidemia
  - High triglycerides
  - Low HDL
  - Preponderance of small/dense LDL sub-fraction
- Central obesity
- Acanthosis nigricans
- Increased LH and serum testosterone that accompanies PCOS
- Hypercoagulability
- NASH

Carbohydrate Restriction Is Associated With:

- **Increased satiety**
- Decreased daily caloric intake
- Weight loss
- Decreased central obesity
- Decreased triglycerides
- Increased HDL
- Decreased small dense LDL particle subfraction, rendering LDL less atherogenic
- Decreased fasting insulin and blood sugar

**BUT, WEIGHT LOSS IN GENERAL IS ALSO ASSOCIATED WITH MANY OF THESE IMPROVEMENTS, SO WHY LOW CARB?**




## A Low Carbohydrate Dietary Pattern May Be Superior To Low Calorie Because...

- Ketosis/Carb restriction suppress appetite
- Weight loss is not necessary to show cardiovascular risk reduction
- Regardless of the amount of weight lost, carb restriction may offer more cardiovascular benefit than calorie restriction
- Endothelial function may improve more on a low carb intervention




## Ketosis Suppresses Appetite

- **Do Ketogenic Diets Really Suppress appetite? A systematic review and meta-analysis.** *Obesity Reviews*. 2014.
- **Findings:**
  - In the context of energy restriction, which usually stimulates appetite in obese subjects, individuals adhering to a ketogenic diet were less hungry and had reduced desire to eat
- **Consuming eggs for breakfast influences plasma glucose and ghrelin, while reducing energy intake during the next 24 hours in adult men.** *Nutr Res*. 2010.
- **Design:** Cross over
- **Population:** 24 men, 20-70 years old
- **Intervention:** Consumed 2, isoenergetic breakfasts; carb:fat:protein
  - Egg: 22:55:23
  - Begal: 72:12:16
- **Outcomes:** The begal meal resulted in significantly greater hunger 3 hours after the breakfast and greater calorie consumption in the following 24 hours




## Weight Loss Not Necessary For Cardiovascular Risk Reduction

- **A Ketogenic Diet Favorably Affects Serum Biomarkers for Cardiovascular Disease in Normal-Weight Men.** *The Journal of Nutrition*. 2002.
- **Population:**
  - 20 normal-weight, normolipidemic men
- **Follow-up:** 6 weeks
- **Intervention Group:**
  - 12 consumed ketogenic diet
- **Control Group:**
  - 8 consumed their habitual diet
- **Outcome:**
  - There were no significant changes in blood lipids in the control group
  - In the ketogenic diet group:
    - 33% decrease in serum TG
    - 29% decrease in postprandial lipemia after a fat-rich meal
    - 34% fasting serum insulin
    - No change in fasting serum total and LDL cholesterol
    - Trend toward increase in HDL (11.5%, P = 0.066)
  - In subjects with a predominance of small LDL particles pattern B, there were significant increases in mean and peak LDL particle diameter



## Despite Similar Weight Lost, Carb Restriction May Offer More Cardiovascular Benefit


- **Two Diets with Different Hemoglobin A<sub>1c</sub> and Antihyperglycemic Medication Effects Despite Similar Weight Loss in Type 2 Diabetics.**
- *Diabetes Obesity and Metabolism*. 2015.
- **Population:**
  - 46 Type 2 Diabetics
  - Follow-up: 48 weeks
- **Intervention Group:**
  - 22 randomized to ketogenic diet
- **Control Group:**
  - 24 randomized to low-fat +orlistat
- **Outcome:**
  - Similar reduction in BMI (-2.5)
  - HBA1c: Ketogenic diet -0.7%, low fat diet +0.2% (CI = -1.6, -0.02; p = 0.045)
  - Ketogenic diet led to a greater reduction in anti-hyperglycaemic medications



## Endothelial Function May Improve More On A Low Carb Strategy

Outcomes (Fasting)	Low fat	Low carb
TG	-15%	-47%
Fasting Insulin	-6%	-51%
Lymphocyte responses	-1%	-12%
Peak flow mediated dilation at 3 hours, change	Decrease from 7.9 to 5.2%	Increase from 5.1 to 6.5%


- **Effects of dietary carbohydrate restriction versus low-fat diet on flow-mediated dilation.** *Metabolism*. 2009.
- **Population:**
  - 40 overweight men and women with moderate hypertriglyceridemia
- **Control/Intervention Group:**
  - Random allocation to either a 1500 kcal low fat or 1500 kcal low carb diet (carbohydrate-fat-protein = 56:24:20 or 12:59:28 respectively)
- **Outcome:**
  - Flow-mediated dilation of the brachial artery, before and after ingestion of a high-fat meal (808 kcal, 84% fat) at baseline and after 12 weeks




## The Origin Of the MetabolicHealth Concept


- Did you know there were two Bantings?

**Frederick Banting, 1891-1941**



**William Banting, 1796-1878**







## The Origin Of the MetabolicHealth Concept

- Atkins' reign of popularity and polarity

**Robert Atkins, 1930-2003**





## The Origin Of the *MetabolicHealth* Concept

- Starting in the early 2000's,
  - The rise of carb restriction as a scientifically supported therapeutic intervention
  - The concept of the **Well Formulated Low Carbohydrate (Ketogenic) (High/Healthy Fat) Diet**



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## The Origin Of the *MetabolicHealth* Concept

- Now less about a brand (eg. Atkins) and more about **low carb** as a therapeutic concept/tool
- The term *MetabolicHealth* is my own branding but is inspired by Volek et al.
  - Carbohydrate Restriction has a More Favorable Impact on the Metabolic Syndrome than a Low Fat Diet.** Lipids. 2009.

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If we can accept the assumption that the diseases of insulin resistance are caused by a combination of genetics plus a high sugar/refined carbohydrate dietary pattern...

Why Are We Talking about **Metabolic Syndrome**...

When We Could Be Talking About **MetabolicHealth?**

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### Does A Low Carb Intervention Have A Role For My Patients?

#### Jeff



- 69 year old man
- Asymptomatic
- Enjoys birding but has found his stamina has been down lately and he needs afternoon naps

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### Does A Low Carb Intervention Have A Role For My Patients?

#### Jeff's measurements:

Parameters	Baseline	Follow-up Period	Did the lifestyle intervention help?	Total follow-up	Most Recent
Weight	86kg	3 months	76kg	13 months	76kg
Waist	100cm		85cm		83cm
HbA1c	6.6%		5.8%		5.6%

A few early adopters suggested it did

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### The Question:

- If Diabetes Canada allows 3 months of lifestyle intervention to achieve glycemic targets, is **carbohydrate restriction counselling** the intervention of choice?
- It is supported by the American Diabetes Association since 2008 but not by Diabetes Canada
- A vocal minority in the medical community believe carbohydrate restriction should be the standard of care:
  - Dietary carbohydrate restriction as the first approach in diabetes management: Critical review and evidence base.** Nutrition. 2015.
- Others do not agree.
  - Low Carbohydrate Diets and Type 2 Diabetes: What is the Latest Evidence?** Diabetes Ther. 2015

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### Concerns About Low Carbohydrate Ketogenic Diets

- "We shouldn't be so prescriptive in telling people what to eat!"
  - The liberalization of diets argument
- "Ketones are bad"
  - The ketophobia misunderstanding
- "The brain takes 130g of carbohydrate a day to function optimally"
  - Few cell types in the body are glucose dependant
- "Saturated fat is bad for our health"
  - We are not what we eat
- "Low carb, high protein diets cause kidney failure"
  - Low carb does not have to equal high protein
- "Long-term safety is not proven"
  - Studies out to 2 years of follow-up suggest safety



### What About Jeff's Other Parameters? 16 months later

Parameter	Baseline	Most Recent
Waist Circumference (cm)	100	83
Weight (kg)	85	76
BMI	27	24.5
Blood pressure	119/74	116/69
HbA1c	6.6%	5.6%
Creatinine	104	81
Urea		6.1
Urine Protein	Neg	Neg
Microalbumin/Creatinine Ratio	0.3	0.3
ALT	19	17
Uric Acid	325	227
Total Cholesterol	5.4	4.69
LDL-C	3.66	2.96
Non-HDL-C	4.26	3.23
HDL-C	1.14	1.46
TG	1.31	0.55

### What About Jeff's Pharmacotherapy?

- None – patient refused



### 1. Liberalization Of Diets?

- Patients should not be told how to eat
- We should avoid being overly prescriptive in our diets
- Response:
  - We are obligated to prescribe first the most effective, safe and sustainable non-pharmacologic interventions
  - Then, pharmacologic interventions should be used judiciously to help patients meet their health goals



### Mary-Ann



- 59 year old woman
- Meet and Greet appointment:
  - BMI 45 → "Do you know if you might be diabetic?" ... "No I am not"
    - Denied polyphagia, polydipsia, polyuria
  - Follow-up lab work
    - HbA1c 11.1%
- "I don't want any medication and please don't tell my husband"



### Mary-Ann's Outcomes: 5 Months Later

Parameter	Baseline	Most Recent
Waist Circumference (cm)	123	102
Weight (kg)	126	103
BMI	44	36
Blood pressure	127/73	121/66
HbA1c	11.1%	5.6%
Creatinine	52	56
Urea	6.1	7.8
Urine Protein		Neg
Microalbumin/Creatinine Ratio		Neg
ALT	86	29
Uric Acid		357
Total Cholesterol	3.97	4.3
LDL-C	2.72	2.81
Non-HDL-C	3.19	3.18
HDL-C	0.78	1.12
TG	1.03	0.81

## What About Mary-Ann's Pharmacotherapy?

- None



## 2. Nutritional Ketosis ≠ DKA

- DKA is a state of counter-regulatory hormone surge:
  - Unopposed glucagon, cortisol
- Often, patients in DKA are very sick:
  - Volume contracted, hypotensive, tachycardic, electrolyte disturbances, acidotic, altered mentation
- Nutritional ketosis:
  - Far lower concentrations of blood ketones
  - Insulin is present preventing unopposed ketone generation
  - Normal mentation, normal vitals



## 3. The Brain is NOT Dependant on Dietary Carbohydrates

- "The brain takes 130 g of carbohydrate a day to function"
- I have heard this many times over the last year and the advocates are quoting the CDA's 2013 guidelines.
  - To support this statement, the CDA references:
    - The Institute of Medicine's 2002 document: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients)*
- However, pages 275 to 280 in this document actually begins with the statement:
  - "The lower limit of dietary carbohydrate compatible with life apparently is zero, provided that adequate amounts of protein and fat are consumed."



## Sally



- 45 year old woman
- Struggles with anxiety, personality traits and compulsive eating



## Sally's Outcomes: 7 Months Later

Parameter	Baseline	Most Recent
Waist Circumference (cm)	152	127
<b>Weight (kg)</b>	<b>151</b>	<b>129</b>
BMI	56	47
Blood pressure	134/78	145/83
<b>HbA1c</b>	<b>9.3%</b>	<b>6.3%</b>
Creatinine	62	74
Urea	5.0	6.2
Urine Protein	Neg	Neg
Microalbumin/Creatinine Ratio	Neg	Neg
ALT	25	19
Uric Acid	285	409
Total Cholesterol	4.25	4.97
LDL-C	2.23	2.8
Non-HDL-C	2.74	3.24
HDL-C	1.51	1.73
TG	1.13	0.97

## What About Sally's Pharmacotherapy?

Medication	Baseline	Now
Metformin	1000 mg po bid	Same
Lantus	40 units sc bid	Same
Gliclazide MR	120 mg po daily	Stopped

Date:	acB:	acL:	acS:	qHS:
Nov 15	4.8	4.4	4.9	4.4
Nov 16	5.0	4.6	5.6	5.1
Nov 17	4.4	6.9	4.4	5.8



## 4. Dietary Fat: Safe?

- Recent studies refute claims that dietary fat poses cardiovascular risk
- How long will it be before mainstream medicine catch up with the research?
- We are 10 years behind right now.



## 4. Dietary Fat: Safe?

### Low-fat dietary pattern and risk of cardiovascular disease: the Women's Health Initiative Randomized Controlled Dietary Modification Trial. JAMA. 2006.

- Objective:**
  - To test the hypothesis that a dietary intervention, intended to be low in fat and high in vegetables, fruits, and grains would reduce CVD risk
- Population:**
  - Randomized controlled trial of 48,835 postmenopausal women aged 50 to 79 years, of diverse backgrounds and ethnicities
- Intervention/Control Group:**
  - Women were randomly assigned to an intervention (19,541 [40%]) or comparison group (29,294 [60%]) in a free-living setting
  - Study enrollment occurred between 1993 and 1998 in 40 US clinical centers. Mean follow-up in this analysis was 8.1 years
  - Intensive behavior modification in group and individual sessions designed to reduce total fat intake to 20% of calories and increase intakes of vegetables/fruits to 5 servings/day and grains to at least 6 servings/day
  - The comparison group received diet-related education materials
- Outcomes:**
  - Reduced total fat intake and increased intakes of vegetables, fruits, and grains did not significantly reduce the risk of CHD, stroke, or CVD in postmenopausal women



## 4. From Dr. Ron Krauss

Senior Scientist and Director of Atherosclerosis Research at Children's Hospital Oakland Research Institute

- Interviewed by Dr. Rhonda Patrick; on youtube



- Dietary saturated fat, particularly the shorter chain fatty acids, tend to increase LDL-C but this increase does not seem to confer increased cardiovascular risk



## 4. Dietary Saturated Fat: Safe?

### Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. BMJ. 2015.

- Design:**
  - Systematic review examining the association between dietary saturated fat and various cardiovascular end-points
  - Between 3 to 12 prospective cohort studies were found for each association and were pooled
  - Each association pooled between 90, 501 to 339, 090 participants
- Findings:**
  - Dietary saturated fat intake was not associated with:
    - All cause mortality (relative risk 0.99, 95% confidence interval 0.91 to 1.09)
    - CVD mortality (0.97, 0.84 to 1.12)
    - Total CHD (1.06, 0.85 to 1.17)
    - Ischemic stroke (1.02, 0.90 to 1.15)
    - Type 2 Diabetes (0.95, 0.88 to 1.03)



## 4. Dietary Saturated Fat: Safe?

### Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE) Lancet. 2017

- Design:**
  - A prospective cohort study
  - Ages 35–70 years enrolled between 2003 and 2013 from 18 countries
  - Median follow-up of 7.4 years
  - Dietary intake of 135,335 individuals was recorded using validated food frequency questionnaires
- Findings:**
  - Total fat and types of fat were not associated with cardiovascular disease, myocardial infarction, or cardiovascular disease mortality, whereas saturated fat had an inverse association with stroke
  - Higher carbohydrate intake was associated with higher risk of total mortality



## 4. We Are What Our Body Makes Out of What We Eat

### Effects Of Step-wise Increases In Dietary Carbohydrate On Circulating Saturated Fatty Acids And Palmitoleic Acid In Adults With Metabolic Syndrome. PLoS One. 2014.

- Population:**
  - 16 adults with metabolic syndrome
  - Mean age 44.9±9.9 yr, BMI 37.9±6
- Intervention:**
  - 4, 3 week diets that progressively increased carbohydrate content from 47 to 346 g/day with concomitant decreases in total and saturated fat
- Outcomes:**
  - Despite a distinct increase in saturated fat intake from 46 to 84 g/day and then a gradual decrease in saturated fat to 32 g/day at the highest carbohydrate phase, there were no significant changes in the proportion of total serum plasma fatty acid in any plasma lipid fractions
  - The proportion of palmitoleic acid in plasma triglyceride and cholesteryl ester was significantly and uniformly reduced as carbohydrate intake decreased, and then gradually increased as dietary carbohydrate was re-introduced
- Conclusions:**
  - Dietary and plasma saturated fat are not related, and that increasing dietary carbohydrate across a range of intakes promotes incremental increases in plasma palmitoleic acid
  - Plasma palmitoleic acid is a biomarker consistently associated with adverse health outcomes



### 4. The AHA Warns Against Saturated Fat:

- **Dietary Fats and Cardiovascular Disease: A Presidential Advisory From the American Heart Association.** Circulation. 2017.
- Meta-analysis of 4 RCTs, the most recent of which was published in 1983, whose population was psychiatric inpatients from Finland
- They conclude strongly that lowering intake of saturated fat and replacing it with unsaturated fats, especially polyunsaturated fats, will lower the incidence of CVD



### 4. Atherogenic Dyslipidemia

- Atherogenic Dyslipidemia is otherwise known as "Pattern B"
- Triad of high TG, low HDL and preponderance of small, dense LDL
  - LDL molecules less than 25 nm in size
- Originally described by Austin in 1990
- May explain more cardiovascular risk than baseline LDL
- **Saturated Fats Versus Polyunsaturated Fats Versus Carbohydrates for Cardiovascular Disease Prevention and Treatment.** Annu Rev Nutr. 2015.
  - When you feed a person a diet higher in carbohydrates, especially when it replaces fat calories, their lipid profile shifts toward pattern B



### 4. Atherogenic Dyslipidemia

↑ Small, Dense LDL Subfraction + ↑ TG + ↓ HDL is associated with CVD

- **Atherogenic Lipoprotein Subfractions Determined by Ion Mobility and First Cardiovascular Events After Random Allocation to High-Intensity Statin or Placebo.** Circulation. 2015

- The JUPITOR trial randomized 11,186 to placebo or 20 mg of rosuvastatin/day, and followed for 1.9 to 5 years

Baseline Lipid and Lipoprotein Measures in Relation to Incident CVD Events Among the Placebo Arm

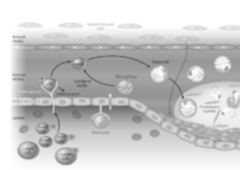
Lipoprotein	CVD		CVD in subgroups	
	HR	95% CI	HR	95% CI
LDL-C	1.00	1.00	1.00	1.00
LDL-C < 100 mg/dL	0.90	0.78-1.04	0.95	0.81-1.11
LDL-C 100-129 mg/dL	0.95	0.81-1.11	0.95	0.81-1.11
LDL-C ≥ 130 mg/dL	1.00	0.87-1.14	1.00	0.87-1.14
LDL-C < 100 mg/dL	0.90	0.78-1.04	0.95	0.81-1.11
LDL-C 100-129 mg/dL	0.95	0.81-1.11	0.95	0.81-1.11
LDL-C ≥ 130 mg/dL	1.00	0.87-1.14	1.00	0.87-1.14
LDL-C < 100 mg/dL	0.90	0.78-1.04	0.95	0.81-1.11
LDL-C 100-129 mg/dL	0.95	0.81-1.11	0.95	0.81-1.11
LDL-C ≥ 130 mg/dL	1.00	0.87-1.14	1.00	0.87-1.14

### 4. Pathogenesis of Small, Dense LDL in Atherosclerosis:

From: Saturated Fats Versus Polyunsaturated Fats Versus Carbohydrates for Cardiovascular Disease Prevention and Treatment. Annu Rev Nutr. 2015.

Low-density lipoprotein (LDL) particles and atherogenesis

- "LDL is innocuous.
  - It is oxidized, small dense LDL that mediates cardiovascular damage"
  - Griffin, J.E. Textbook of Endocrine Physiology. Fourth Edition. 2000, pg 404
- 1. LDL particles circulating in the blood infiltrate the endothelial layer of arteries and are bound by proteoglycans and become oxidized.
- 2. This triggers inflammatory processes and foam cell formation by macrophages. These lipid-laden foam cells form the core of the atherosclerotic plaque and can amplify local inflammation and promote thrombosis.
- 3. Apolipoprotein CIII (apoCIII), an exchangeable apoprotein whose concentrations vary on apoB-containing particles, has been shown to play a direct role in some of these processes.
- 4. Small, dense LDL is considered more atherogenic due to its longer plasma residence time, higher apoCIII content, greater arterial retention, and increased susceptibility to oxidation, triggering inflammatory and thrombotic processes.



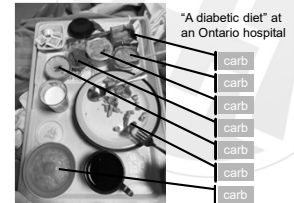
### 4. Is Dietary Fat The Enemy?

- **Dietary fat restriction** has not been proven to reduce cardiovascular risk
- **Saturated fat consumption** has not been proven to cause cardiovascular disease
- **Replacing dietary fat calories with carbohydrate calories** pushes the lipid profile toward atherogenic dyslipidemia
- **Atherogenic dyslipidemia** is associated with cardiovascular disease



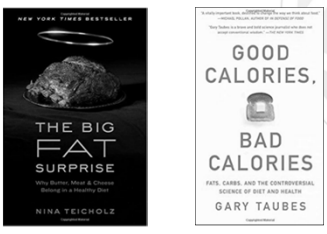
### 4. Are We Causing Harm By Pushing Carbohydrate Consumption?

- We are mandated to feed institutionalized patients in our hospitals and nursing homes a diet with a minimum percentage of energy from carbohydrates
- Diabetes Canada directs our diabetic patients to eat a minimum percentage of their energy from dietary carbohydrates





## The Low Fat Politics



**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## Patty



- 77 year old woman
- Long standing T2DM
- Under the care of the Diabetic Ed Team

**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## Patty's Outcomes: 13 Months Later

Parameter	Baseline	Most Recent
Waist Circumference (cm)	118	102
Weight (kg)	101	84
BMI	36	30
Blood pressure	125/52	131/58
HbA1c	7.4%	6.8%
<p><b>Should we worry if LDL-C goes up? I would argue NO.</b></p> <p>1. LDL may rise because LDL-C is calculated and if TG goes down and HDL goes up, LDL-C calculated will go up</p> <p>Misc: 2. We know that amongst patients eating a low carb, high fat diet, the fraction of LDL that increases in concentration is the large, buoyant molecules (Siri-Tarino, Annu Rev Nutr. 2015), which are not associated with CVD risk.</p>		
Total Cholesterol	3.64	4.56
LDL-C (calc)	1.94	2.76
Non-HDL-C	2.51	3.22
HDL-C	1.13	1.34
TG	1.25	1.02

**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## What About Patty's Pharmacotherapy?

Medication	Baseline	Now
Insulin	Lantus 38 units qHS	Lantus 5 units bid
	Novorapid 5 units ac meals	Novorapid stopped
Valsartan	40 units daily	Same
Bisoprolol	2.5 mg po daily	Same
Spirolactone	12.5 mg po daily	Stopped
Lasix	20 mg po daily	Stopped

Date:	acB:	acL:	acS:	qHS:
Nov 15	5.2	6.1	5.3	6.9
Nov 16	5.2	5.2	5.2	6.3
Nov 17	5.2	5.4	5.5	5.3

**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## 5. Low Carb Causes Renal Failure?

- Average change from baseline to present:
  - Down 0.35 amongst 18 patients
- To arrive at this I have excluded 3 extreme changes:
  - 1 patient whose ACR decreased by 81
  - 2 patients whose ACR increased by 20 and 14 respectively
- Amongst 20 patients with Negative ACRs at baseline:
  - 8 of them became detectable at follow-up with the highest being 2.8
- Amongst 25 patients with Positive ACRs at baseline:
  - 6 of them become non-detectable at follow-up; one patient's ACR resolved from 7.7

**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## 5. Low Carb Improves Renal Function

- **Renal Function Following Three Distinct Weight Loss Dietary Strategies During 2 Years of a Randomized Controlled Trial.** Diabetes Care. 2013.

- Population:
  - 318 participants
  - Average age of 51 years, 88% men, BMI 31, mean eGFR 70.5, mean urine MCR 12, serum creatinine = 176 µmol/L
- Groups:
  - Follow-up: 2-years
  - Design: RCT
  - Groups: low-fat, Mediterranean, or low-carbohydrate diets
- Outcomes:
  - The 2-year compliance was 85%
  - The proportion of protein intake significantly increased to 22% of energy only in the low-carbohydrate diet (P < 0.05 vs. low-fat and Mediterranean)
  - All groups showed significant improvement in eGFR >4%
  - Controlled for age, sex, diet group, type 2 diabetes, use of ACE inhibitors, 2-year weight loss, and change in protein intake (confounders and univariate predictors)
  - Only a decrease in fasting insulin (β = -0.211; P = 0.004) and systolic blood pressure (β = -0.26; P < 0.001) were independently associated with increased eGFR
  - The same ACRs improved similarly across the diets, particularly among participants with baseline low-eGFR microalbuminuria.
    - Mean improvement in ACR of -24.8 (P < 0.05)

**MEGABOLIC HEALTH PROGRAM**  
THE 3-DIETARY-STRATEGY TRIAL

## 6. Long Term Safety and Efficacy

- Diabetes Canada published in its Nutrition Therapy section in 2013:
  - "A systematic review and meta-analysis of controlled feeding studies in people with type 2 diabetes found that CHO-restricted diets (mean CHO from 4% to 45% of total energy per day) improved A1C and triglycerides (TG), but not total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) or body weight compared with higher-CHO diets over the short term" (Kirk | J Am Diet Assoc | 2008).
  - "The long-term sustainability and safety of these diets, however, remain uncertain. Very-low-CHO diets may not ensure sufficient vitamin, mineral and fibre intake" (No reference provided).

Dworatzek, Paula D. "Nutrition Therapy." Can J Diabetes 2013;37(suppl 1):S45-S55.



## 6. Long Term Safety and Efficacy

- The Kirk meta-analysis published in 2008 concluded that carbohydrate restriction helps with glycemic control in the short term; furthermore,
  - "Randomized, controlled studies of restricted-carbohydrate diets in patients with diabetes need to be conducted in order to evaluate the overall sustainability of outcomes and long-term safety."



## 6. Long Term Safety and Efficacy

- Fortunately, since 2006, there are at least 25 RCT done showing favorable outcomes for low carb interventions compared to low calorie (list available at MetabolicHealth.ca) including a 2009 study by Volek at et., which inspired the name sake of the program I have developed for my patients
- Unfortunately, despite being a 2013 guideline, Diabetes Canada has not updated its recommendations pertaining to low carb dietary interventions to include more recent research



## Conclusions:

- Could patients also have success with alternative diets?
  - YES!
    - I conceptualize a Mediterranean Diet as a maintenance diet for patients who have recovered from insulin resistance
    - Calories restriction is likely appropriate for patients who do not have insulin resistance



## Conclusions:

- Has Dr. Biondi had success promoting a low carb lifestyle intervention in his practice?
  - Yes – In an average of 8 months:
    - 78 patients have lost between 10 to 66 lbs, 22 lbs each on average
    - Total weight loss of 1948 lbs



## Conclusions:

- How can I start?
  - Whether you are seeing a patient for the first and only time or the umpteenth time,
    - Give him or her a MetabolicHealth Minute



## Conclusions:

- The **MetabolicHealth Program** accepts referrals for:
  - Type two diabetes +/- insulin treatment
  - Morbid obesity (BMI > 40)
  - Metabolic Syndrome (3 of waist >102cm, TG > 1.7, HDL < 1.3, HTN, IFG/IGT)
  - Polycystic ovarian syndrome
  - NASH
- We are happy to help you bring the MetabolicHealth Program to your office. Inquire at [MetabolicHealth.ca](http://MetabolicHealth.ca)**

A black and white photograph of a soda can with the word "COLA" on it. A tag is attached to the can with a string, containing a health warning. The tag text reads: "Health Warning: If you are obese, diabetic or have high blood pressure, sweet beverages may be bad for your health. Ask your doctor if a dietary pattern low in sugar and refined carbohydrates is right for you." The background features a large, faint version of the MetabolicHealth Program logo.

**Thank You.**

The logo for the MetabolicHealth Program, featuring a stylized cross symbol inside a circle, with the text "METABOLICHEALTH PROGRAM" and "THE FUTURE OF HEALTH CARE" below it.