

# Coca-colonization: Loss of Traditional Diet and the Rise in Chronic Disease

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## Coca-colonization

... chronic disease epidemics that have occurred concurrently with modernization of lifestyle, a process labeled by the late Arthur Koestler as 'Coca-colonization' ...

Zimmet, Journal of Internal Medicine 2000



“Hundreds of thousands sickened and died as a result of their encounters with Europeans. Famine and warfare contributed, but infectious diseases were the great killer. Influenza, measles, polio, diphtheria, smallpox and other diseases were transported from the slums of Europe to the unprotected villages of the Americas. The subsequent decline of the indigenous population is often described as genocide or a holocaust.”

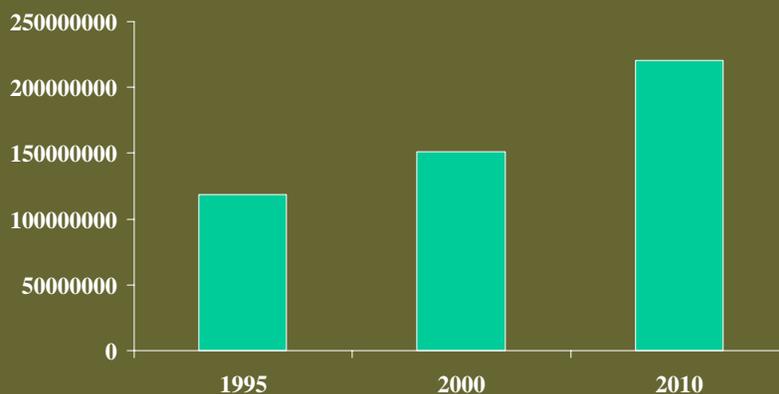
Report of the Royal Commission on Aboriginal Peoples 1996

Effective prevention and treatment tools and strategies now exist for virtually all the infectious diseases known to man.

The remaining barriers to eradicating health inequity in infectious disease control are mainly socioeconomic in nature.

The same cannot be said for chronic disease.

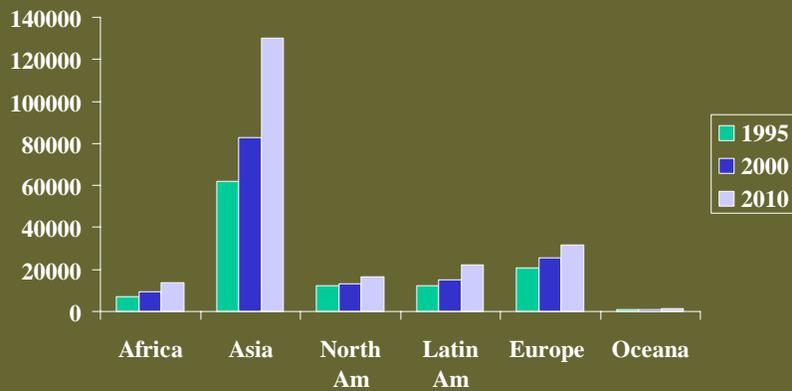
## Global Estimates of Type 2 Diabetes



Zimmet, Journal of Internal Medicine 2000

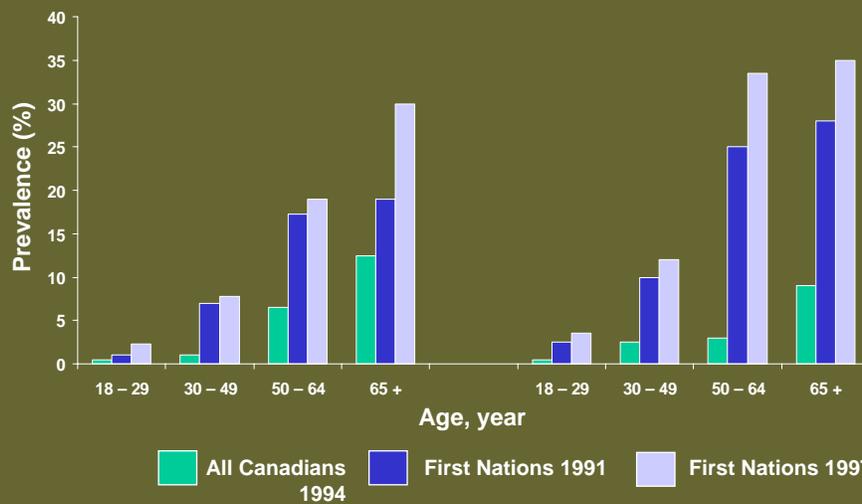
## Global Estimates of Type 2 Diabetes

(1000's)



Zimmet, Journal of Internal Medicine 2000

## Prevalence of Diabetes in First Nations compared to all Canadians



Young et al, CMAJ 2000

## What is Diabetes?

A metabolic disorder characterized by the presence of hyperglycemia due to defective insulin secretion, insulin action, or both.

## Type 2 Diabetes is the Tip of the Iceberg of Metabolic Syndrome

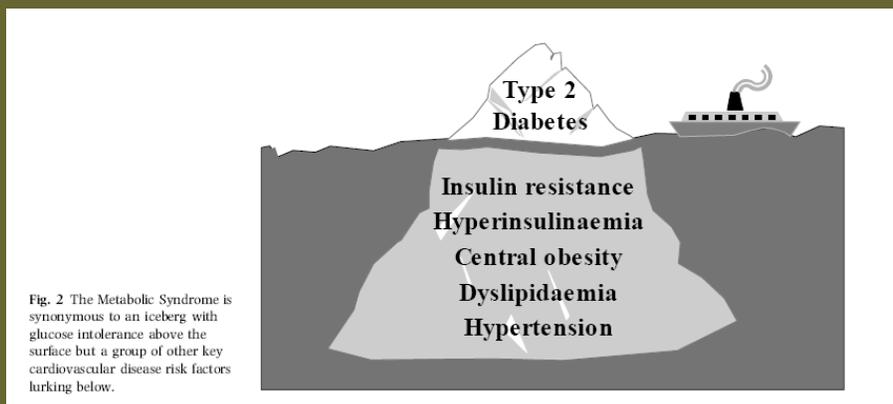
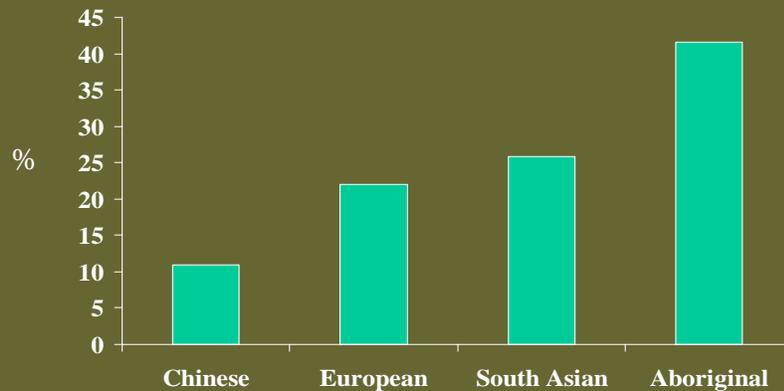


Fig. 2 The Metabolic Syndrome is synonymous to an iceberg with glucose intolerance above the surface but a group of other key cardiovascular disease risk factors lurking below.

Zimmet, Journal of Internal Medicine 2000

## Metabolic Syndrome in Canada



Anand et al, *Circulation* 2003

Five symptoms common to most definitions of MetS are those that are reliably improved by CHO restriction. Carbohydrate restriction is one strategy for weight loss but, in addition, improves glycemic control, insulin levels, TAG and HDL levels even in the absence of weight loss. We suggest that *response to CHO restriction* may, in fact, be an operational definition of MetS. Its underlying basis would rest on the idea that the features of MetS are associated with a disruption in insulin metabolism which is strongly influenced by dietary CHO.

Volek and Feinman, *Nutrition and Metabolism* 2005

Pladeval et al, A Single Factor Underlies the Metabolic Syndrome, A Confirmatory Factor Analysis, Diabetes Care 2006

“These analyses support the current clinical definition of metabolic syndrome, as well as the existence of *a single factor that links all of the core components.*”

Type 2 Diabetes is the Tip of the Iceberg of Metabolic Syndrome

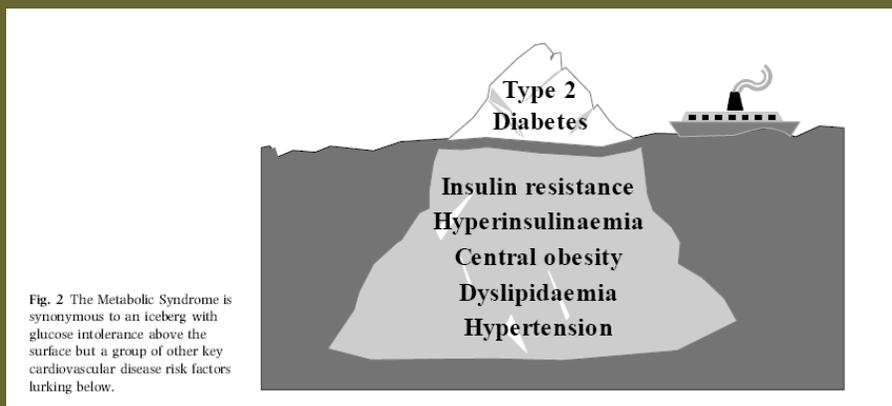
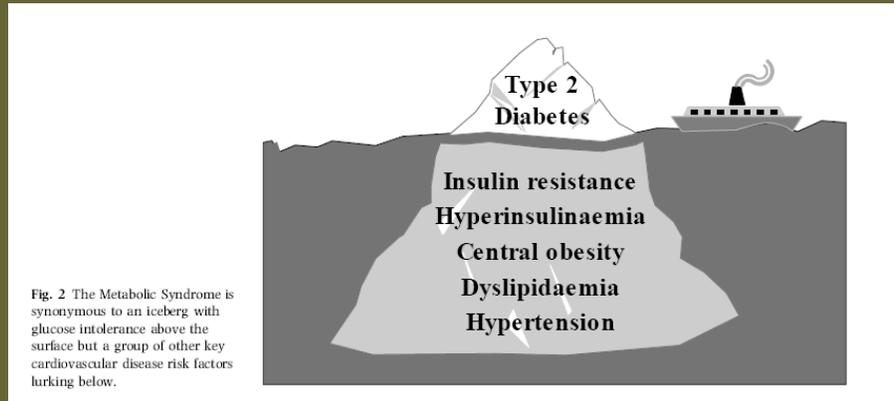


Fig. 2 The Metabolic Syndrome is synonymous to an iceberg with glucose intolerance above the surface but a group of other key cardiovascular disease risk factors lurking below.

Zimmet, Journal of Internal Medicine 2000

## Type 2 Diabetes is the Tip of the Iceberg of *Carbohydrate Intolerance Syndrome*



Zimmet, Journal of Internal Medicine 2000

### A different way of looking at type 2 diabetes:

The advanced stage of a disease continuum which begins before the clinical manifestations of overweight and obesity, which spans the components of metabolic syndrome and which is propelled by chronic carbohydrate consumption in excess of individual genetically determined metabolic threshold.

## How do we manage intolerances?

1. Gluten intolerance ... Avoid wheat products
2. Lactose intolerance.. Avoid dairy products
3. Phenolketonuria ... Avoid protein foods
4. Carbohydrate intolerance ... ***Eat lots of carbohydrates!!!***

## Joslin Diabetic Diet

Quantity of food required by a severe diabetic patient weighing 60 kilograms:

Carbohydrate	10 g	40 cal
Protein	75 g	300 cal
Fat	150 g	1,350 cal
Alcohol	15 g	105 ca

Meats, poultry, game, fish, clear soups, gelatin, eggs, butter, olive oil, coffee, tea

Osler and Macrae, The Principles and Practice of Medicine, 1923

## Atkins Diet Research

- 120 overweight subjects randomized to Atkins vs AHA low-fat/low-cal for 6 mos.
- Atkins had better compliance (76% vs 57%)
- Atkins lost 57% more weight (13.8% vs 8.8%)
- Atkins raised HDL by 10% vs -3%
- Atkins lowered triglycerides by 47% vs 14%

Yancy et al, Ann Intern Med 2004

## 12 month Atkins Diet Study

- low-fat AHA vs Atkins over 12 months
- 63 obese subjects randomly assigned
- Atkins group lost more weight after 6 months
- reduced cardiovascular risk factors in Atkins group (increased HDL and decreased triglycerides)
- at 12 months Atkins dieters lost 76% more weight (4.4% vs 2.5%) but not statistically significant

Foster et al, NEJM 2003

## 12 month Atkins Diet Study

- low-fat AHA vs Atkins over 6 months, followed-up at 12 months
- 132 obese subjects randomly assigned
- At 6 months, Atkins group lost more weight (5.5 kg vs 1.6 kg)
- reduced cardiovascular risk factors in Atkins group (HDL decreased less and triglycerides decreased more)
- At 12 months Atkins dieters lost 65% more weight (5.1 kg vs 3.1 kg) but not statistically significant

Stern et al, Ann Intern Med 2004

## Low-Carb/High Protein Diet for Diabetics

- Untreated type II diabetics
- 5 week LoBAG diet, non-ketogenic, no weight loss
- carb:protein:fat ratio 20:30:50 vs control 55:15:30
- Fasting glucose decreased from 9.3 to 6.6
- HgA1c decreased from 9.8 to 7.6
- Serum insulin dropped and glucagon increased
- No change in cholesterol
- “dramatically reduced the circulating glucose concentration in people with untreated type II diabetes”

Gannon and Nuttal, DIABETES 2004

## Traditional Diet Research

- 10 Aborigine men with type II diabetes
- Lived for 7 weeks as hunter-gatherers
- average wt loss of 8.1 kg
- Fasting glucose fell from 11.6 to 6.6
- Fasting insulin fell from 23 to 12
- Insulin response increased from 61 to 104
- Decreased triglycerides and VLDL

O'Dea, Diabetes 1984

## Traditional Diet Research

- Prospective cohort study of northern Cree with type II diabetes
- Three month study of 25 subjects living traditional lifestyle in the bush and 26 controls in the community
- Limited effect on diabetic indices
- Bush-living group ate store-bought food

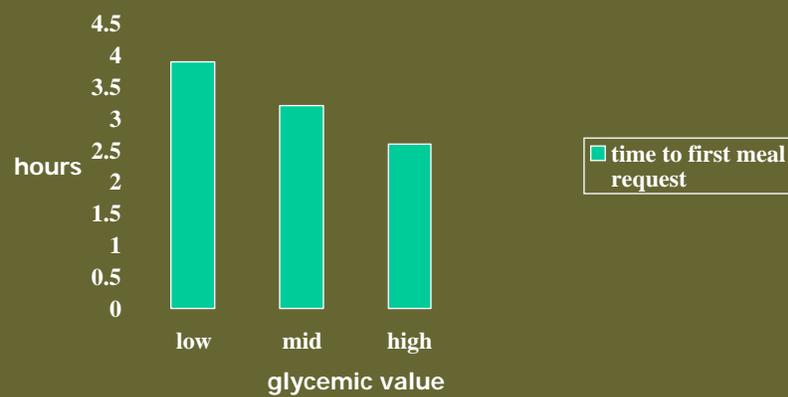
Robinson et al, Chronic Diseases Canada 1995

## Diet Composition and Appetite

- Crossover study of 12 obese teenage boys
- Isocaloric meals of varying glycemic values
- Two meals followed by 5 hrs monitoring of caloric intake

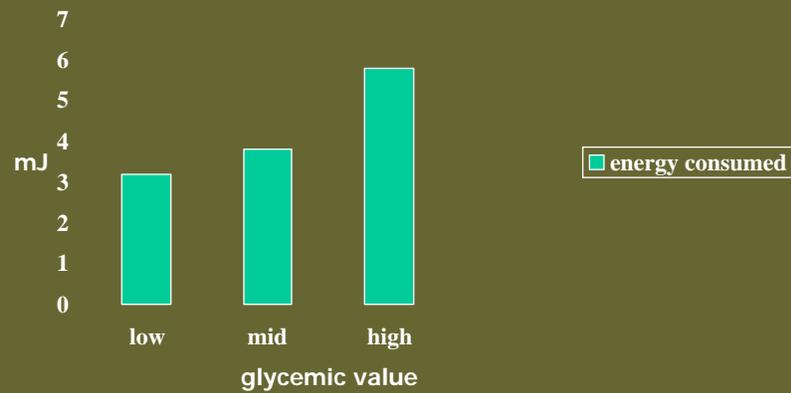
Ludwig et al, Pediatrics 1999

## Diet Composition and Appetite



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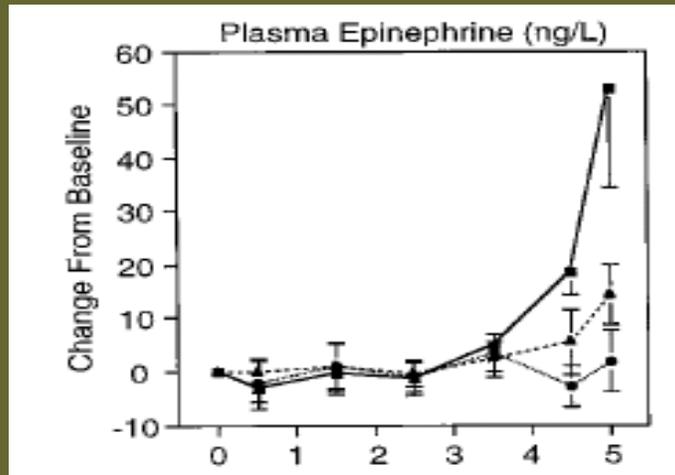
## Diet Composition and Appetite

High glycemic meals led to:

- Higher serum insulin
- Lower plasma glucagon
- Lower post-absorptive plasma glucose and serum fatty acids
- Elevated plasma epinephrine

Ludwig et al, Pediatrics 1999

## The Serum Glucose Rescue



Ludwig et al, Pediatrics 1999

## Diet Composition and Appetite

The rapid absorption of glucose after consumption of high-GI meals induces a sequence of hormonal and metabolic changes that promote excessive food intake in obese subjects.

Ludwig et al, Pediatrics 1999

## Diet Composition and Appetite

- Low GI = egg, egg white, low-fat cheese, spinach, tomato, grapefruit, apple
- Medium GI = steel cut oats, 2% milk, half and half, fructose
- High GI = instant oatmeal, 2% milk (with lactase), half and half, dextrose

Ludwig et al, Pediatrics 1999

## Diet Composition and Appetite

- Inpatient comparison of 2 diets
- 10 obese patients with type II diabetes
- Usual diet for 7 days followed by low-carb (< 20 gm/d) for 14 days
- No caloric restriction

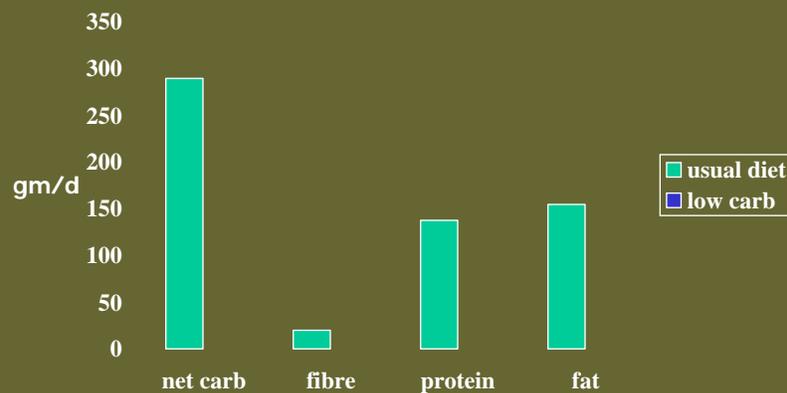
Boden, et al, Ann Intern Med 2005

## Diet Composition and Appetite

- weight loss of 2.02 kg during low-carb period (0.35 kg water)
- fasting glucose decreased from 7.5 to 6.3
- HgA1c decreased from 7.8% to 6.8%
- insulin and leptin decreased, grehlin increased
- triglycerides dropped 35%, total cholesterol dropped 10%
- **calorie intake decreased from 3057 to 2101**

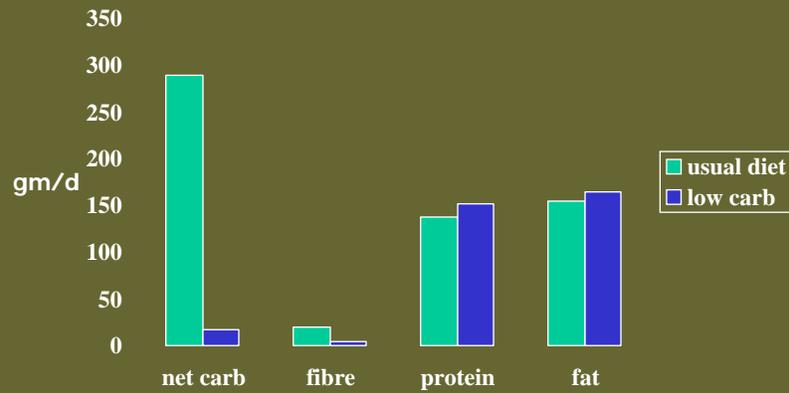
Boden, et al, Ann Intern Med 2005

## Diet Composition and Appetite



Boden, et al, Ann Intern Med 2005

## Diet Composition and Appetite



Boden, et al, Ann Intern Med 2005

## Traditional Aboriginal Diet

- Varied depending on geography and culture
- Consist of game, fish, seafood, and a variety of seasonal plants, all with low glycemic values
- Traditional diets were consistently “low-carb”
- The modern diet of First Nations people is very high in sugar and other refined carbohydrates.



Case Study:

- 48 year old First Nations man with type II diabetes, hypertension and Hyperlipidemia
- On insulin for past 17 years
- Humulin N 25u, Humulin R 3-5 u qid, Ramipril 10 mg.
- Fasting glucose 9 – 10 mmol
- weighs 291lbs (135 kg)
- starts Atkins diet



- at 2 weeks
  - weight loss of 17 lbs (8 kg)
  - blood glucose normalizes
  - discontinues insulin
- at 4 weeks
  - weight loss of 31 lbs (14 kg)
  - blood pressure normalizes
  - discontinues ACE inhibitor
- at 9 weeks
  - weight loss of 37 lbs (17 kg)
  - BP 118/72
  - fasting glucose 5.0 – 6.0 mmol
- at 18 weeks
  - weight loss of 46 lbs (21 kg)
  - normal glucose
  - normal BP
  - normal cholesterol
  - no meds



The low-fat "diet heart hypothesis" has been controversial for nearly 100 years. The *low-fat, high-carbohydrate diet*, promulgated vigorously by the National Cholesterol Education Program, National Institutes of Health, and American Heart Association since the Lipid Research Clinics-Primary Prevention Program in 1984, and earlier by the U.S. Department of Agriculture food pyramid, may well have played an unintended role in the current epidemics of obesity, lipid abnormalities, type II diabetes, and metabolic syndromes. This diet can no longer be defended by appeal to the authority of prestigious medical organizations or by rejecting clinical experience and a growing medical literature suggesting that the much-maligned *low-carbohydrate, high-protein* diet may have a salutary effect on the epidemics in question.

Weinberg, Journal of the American College of Cardiology 2004

“Well, I'll do everything humanly possible. Unfortunately, we barbers aren't gods. You know, medicine is not an exact science, but we are learning all the time. Why, just fifty years ago, they thought a disease like your daughter's was caused by demonic possession or witchcraft. But nowadays we know that Isabelle is suffering from an imbalance of bodily humors, perhaps caused by a toad or a small dwarf living in her stomach.”

- Theodorick of York (aka Steve Martin), Saturday Night Live



