

Ketogenic Diets Practical Approach

What Health Care Professionals Need to know?



November 15, 2019
Diabetes Connect
Presenter Wendy Graham RD CDE

Learning Objectives

- * Recognize the difference between low carbohydrate and ketogenic diet
- * Recognize contraindications for using the ketogenic diet for a person with type 2 diabetes
- * Describe medications that may require alterations
- * Describe the nutrient supplementation required with the ketogenic diet

Ketogenic Diet

What is it?

Very Low Carbohydrate	20-50 g/day	(2-10%)
High Fat		(70- 90%)
Protein		(6-20%)

Fat: Carb+Protein

4:1

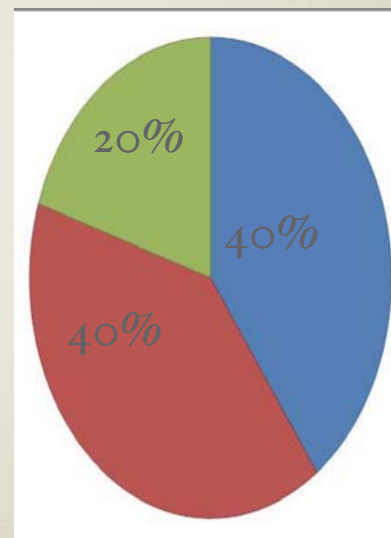
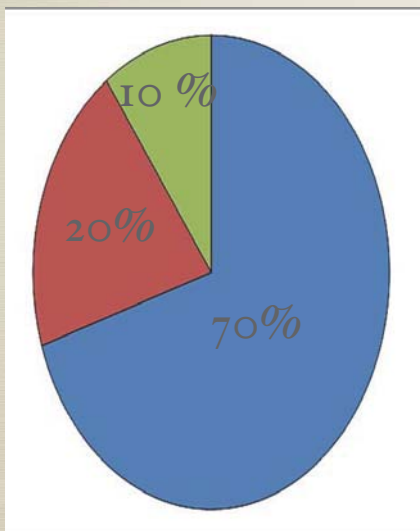
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Macronutrient Distribution

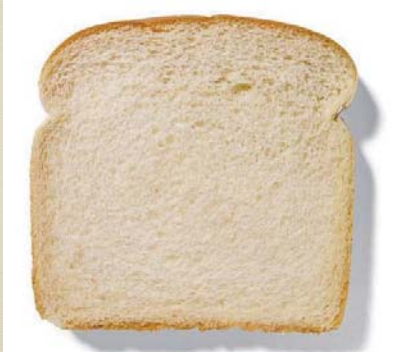
Ketogenic

Low Carbohydrate



Carbohydrate

15 grams of Carbohydrate



Or

Carbohydrate- Keto

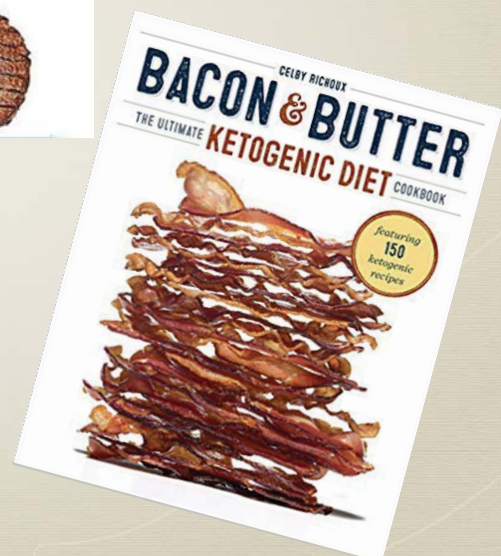
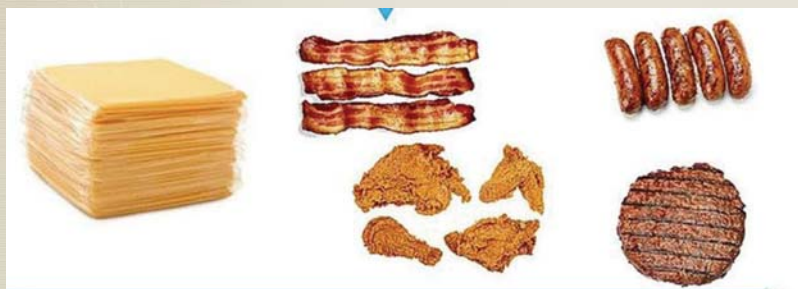


Carbohydrate-Keto



Source: www.dietdoctore.com

People think Keto is.....



Keto Diet Sample Meals Ratio 3:1



½ tomato
100g cucumber
2 oz cheese
2 oz kolbassa
12 olives
1 ½ large radish
3 Tbsp oil
7.7 g carb
20 g protein
75.6 g fat
791 calories



2oz salmon
1 c grated cauliflower
½ portabello mushroom
½ c green beans
1 c almond milk
12 olives
2 Tbsp cream cheese
3 Tbsp olive oil
7.6 g carb
15 g protein
63.3 g fat
660 calories

Guidelines

American Diabetes Association May 2019

- * *Very low carbohydrate –ketogenic diet can be considered in Select Adults with type 2 diabetes if*
- * **A1c not at target**
- * **Priority is reducing medications**

Evidence

research letter

Diabetes, Obesity and Metabolism 16: 90–93, 2014.
© 2013 John Wiley & Sons Ltd

Two diets with different haemoglobin A1c and antiglycaemic medication effects despite similar weight loss in type 2 diabetes

N= 22, 44 weeks

ORIGINAL ARTICLE

Short-term safety, tolerability and efficacy of a very low-calorie-ketogenic diet interventional weight loss program versus hypocaloric diet in patients with type 2 diabetes mellitus

A Goday^{1,2,3}, O Bellido⁴, I Sajoux⁵, AB Crujeiras^{6,7}, B Burguera^{8,9}, PP Garcia-Luna¹⁰, A Oleaga¹¹, B Moreno¹² and FF Casanueva^{8,7}

RCT, N=45,
16 weeks Retention 64%

ORIGINAL ARTICLE

Effects of an energy-restricted low-carbohydrate, high unsaturated fat/low saturated fat diet versus a high-carbohydrate, low-fat diet in type 2 diabetes: A 2-year randomized clinical trial

Jeannie Tay PhD^{1,2,6} | Campbell H. Thompson MD² | Natalie D. Luscombe-Marsh PhD¹
Thomas P. Wycherley PhD³ | Manny Noakes PhD⁴ | Jonathan D. Buckley PhD³ |
Gary A. Wittert MD² | William S. Yancy Jr MD^{4,5} | Grant D. Brinkworth PhD¹

RCT, N=61, 2 years Retention 53%

Evidence

Results

- * ↓A1c (0.6-0.7%)
- * Medication reduction
 - * greater than 50% MES reduction in 70% of patients
- * Improvement in lipids
- * ↓Weight

Medication Effect Score(MES)

- % of medications maximum dose
- Multiplied by adjustment factor

Goday et al. Short-term safety, tolerability and efficacy of a very low-calorie-ketogenic diet interventional weight loss program versus hypocaloric diet in patients with type 2 diabetes mellitus. Nutrition and Diabetes 2016 Sep; 6(9):e230. doi: 10.1038/nutd.2016.36

Mayers et al. Two Diets with Different Hemoglobin A1c and Antiglycaemic Medication Effects Despite Similar Weight Loss in Type 2 Diabetes. Diabetes Obesity Metab 2014 Jan; 16(1): 10.1111/dom.12191. Accessed February 2019.

Tay, J et al. Effects of an energy-restricted low-carbohydrate, high un saturated fat/low saturated fat versus a high-carbohydrate, low fat diet in type 2 diabetes: A 2 year randomized clinical trial. Diabetes Obesity Metab 2018;20:858-71.

Evidence ++ Intervention

Hallberg et al 2018; Athinarayanan et al 2019

Individualized diet advice

Biomarker tracking tools:

- * weight scale, BP cuff (if had HTN),
- * BG/ketone meter

Access to web-based software app:

- * Health coaching & ongoing education
- * Weekly f/u x 3 months, biweekly x 3 mos, monthly x 1 month

Social Support via online peer community



Hallberg S et al. Effectiveness and Safety of a Novel Care Model for the Management of Type 2 Diabetes at 1 year: An Open-Label, Non-Randomized, Controlled Study. *Diabetes Therapy*. 2018. <https://doi.org/10.1007/s13300-018-0373-9>
Athinarayanan et al. Long Term Effects of a Novel Continuous Remote Care Intervention Including Nutritional Ketosis for the Management of Type 2 Diabetes: A 2 year Non-randomized Clinical Trial. 2019 June 05. *Frontiers in Endocrinology* doi:10.3389/fendo.2019.00348. Accessed July 2019.

Evidence ++ Intervention

	1 year	2 year
A1c	↓1.3%*	↓0.9%*
Weight	↓13.8 kg	↓11.9
Diabetes reversal #	60%	53.5%
Retention	83%	74%

*with medication reduction

#Diabetes reversal (A1c < 6.5 with no medications other than metformin)

McKenzie A et al. A Novel Intervention including individualized nutritional recommendations Reduces hemoglobin A1c level, Medication Use, and weight in Type 2 Diabetes. *JIMR Diabetes*. 2017 Mar 7;2(1):e5. doi: 10.2196/diabetes.6981.
Hallberg S et al. Effectiveness and Safety of a Novel Care Model for the Management of Type 2 Diabetes at 1 year: An Open-Label, Non-Randomized, Controlled Study. *Diabetes Therapy*. 2018. <https://doi.org/10.1007/s13300-018-0373-9>
Athinarayanan et al. Long-term Effects of a Novel Continuous Remote Care Intervention Including Nutritional Ketosis for the Management of Type 2 Diabetes: A 2 year non-randomized Clinical Trial. *Frontiers in Endocrinology*. 2019. doi:10.3389/fendo.2019.00348

Limitations in Evidence

- * Definitions vary
- * Small sample size
- * No control group
- * High dropout rate
- * Short term <3 year



Summary of Results

- * Reduction in A1c
- * Reduction in triglycerides
- * Reduction in medication
- * Improved insulin sensitivity
- * LDL variable ↑ or ↓

Contraindications

- * Cardiomyopathy
- * CHF
- * Chronic Kidney Disease
- * Chronic Metabolic Acidosis
- * ***Fatty acid oxidation deficit***
- * Liver Disease
- * Renal Stones
- * Severe Dyslipidemia
- * Severe Esophageal Reflux
- * Use of SGLT2 medications



Gupta L et al. Ketogenic diet in endocrine disorders: Current perspective. J Postgrad Med. 2017 Oct-Dec 63(4):2423-251.

Contraindications

- * Pregnancy and Breastfeeding
- * Type 1 or LADA
- * Infections
- * Frail elderly
- * Eating Disorders
- * Recent stroke or MI within last 12 months
- * Alcohol or substance abuse



Caprio M et al. Very-low-calorie ketogenic diet (VLCKD) in the management of metabolic diseases: systematic review and consensus statement from Italian Society of Endocrinology. Journal of Endocrinological Investigation 2019 May 20. doi: 10.1007/s40618-019-01061-2. Downloaded September 2019.

Contraindications

Potential concerns:

- * Cholelithiasis
- * Cognitive Impairment
- * Disordered Eating
- * Erratic Lifestyle
- * Lack of Family Support
- * Lack of Numeracy/Literacy
- * Psychological Disorders
- * Religious Fasting



Initial Bloodwork/ Tests

- * Albumin
- * BUN
- * **\$ Carnitine free/total**
- * Creatinine
- * Electrolytes
- * Glucose
- * Lipid Profile
- * Total Protein
- * TSH*
- * C peptide*
- ECG
- Calcium
- Iron
- **\$ Selenium**
- Vitamin D
- Zinc
- **\$ Acylcarnitine**
- **\$ Urine organic acids**
- **\$ Plasma amino acids**

\$ not covered by OHIP

Kossoff E et al. Optimal clinical management of children receiving dietary therapies for epilepsy: Updated recommendations of the International Ketogenic Diet Study Group. *Epilepsia Open*. 2018; 3(2):175-192.

*Westman et al Implementing a low carbohydrate, ketogenic diet to manage type 2 diabetes mellitus. *Expert Review of Endocrinology & Metabolism*. 2018;13(5):263-272.

Nutritional Deficiencies

Supplement:

Vitamin D

Calcium

Thiamine

Vitamin C

Selenium

Folate

?Carnitine

?Fibre



What about the Medications



- Insulin
- Sulfonylurea
- Antihypertensive agents
- Alpha-glucosidase inhibitors

Side Effects- Mild

- * "Keto Flu"
- * Constipation
- * Insomnia
- * Backache
- * Diarrhea & vomiting
- * Halitosis



Cons

- * Potential for loss of body protein and skeletal muscle
- * Increased oxidative stress
- * Increased risk of lower GI disorders
- * Increased acid load leading to bone loss
- * Nutritional deficiency diseases
- * Ketoacidosis

What do I do with my Patient?

- * Assessment
 - * What is Keto to them
 - * Why Keto
- * Contraindications
- * Pros/Cons
- * Referral to RD
- * Blood work at initiation and every 3 months
- * Medical tests at 1 year

Summary

- * Evidence is limited, but evolving
- * Food Pattern is difficult to maintain
- * Requires adequate planning and medical monitoring
- * Benefit in *Highly Motivated patients*
 - * improved blood glucose
 - * decreased medication
 - * decreased weight
 - * improved triglycerides, HDL*
- * Respect the patient's choice and provide support

Resources

Websites

Matthew's friends

* <https://www.matthewsfriends.org/>

Charlie foundation

* <https://charliefoundation.org/>

Thank you

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