Advances and Practical Application of The Modified Atkins Diet





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Associate Professor, Pediatrics & Neurology
Johns Hopkins Hospital
June 13, 2011





Topics

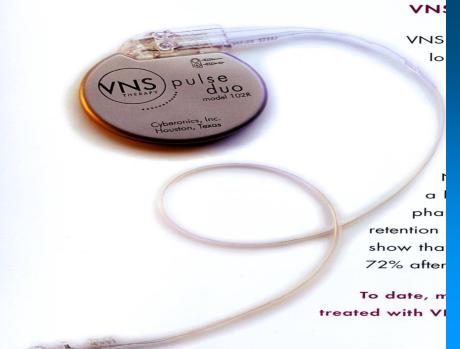
- History and concept behind the modified Atkins diet
 - Why do I call it "modified"?
- How to do it
- Myths
- Side effects
- Those crazy food labels
- What's new in 2011?
 - KetoCal and other new research to come

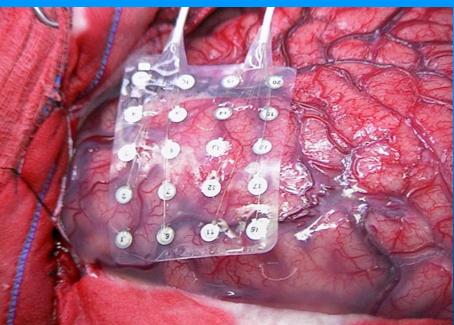
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The Ketogenic Diet: Basics

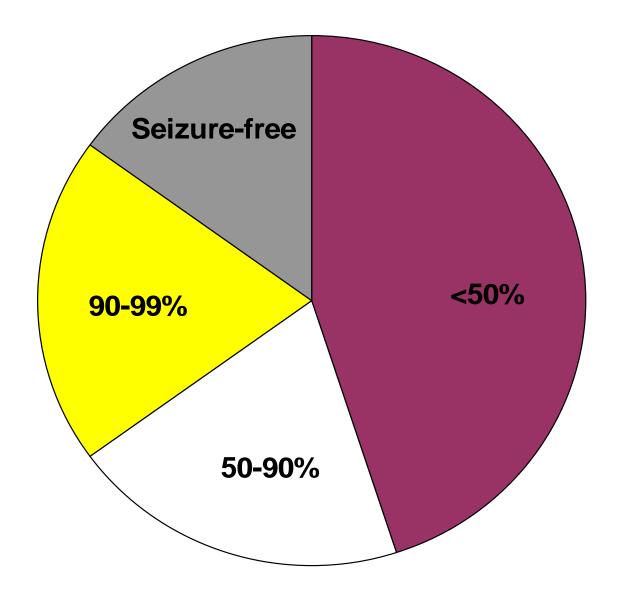
- 90% calories are fat
 - 4:1 ratio of fat: carb+protein (grams) most common
- Fluid and calorie-limited
- Foods weighed on gram scales
- Typically started in the hospital over 4 days
 - 24-hour fasting period optional
- Mostly used for children







6-Month Seizure Reduction from Ketogenic Diet



An Easier Diet for Epilepsy Patients

Bissett Schwanke first noticed that her 4-year-old daughter, Genevieve, was having tics in January 2004. Then, after she had scheduled an appointment with her pediatrician, she saw something new—a seizure. Visits to a local neurologist and tests confirmed her worst fears—Genevieve had child-hood epilepsy.

"It was pretty devastating,"
Schwanke says. "It snowballed from
head nods to four to six seizures a day."

On top of that, the prescribed drug therapy seemed to have no effect. Antiepileptics take months to take hold therapeutically, she was told. But when Genevieve's seizures became even more frequent and intense in the spring of 2005, Schwanke consulted with Hopkins neurologist **Eileen Vining**. But Vining saw some improvement in Genevieve's seizure control and recommended that she stay with the drug therapy. Give it a real opportunity to work, and then consider other options.

Schwanke knew that the high fat/low carbohydrate ketogenic diet was effective in controlling epilepsy, but it had its drawbacks, including a required fast and a hospital stay during which families are trained in the rigors of the diet. Side effects include kidney stones, constipation and stunted growth. When she returned to Hopkins, Vining told her about a less-restrictive, modified Atkins diet that also produces ketones-a chemical by-product of fat that can inhibit seizures-but requires fewer restrictions on calories, fluids and proteins, and no fast or hospitalization. Also, Hopkins pediatric neurologist Eric Kossoff was conducting a small pilot study of this diet. When Schwanke still saw no success with the anti-epileptics by the fall, she enrolled Genevieve in the six-month study. The results were astounding.

"Within 36 hours she did not have another seizure, and she's remained seizure free," Schwanke says. "It was a complete miracle. We did not expect that kind of response."

In Kossoff's study, presented at a Hopkins neurology conference and a meeting of the American Epilepsy Society last December, 13 of 20 patients had a greater than 50 percent improvement in seizures, and seven had a greater than

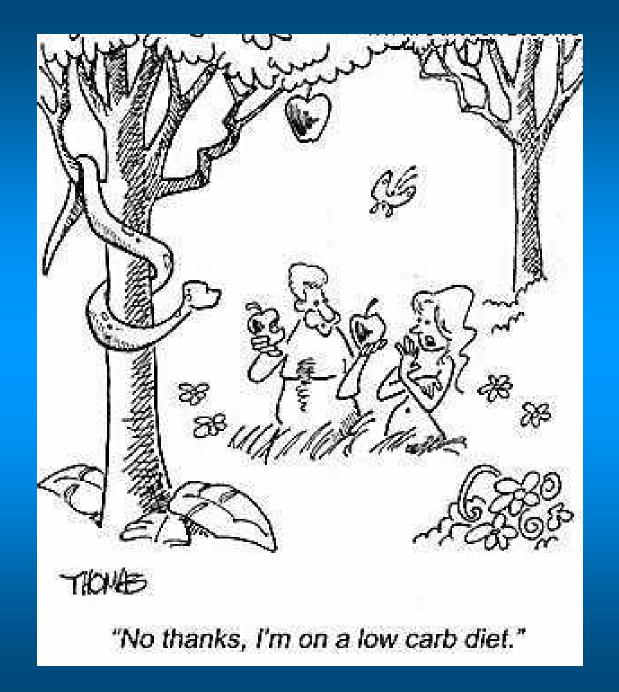


Genevieve Schwanke has been seizure free since going on the modified Atkins diet last fall.

90 percent improvement. In addition to Genevieve, three other patients were seizure free. Nearly half were able to reduce or completely discontinue medications. Also, side effects were low.

"Our findings suggest relatively good efficacy compared to the ketogenic diet," Kossoff says. "Our study wasn't large enough to say a modified Atkins diet should replace the ketogenic diet, but the results are encouraging and intriguing."

Schwanke couldn't agree more: "The meds wore her out. Now she's active, goes to school, plays with her friends. It's like we turned a page and got our child back." For more information, call 410-614-6054.



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- First patient (age 7) started de novo: March 21, 2003. Seizure-free by March 23.
 - Dr. Atkins dies in a tragic accident April 8

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 - Dr. Atkins dies in a tragic accident April 8
- Case series of 5 patients: Dec 2003

Efficacy of the Atkins diet as therapy for intractable epilepsy

Eric H. Kossoff, MD; Gregory L. Krauss, MD; Jane R. McGrogan, RD; and John M. Freeman, MD

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Efficacy of the Atkins diet as therapy for intractable epilepsy

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 Robert Atkins Foundation funds first formal pediatric MAD trial – Sept 2003- May 2005





115 (42%) of 272 children and adults with >50% seizure reduction to date

- 26 (10%) became seizure-free

Kossoff Neurology 2003; Kossoff Epilepsia 2006; Kang Epilepsia 2007; Kossoff Epilepsy Behav 2007; Ito Brain Dev 2007; Kossoff Epilepsia 2008; Carrette Clin Neuro Neurosurg 2008; Weber Seizure 2009; Porta Seizure 2009; Slaughter Epi Research 2009; Kumada J Child Neurol 2009; Kossoff J Child Neurol 2010, Kumada Brain Dev 2011, Smith Epilepsia 2011



Are these diets alike? YES!!!

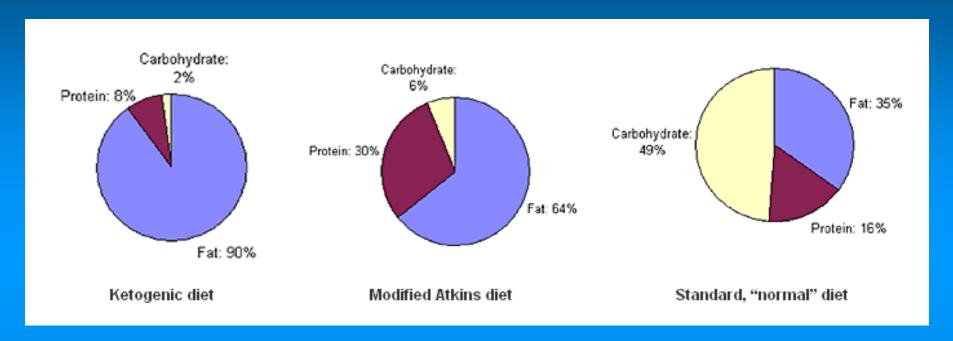
 Low carbohydrate, high fat diet with similar foods

- Can be used long-term
- Weight loss can occur
- Induces urinary ketosis





Are these diets different? YES!!!



- No calorie restriction
- No fluid restriction
- No hospital admission (taught in clinic)
- No weighing of foods on gram scales
- No fasting required
- Parents can do it with their child



How is it "modified"?

Atkins "by the book"

 High fat foods are allowed

Modified Atkins

 High fat foods <u>strongly</u> encouraged



How is it "modified"?

Atkins "by the book"

- High fat foods are allowed
- Carbs 20 grams per day just 1st 2 weeks

Modified Atkins

- High fat foods <u>strongly</u> encouraged
- Carbs 10-20 grams per day indefinitely



How is it "modified"?

Atkins "by the book"

- High fat foods are allowed
- Carbs 20 grams per day just 1st 2 weeks
- Weight loss is the goal
 watch calories

Modified Atkins

- High fat foods <u>strongly</u> encouraged
- Carbs 10-20 grams per day indefinitely
- Weight loss not the goal– eat ad lib

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"Modified Atkins Diet 101" Month One

- Baseline CMP, CBC and lipid profile
- Send a 2-day food record before starting
- Go shopping (and surfing)
- Take a daily multivitamin and calcium
- 10 grams of any carbohydrates per day
 - 15 g/day for teens; 20 g/day for adults
- Eat lots of high fat foods, plenty of carb-free fluids
- Check ketones twice weekly; weight weekly
- Leave medications unchanged
- Avoid low-carb store products first month
- Call your keto team in one month for an update









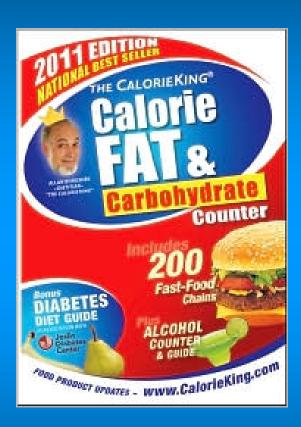
Multivitamins

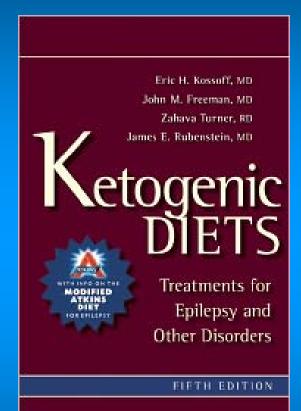


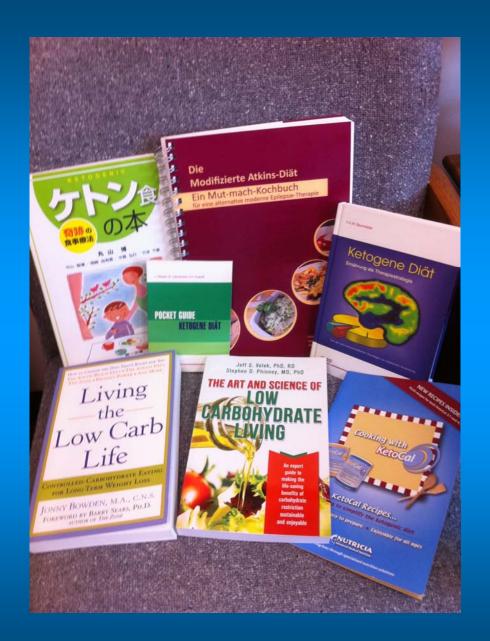








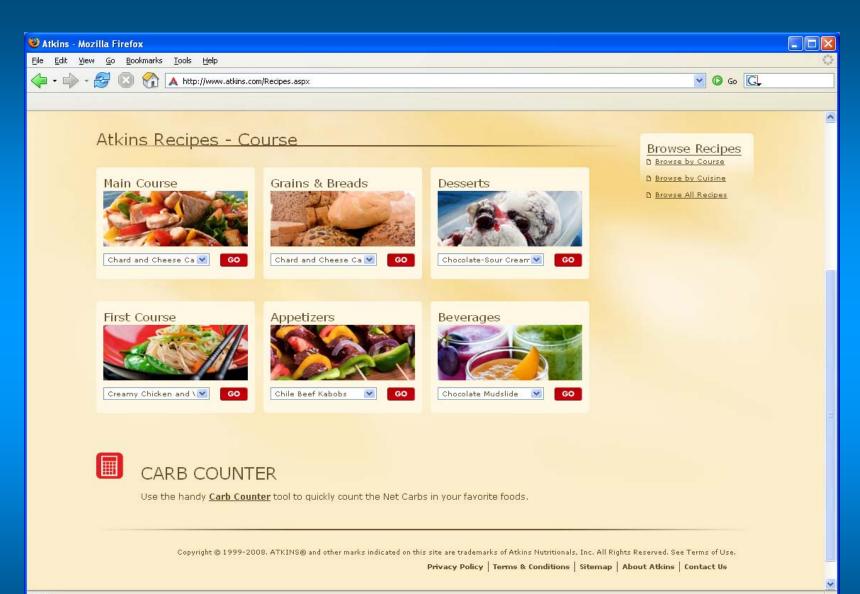


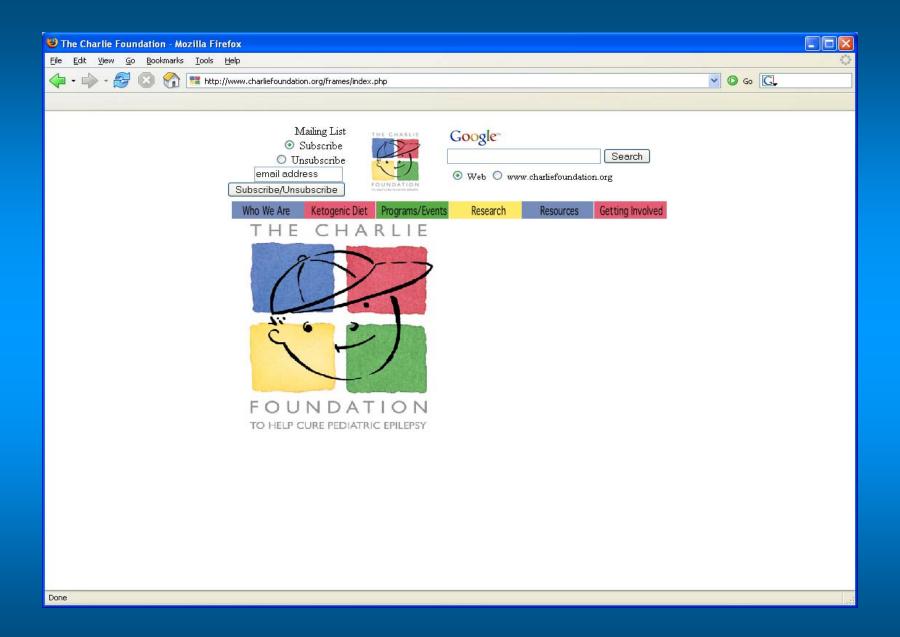


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Adult Atkins Diet Clinic Sample Menu

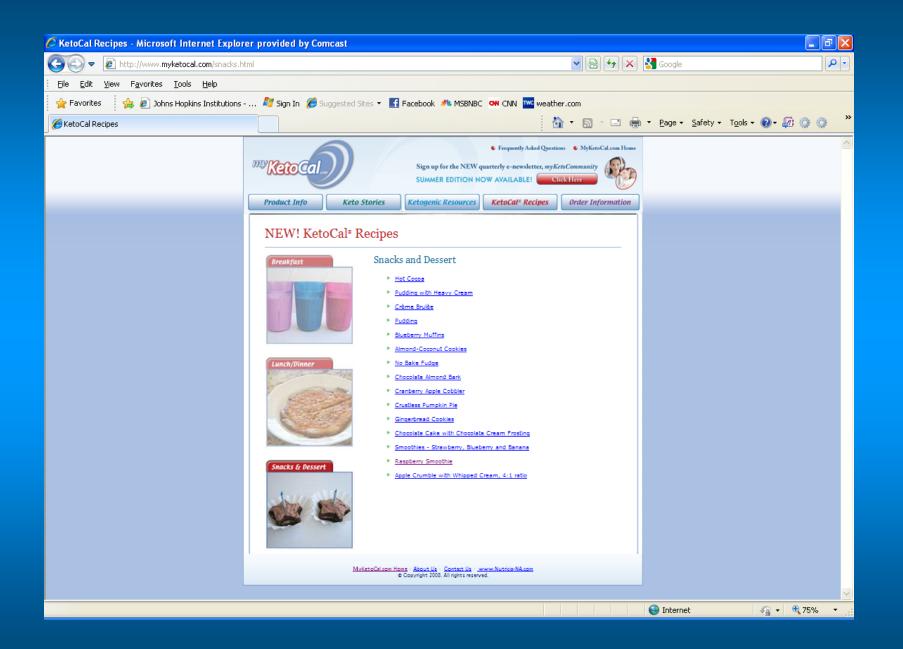
	Sunday	Monday	TUESDAY	WEDNESDAY	Thursday	FRIDAY	SATURDAY
Breakfast	Decaf Coffee with Half & Half Bacon Scrambled Eggs	Herbal Tea Ham & Cheddar Cheese Omelet	Decaf Coffee with Half & Half Sausage Links Fried Eggs	Decaf Coffee with Half & Half Poached Eggs Tomato with Cheddar Cheese	Water Vegetable & Mozzarella Cheese Omelet with Green Peppers and Mushrooms	Herbal Tea Grilled Ham Steak Scrambled Cheese Eggs with Cheddar Cheese	Decaf Coffee with Half & Half Steak & Eggs
Lunch	Water Roast Chicken breast Salad – Romaine lettuce, cucumber, mushrooms & Italian dressing	Club Soda Fried Chicken Wings Celery Sticks Blue Cheese dressing	Water Bunless Double Cheeseburger Lettuce Tomato Mayonnaise Dill Pickle	Water Shrimp & Scallops Steamed Snow Peas	Club Soda Chicken Cobb Salad - Chicken Breast, Romaine lettuce, Cucumber, Boiled Egg, & Blue Cheese dressing	Diet Soda Sautéed Beef & Vegetables (Green Peppers & Mushrooms)	Water Braised Short Ribs Salad – Romaine lettuce, tomato, alfalfa sprouts & Blue Cheese dressing
Dinner	Diet Soda Broiled Salmon Steamed Broccoli with Cheddar Cheese	Water Sirloin Steak Salad – Romaine lettuce, bacon bits, 1 boiled egg & Italian dressing	Diet Soda Fried Pork Chops Buttered Green Beans	Diet Soda Roasted Turkey Breast Spinach Salad with Mushrooms & Italian dressing	Water Seared Tuna Steak Steamed Asparagus	Club Soda Roast Duck Steamed Spinach	Water Grilled Sea Bass Steamed Buttered Cauliflower
Total Carbs	15 g	13 g	12 g	12 g	12 g	12 g	13 g



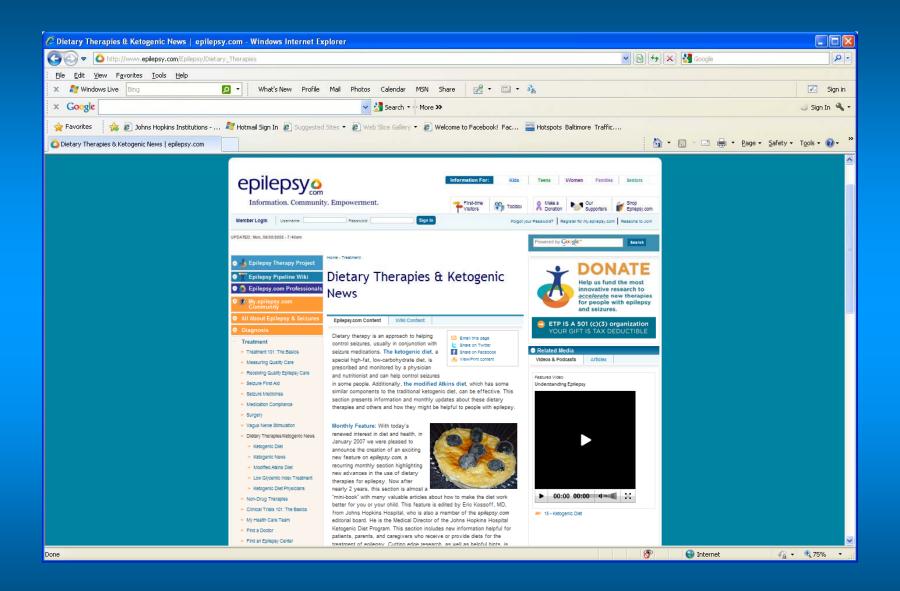


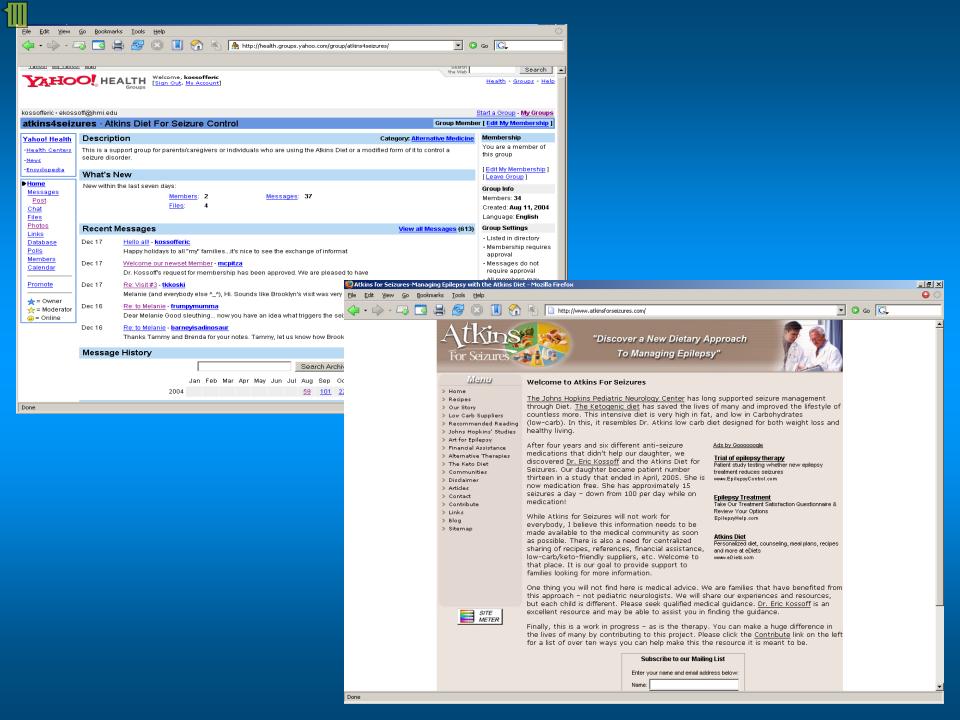


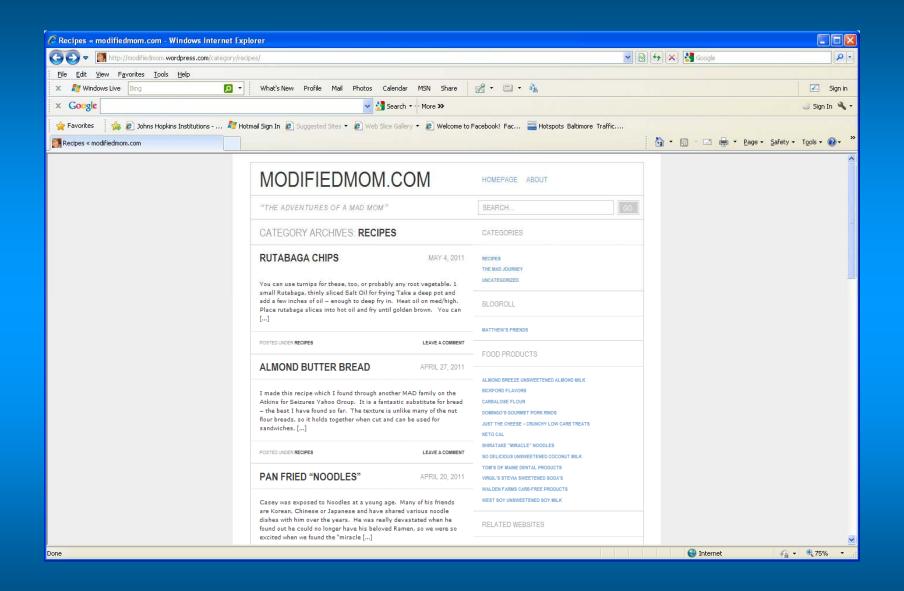


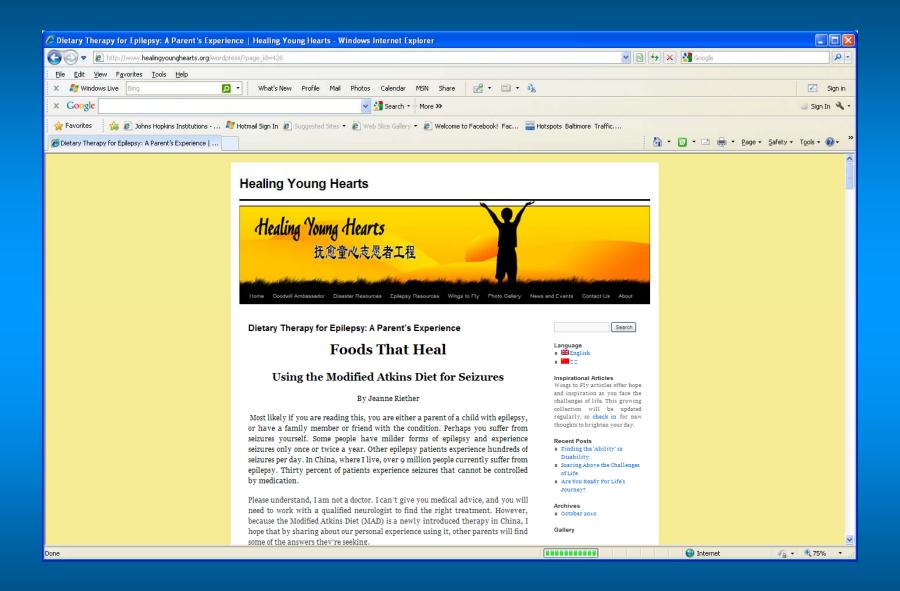








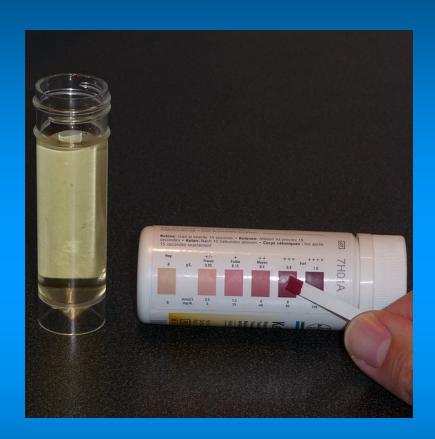


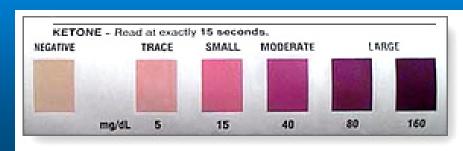




How to check ketones

- Purchase- KetoStix
- Dip the reagent end of the strip into urine specimen collected in a clean cup.
- In 10-15 seconds, check color against color chart
- Check twice a week







Modified Atkins Diet Seizure Calendar

• Your seizures dail

PLEASE TRACK • Your urine ketones twice a week for the first month, then weekly

· Your weight weekly

21
160 lbs.
Moderate
No seizures

Ex: Sun

Sun	Mon	Tue	Wed	Thu	Fri	Sat
_	-		_	_	_	_
_	_	_		_		_
_		_	_	_	_	
_		_	_	_	_	_
_		_	_	_	_	

"Modified Atkins Diet 101" Month 2+

- 15-25 grams of carbohydrates per day
- Don't need to check ketones regularly
 - Once per week is OK
- Check weight weekly
- Can reduce medications if desired
- Start using low-carb store products if desired
- Visit and labs at 3-4 months if it's helping



How long should a child stay on the diet?

- As long as necessary!!!!
- Think of your own personal goals and expectations
 - Less seizures?
 - Fewer medications?
 - Milder seizures (less ER visits)?
 - Weight loss?
 - Driving?
- Usually after 2 years, we'll try to wean the diet
 - Not necessarily true for teens and adults



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High-Fat Ketogenic Diet Diminishes Seizures For Local Man With TSC

Originally published June 24, 2008

By <u>Susan Guynn</u> News-Post Staff

New Market -- Joedy Atkinson eats chunks of butter and drinks heavy cream at every meal.

It's part of a special diet he's followed most of his 28 years. His mother, Eva Atkinson, is certain Joedy's high-fat diet is responsible for diminishing multiple daily seizures to a total of about 25 during the past 23 years.

At 3 1/2 months, Joedy began having seizures. He was diagnosed with epilepsy.

"Around 9 months, we noticed he wasn't progressing," said Eva. "His gross motor skills were fine," but when it came to making eye contact and speech, Joedy was lagging.

Further testing showed Joedy also had a genetic disorder called tuberous sclerosis complex (TSC). It causes benign tumor-like tubers to form in different organs, primarily in the brain, eyes, heart.



Photo by Doug Koontz

Eva Atkinson measures out meals for her son Joedy, 28, who has tuberous sclerosis and epilepsy. Eva says following a strict ketogenic diet for the past 23 years has reduced Joedy's seizures from multiple daily to about 25 since he began the diet around age 5.

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Things I've heard lately that aren't necessarily true...

- Adults will not be compliant with the MAD
- If you're not doing well, cut your daily carb count
- A meal plan with recipes is needed
- If the MAD doesn't work, it doesn't mean the KD won't work – try it
- The MAD makes medications more potent/toxic get rid of them to make it work
- Fruits are not allowed
- Splenda/Nutrasweet is not allowed
- There are less side effects than the KD...

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The Ketogenic Diet: An Effective Medical Therapy With Side Effects

Wheless JW. *J Child Neurol* 2001;16:633-5.

FOOD FOR THOUGHT: THE KETOGENIC DIET AND ADVERSE EFFECTS IN CHILDREN

Duchowny M. Epilepsy Currents 2005;5:152-4.

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Side Effects: MAD

- Constipation*
- Weight loss
- Decreased vitamins and calcium > daily vitamin supplements
- Acidosis and over-ketosis*
 - Lightheadedness, dizziness, nausea, stomach ache, headache, fatigue > drink orange juice
- Kidney stones*
- Hyperlipidemia > monitoring of fasting lipids, decrease saturated fats

*make sure to drink plenty of fluids and avoid dehydration



	Baseline	6 months	P value
Weight (kg)	34.0	33.7	0.96
ALT	21	26	0.30
AST	27	28	0.54
CO_2	23	22	0.36
BUN	12	17	0.01
Creatinine	0.5	0.5	0.92
Cholesterol	192	221	0.06
HDL	65	69	0.79
LDL	108	130	0.15
Triglycerides	82	84	0.56

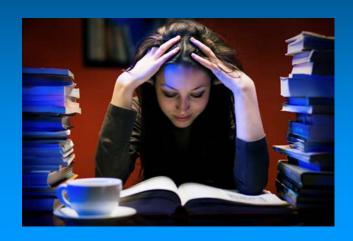
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The Food Label – Nutrition Facts



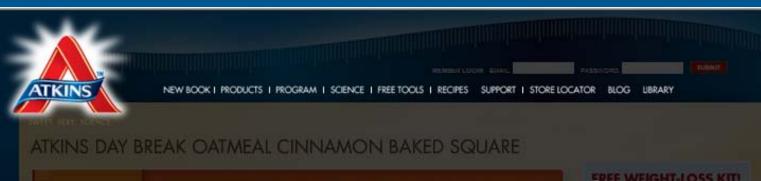
- Serving Size
- Servings per container
- Carbohydrate
- Subtract Fiber ONLY
- Include sugar alcohols in carb count



Ingredients: Soybean oil, eggs, water, distilled and cider vinegar, salt, oleoresin paprika, natural flavors, calcium disodium EDTA added to protect flavor. Contains: Eggs

Nutrition Facts	Amount/serving	%DV*	Amount/serving	%DV*
Serving Size 1 Tbsp (14g)	Total Fat 12g	18%	Sodium 75mg	3%
Calories 100	Sat Fat 1.5g	8%	Total Carb. Og	0%
Fat Cal. 100	Trans Fat 0g		Dietary Fiber 0g	
	Polyunsat Fat 7g		Sugar 0g	
	Monousat Fat 2.5g		Protein 0g	
	Cholesterol 10mg	4%		





Sparotein 10 Sugar 14th Celories Spily se Het Celor

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Nutrition Facts

Serving Size 1 Bar (40g)

Amount Per Serving	
Calories 140	Fat Cal. 70
% [Daily Value*
Total Fat 7g	11%
Saturated Fat 4g	20%
Trans Fat Og	
Cholesterol Omg	0%
Sodium 120mg	5%
Potassium 35mg	1%
Total Carbohydrate	24g 8%
Dietary Fiber 10g	40%
Sugars 1g	
Sugar Alcohols 7g	
Protein 5g	10%

Vitamin A.	10% •	Vitamin C	10%
Calcium	4% •	Iron	6%
Vitamin E	10% •	Thiamin	15%
Riboflavin	10% •	Niacin	15%
Folate	10% •	Phosphorus	4%

* Percent Daily Values are based on a 2,000 calorie diet.

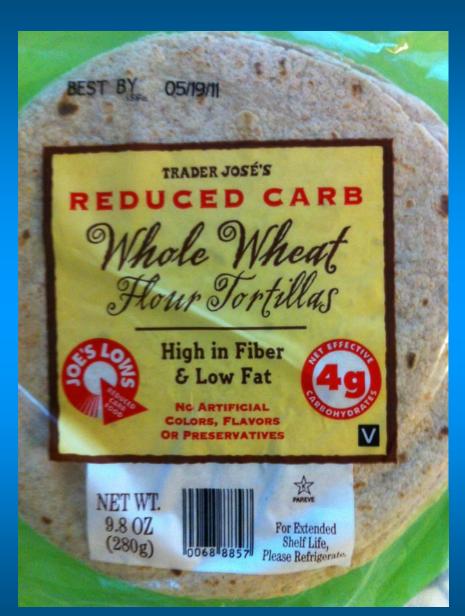
MOREOVENTE, FLOUR BLEND (WHOLE WHEAT FLOUR WHEAT GLOTEN OAT FREE), PALM DOL, MALTITOL, POLYDEXTROSE SOY ORSES (SCY PARE), PALM DOL, MALTITOL, POLYDEXTROSE SOY ORSES (SCY PALM), WHOLE GRAIN ROLLED DATS, WANLLA FLAVORED COATING IMALTITOL, PALM KERREL DIL, STIDLIM CASEMATE, MALK RAT, SLYCEROL, LALTO ESTERS DE FATTY ADDS WITH DITRIC AND, SOY LECTHIN, MATURAL AND ART FIGURE, FLOURS, SUCRALISES!, DATE PASTE, MULLI, WATE, GUSENN, SPICES, LEARTHING, SCOOLIM BICARBONATE, SODILM ADD PYROPHOSPHATE), SALT, NATURAL AND ARTHROLE, HAUGH, FLAUR CHITAMIN D. DUALPHA-TOCOPHEROL ACE TATE (VITAMINE), MADRAMOE, VITAMIN A PALMITATE THIAMIN MONON TRATE (VITAMIN E), REOFLAVIN (VITAMIN E), FOUL ADDS.

CONTAINS WHEAT, SOY AND MILK.

★ Sugar Alcohols total includes 1g of glycerin. Rounded values.



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Nutrition Facts

Serving Size 1 tortilla (28g) Servings Per Container 10

Amount Per Serving
Calories 45 Calories From Fat 10
% Daily Value*

Insoluble Fiber 6g

Dietary Fiber 7g

Sugars 0g Protein 4g

Vitamin A 0% • Vitamin C 0%
Calcium 2% • Iron 2%

* Percent Daily Values are based on a 2,000 calori det. Your daily values may be higher or lower depending on your calorie needs:

Calories	2,000	2,500
Total Fat Less than Sat Fat Less than Cholesterol Less than Sodium Less than Total Carbohydrate Dietary Fiber	65g 20g 300mg 2,400mg 300g 25g	80g 25g 300mg 2,400mg 375g 30g
Calories per gram: Fat 9 • Carbohyd	rate 4 •	Protein 4

INGREDIENTS: WATER, WHEAT FIBEN, WHEAT GLUTEN WHOLE WHEAT FLOUR, OAT FIBER, HIGH OLEIC SUNFLOWER OIL, CONTAINS 2% OR LESS OF THE FOLLOWING: FOR ADDED FRESHNESS (CULTURED WHEAT FLOUR WITH ADDED VINEGAR AND/OR CULTURED WHEAT STARCH), CITRIC ACID, WHEAT BRAN, SALT, SOY LECITHIN (AN EMULSIFIER), GUAR GUM, YEAST, SODIUM ALGINATE, SODIUM BICARBONATE, LEAVENING (SODIUM ACID PYROPHOSPHATE, SODIUM BICARBONATE, CORNSTARCH, MONOCALCIUM PHOSPHATE).

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SKU# 068885 . CT LIC.# 6814

Reduced Carb Whole Wheat Flour Tortillas

Trader Joe's reduced carb tortillas
have over 70% fewer carbs per serving
than flour tortillas with whole wheat,
and they're low in fat. Roll them up for
mini-wraps. Try an open-faced
quesadilla or complement your fajita
menu ideas

	Regular Flour Tortillas with Whole Wheat	Reduced Carb Whole Wheat Flour Tortillas
Per Serving	1 tortita (48g)	1 tortilla (28g)
Total Carbohydrate	24g	7g
Total Fat	3.5g	1.5g





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KetoCal®

- Powdered or liquid formula with slight vanilla taste
- 4:1 ratio
- 2/3 of a cup powder + 8 oz of warm water will make a ~400 kilocalorie drink
 - Can be flavored
 - Better chilled
- Can be incorporated into recipes as a flour substitute, too
- Liquid has more convenience (recent survey)







Study Protocol

- 30 children
- Open-label, prospective design
 - Modified Atkins diet 10 grams/day
 - Supplemental 60 g/day KetoCal ®
 - Only for the first month
- Visits at baseline, 1 month, 2 months
- Labs, rating scale, food record at each visit
- Study funded by Nutricia
- Completed September 2009
- Published February 2011 in Journal of Child Neurology

Results: 1-month Outcomes

- 24 (80%) with >50% seizure reduction
 - − Historical 37 of 64 (58%) p=0.03
- 11 (37%) with >90% seizure reduction
 - − Historical − 12 of 64 (19%) p=0.05
- No correlation with age, seizure type, frequency
- Slight correlation with male gender (p=0.05)

Results: 2-month Outcomes

- 21 (70%) with >50% seizure reduction
 - − Historically 38 of 79 (48%) p=0.03
- 13 (43%) with >90% seizure reduction
 - Historically 15 of 79 (19%) p=0.01
- 8 of 30 (27%) had >25% increase in seizures between 1st and 2nd month
 - Historically, that occurred in 10 of 50 (20%), p=0.39

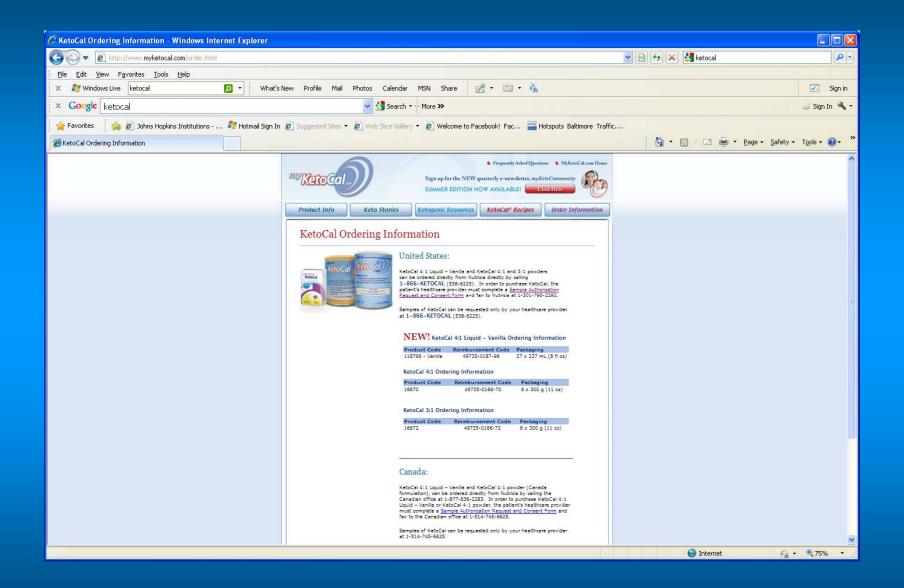
Tolerability

- Rating of MAD: 7.2 / 10
- KetoCal ®
 - Rating 5.3 / 10
 - 87% drank it as shakes
 - 47% chose to restart it after the study ended

Why did it work?

No effect on ketosis or tolerability...but....

	MAD-KC	MAD	p value
Ketogenic ratio	1.8:1	1.0:1	0.0002
Fat (grams)	195	114	0.0001
Carbohydrates	15	10	0.001
(grams)			
Protein (grams)	101	107	0.61
Calories	2.290	1.572	0.0008



Epilepsia, **(*):1-4, 2010 doi: 10.1111/j.1528-1167.2010.02774.x

BRIEF COMMUNICATION

Will seizure control improve by switching from the modified Atkins diet to the traditional ketogenic diet?

*Eric H. Kossoff, †Jennifer L. Bosarge, ‡Maria J. Miranda, §Adelheid Wiemer-Kruel,

¶Hoon Chul Kang, **Heung Dong Kim

*Neurology, The Johns Hopkins University, Baltimore, Maryland, U.S.A.; †Pediatrics, The Johns Hopkins University, Baltimore, Maryland, U.S.A.; ‡Epilepsy, Danish Epilepsy Center, Dianalund, Denmark; §Epilepsy, Epilepsiezentruk Kork, Kork, Germany;
¶Pediatrics, Pediatric Epilepsy Clinic, Severance Children's Hospital, Seoul, South Korea; and
**Department of Pediatrics, Yonsei University College of Medicine, Seoul, South Korea

- 27 patients from 4 countries
 - 10 (37%) had at least 10% improvement after making the switch to the full ketogenic diet
 - 5 became seizure-free ALL had Doose syndrome...
- If the child was not better at all with MAD...they did not get better with the KD
- Suggests the KD is a "higher dose" of dietary treatment

SHORT COMMUNICATION

A pilot study of the modified Atkins diet for Sturge—Weber syndrome

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Use of the modified Atkins diet for adolescents with chronic daily headache

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Future projects

Expanding the use of the MAD to resource-poor countries worldwide

Adults

Adults via email contact only...

Non-epilepsy uses

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