

# **KETOGENIC DIET: HOW TO MAKE IT WORK FOR LIFE**

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# TOPICS TO DISCUSS

- How/Why Does the Ketogenic Diet Work
- Fine Tuning the Ketogenic Diet
- Supplementing the Ketogenic Diet
- Use your Imagination
- Food Samples
- Ketocalculator



# WHY THE DIET WORKS?

- Glucose is the preferred brain fuel source
- Glucose is polar and cannot diffuse alone across the blood-brain barrier – it must be transported across the membrane through a special transporter.
- A single protein transports glucose across the blood-brain barrier – the facilitated glucose transporter type I protein (GLUT1)

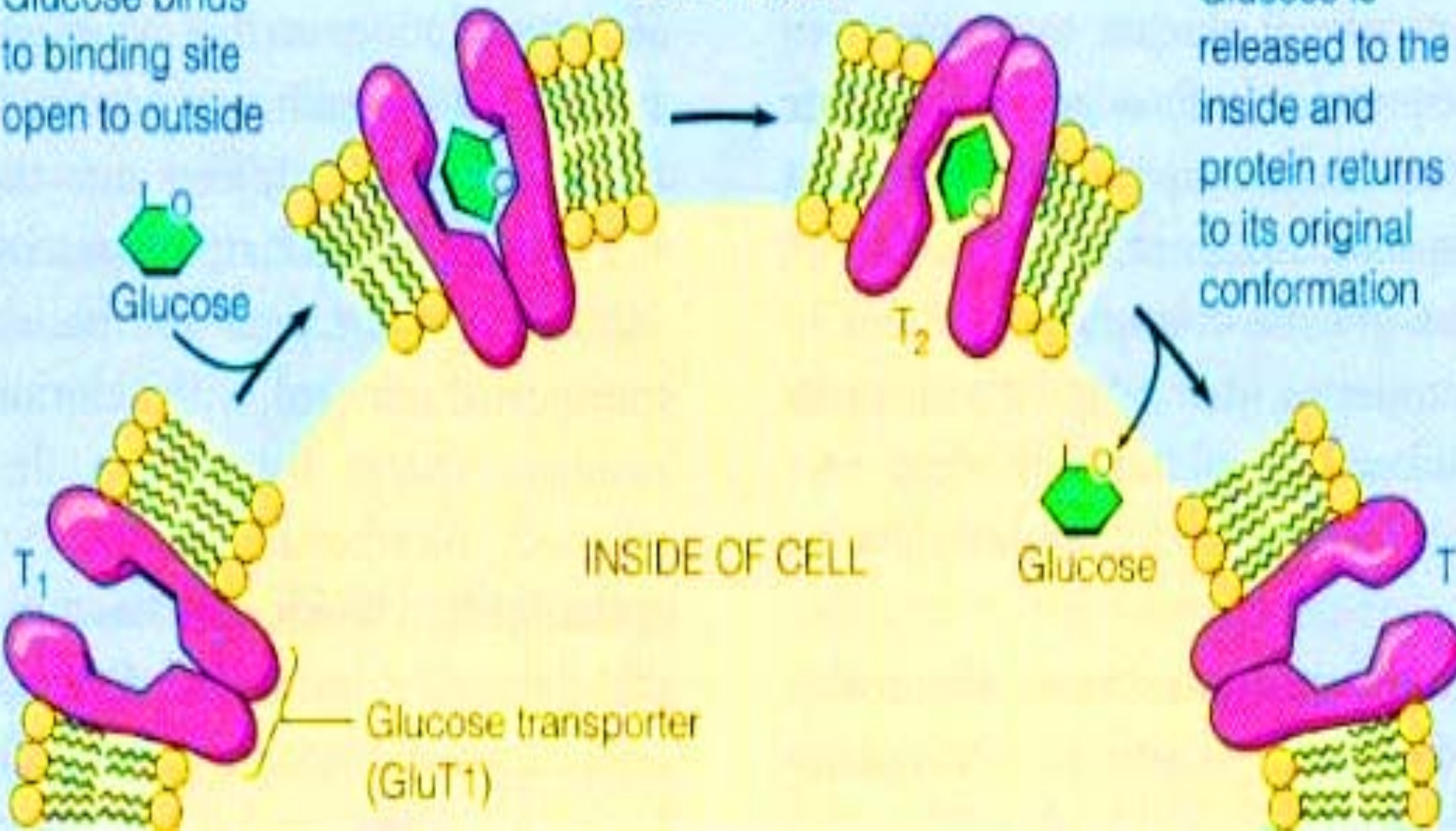


OUTSIDE OF CELL

①  
Glucose binds to binding site open to outside

②  
Transport protein shifts to alternative conformation

③  
Glucose is released to the inside and protein returns to its original conformation



INSIDE OF CELL

Glucose transporter (GluT1)

# WHY THE DIET WORKS?

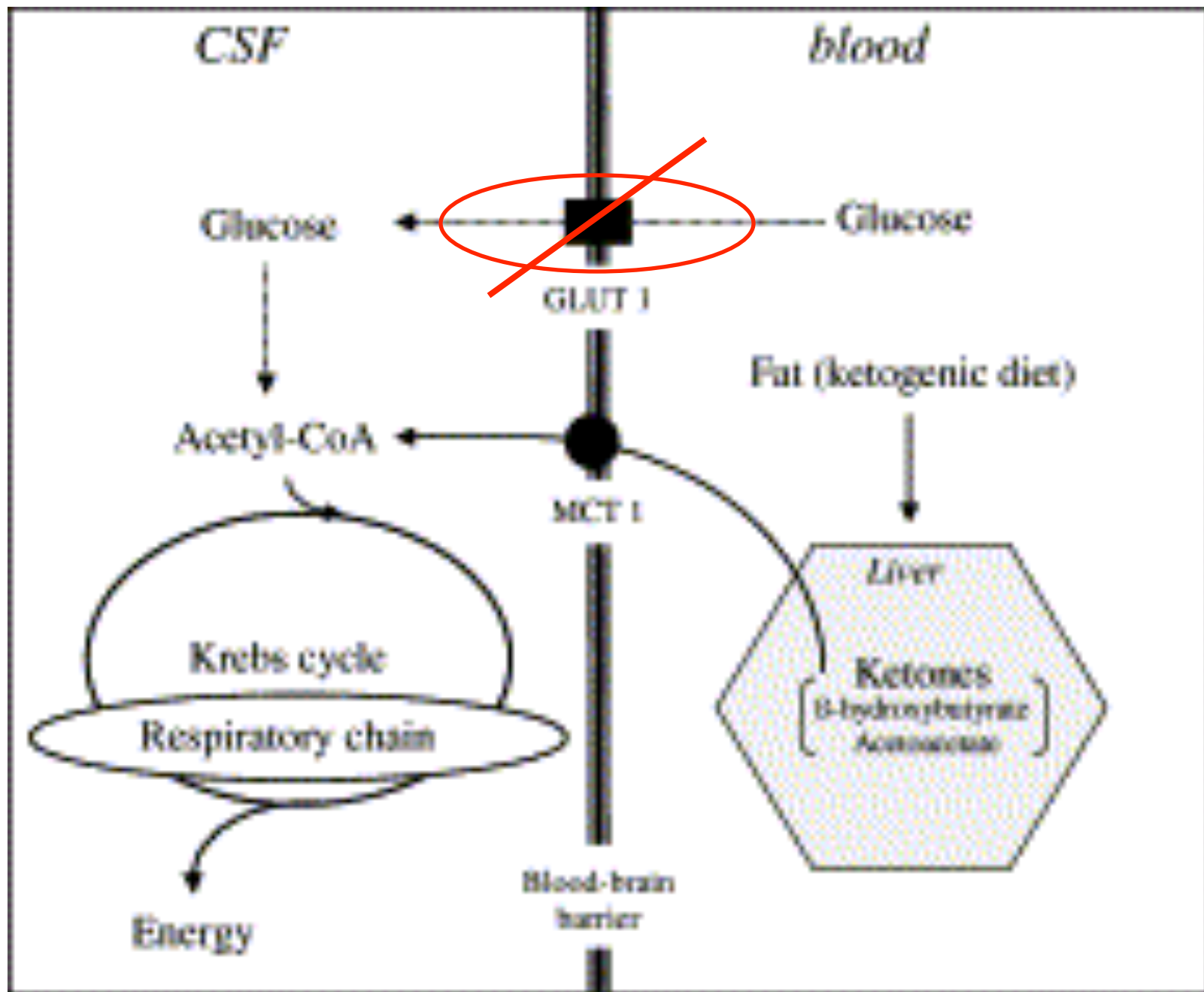
- Molecule that allows glucose to cross into the brain to be used as fuel is missing.
- Creates an “energy crisis”
- Because the brain cannot receive adequate glucose, fat makes sense as a better alternative fuel.
- Brain has limited abilities to use alternative non-glucose energy sources; ketones bodies can be metabolized but not fatty acids.



# WHY THE DIET WORKS?

- Ketone bodies B-hydroxybutyrate and acetoacetate are generated from fatty acid oxidation and provide an adequate supply of alternative fuel for brain metabolism.
- Adequate ketones are reached when the blood betahydroxybutryate (B-OHB) is 4-5 mmol/L.





# OPTIMIZING B-OHB LEVEL

- Monitor using Precision Xtra monitor
- Increase ratio of fat:carbs to protein until BOHB becomes 4-5
- Maintain correct total daily calorie intake
  - Avoid obesity
  - Consume adequate calories to ensure linear growth





# INHIBITORS OF GLUT 1 FUNCTION

- Green tea
- Caffeine
- Coffee
  
- Avoid due to interactions with inhibiting glucose transport.



# PRECISION XTRA MONITOR

- During diet initiation – check daily
- Once stable and between 4-5, check weekly
- Check if child becomes increasingly symptomatic
- Do not have to use urine ketone strips
- Purchase cost: \$75/monitor
  - Pharmacy or on-line



# ADJUST RATIO

- Infants/young children can become ketotic with lower fat to carbohydrate + Protein ratios
- Older children and adults need higher fat to carbohydrate +protein ratios



# FINE TUNING THE DIET- FATS

- Not all fats are equal.
  - If difficulty producing ketones, reduce or remove less dense fats.
    - Butter
    - Mayonnaise
  - Use canola, flaxseed, olive, coconut, or MCT oil instead



# FINE TUNING THE DIET – MCT OIL

- Medium Chain Triglycerides
  - More efficiently metabolized
  - Easily absorbed into gut and cells – does not require carnitine
  - Helps achieve a deeper ketosis without a higher ratio
  - Dosage:
    - Option 1:
      - 5 g per meal or 15 g total daily
    - Option 2:
      - Start with 10% of calories from MCT oil
      - Increase to 20% of calories as tolerated



# COCONUT OIL VS. MCT OIL

- These are not the same
- Coconut oil is only 60% medium chain fats and 40% long chain fats
- MCT oil is 100% medium chain fats
- May not help as much as MCT
- Better than olive or canola in terms of ketosis



# FINE TUNING THE DIET – COCONUT OIL

- Oil from the meat of a coconut
- Highest natural concentration of MCT
- Usually solid and should be weighed similar to butter
- Does not require refrigeration
- Should not fry with unrefined coconut oil



# FINE TUNING THE DIET – MCT OIL

- Possible side effects
  - Nausea
  - Diarrhea
  - Bloating
  - Vomiting
  - Abdominal Cramps





# WHAT LIMITS KETONES?

- Inadequate or excessive calories
- Meals spaced too far apart
- Not consuming all of the meal or snack
- Vomiting or diarrhea
- Puberty – may need higher ratio during this time
- Hidden carbohydrates



# FINE TUNING THE DIET - MEAL TIMING

- Evaluate the timing of your child's meals
- Aim for no more than 4 hours between meals or meals and snacks
- If ketones are low in the mornings, consider a late night snack
- Calories should be equally spread throughout the day
- Consider adding a snack if needed or for convenience splitting into 4-5 equal meals so everything is interchangeable



# FINE TUNING THE DIET - CALORIES

- Too few or too many calories can alter ketosis
- Monitor growth trends to determine if adequate calories
- If ketones are low then hunger will be higher so may not always help to increase calories if child seems hungry
- Calorie adjustments are needed often in the beginning phases of ketogenic diet and less frequent (every 3-6 months) once diet established



# FINE TUNING THE DIET - GROWTH

- Keep record of your child's weight and height at various appts
- Height and weight should follow a trend on growth charts
- BMI should be close to 50%ile for age if your child is mobile, no less than 10-25%ile if immobile



# HIDDEN CARBOHYDRATES

- Things to consider:
  - Lotions
  - Dog or cat food
  - Sneaking – may need cabinet and fridge locks
  - Chewing gum - keep your purse out of reach!
  - Beverages
  - Sweeteners – watch out for sugar packets at restaurants
  - Medications – deduct carbs from allotted carbs for the day
  - “Low-Carb” Products
  - Changes in product formulation



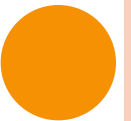
# CHANGES IN PRODUCTS

- Review food labels of common foods often
- If using ketocalculator or another program, make sure your food label matches with the program



# WHAT IMPROVES KETOSIS?

- Meal timing
- Incorporating MCT oil
- Increasing ratio
- Lowering calories if gaining weight too quickly



# SUPPLEMENTS - CALCIUM

Age (years)	Calcium (mg)
1-3	700 mg
4-8	1000 mg
9-18	1300 mg
19-50	1000 mg
51+	1200 mg





# SUPPLEMENTS- CALCIUM

- Ketocal powder and liquid are both excellent sources
- Likely will need to supplement:
  - Several Nature Made tablets contain both calcium and Vitamin D (all very low carb)
  - Sugar Free Tums (deduct carbs from meal plan, 0.5 g carb per 2 tablets)
  - Low Carb Yogurts – Kroger Carb Smart (3 g carb and 200 mg calcium) Danon Light n Fit Carb & Sugar Control (3 g carb and 150 mg calcium)
  - Cream – only 20 mg per ounce



# SUPPLEMENTS –VITAMIN D

- Important functions: bone mineralization, helps with calcium absorption, aids in immunity, reduces inflammation.
- Requirements have increased, nearly everyone needs supplemented
- Some seizure medications interfere with Vit D absorption (Phenobarbital, Depakote) so 50% more is needed.

Age (years)	Vitamin D (IU)
1-70	600
>70	800



# SUPPLEMENTS – VITAMIN D

- D-3 (cholecalciferol) is the most absorbable form
- Check a blood level every 6 months – 1,25 OH-Vit D
- Sources:
  - Sun exposure 5-30 min from 10 am – 3 pm
  - NOW Foods Vitamin D – 1 drop = 300 IU D-3, 0 g carbs
  - D-Vi-sol – 1 ml = 400 IU D-3, 630 mg carb
  - Carlson – 1 drop = 400 IU D-3, 0 g carb
  - Carlson – 1 soft gel = 1000 or 2000 IU D-3, 30 mg carb



# USE YOUR IMAGINATION – UTENSILS THAT MAKE LIFE EASIER

- Silicone muffin liners or candy molds– no worries about food sticking to the side. Can bake, freeze, or microwave
- iSi Easy whip – very easily whips cream
- Immersion blender
- Small food processor or blender – Magic Bullet is great



## USE YOUR IMAGINATION

- Use a food processor to grind nuts for “flour or butter”
- Design your menus with pre-cooked meats – prepare plain meats in large quantities. Chop in bite size pieces and freeze.
- Add diet orange soda or diet root beer to cream to make cream soda.
- Make a menu - take photos of your child’s meals and allow them to choose their meal from the photos.
- Use sugar free syrups (Davinci) but make sure to count the small amount of carbs



# USE YOUR IMAGINATION

- Make meals fun:
  - Twisty straws
  - Fancy toothpicks
  - Character plates and utensils
  - Put fruit on a popsicle stick and freeze
  - Try chopsticks for a child that eats too fast and is then still hungry



# USE YOUR IMAGINATION

## ○ Teenagers:

- Try to get their buy in – figure out what motivates them
- Fit the diet into their lifestyle as much as possible
  - Go out to eat as a family
  - Take a meal to a movie
  - If friends are coming over, have very similar food and weigh meal in advance
  - Try activities that don't involve food – movies, shopping, parks, swimming, visit a pet store or humane society
  - There will very likely be times of rebellion, prepare for it!



# USE YOUR IMAGINATION

## ○ Teenagers

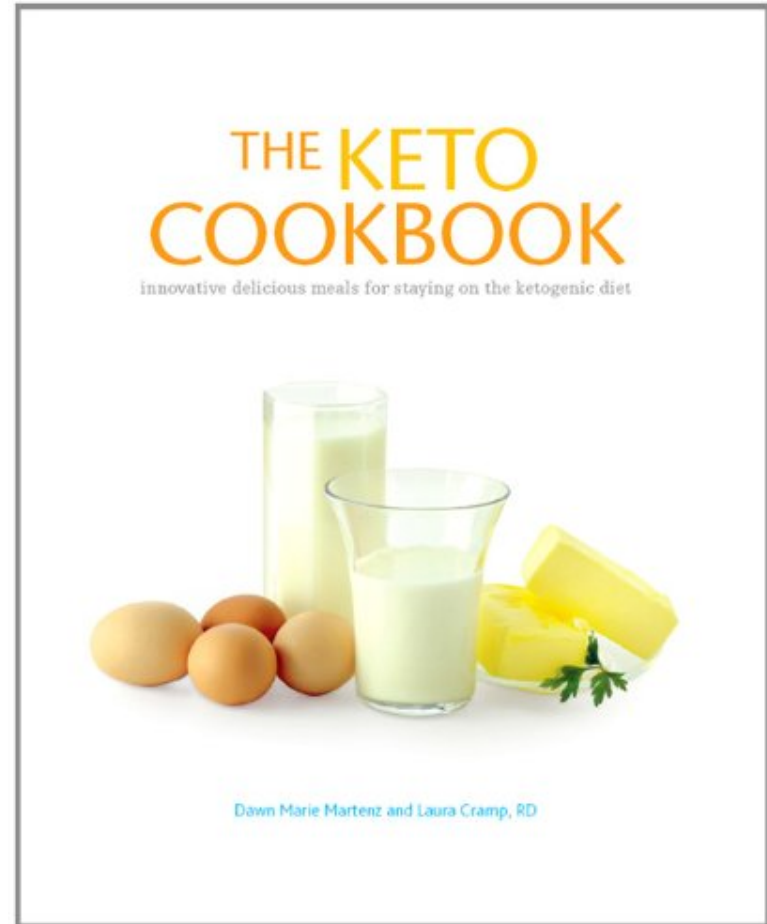
- If your child is able, have him/her meet with the dietitian alone at a few clinic visits to learn more about the diet.
- Involve your child in meal planning, meal preparation, weighing, etc and once old enough give them specific responsibilities to start working on transition for more self care.





# THE KETO COOKBOOK: INNOVATIVE, DELICIOUS MEALS FOR STAYING ON THE KETOGENIC DIET

- New cookbook!
- Written by Dawn Martenez and Laura Cramp, a mother and her daughter's dietitian
- Fresh new meal ideas with beautiful pictures
- Many practical tips



Available on amazon.com for \$19.77 or [www.ketocook.com](http://www.ketocook.com) (Dawn's personal website)

## PRODUCTS TO CONSIDER TRYING

- **None of these items are “free” and all must be worked into the diet**
- Most of these items are available at health food stores, chain grocery stores, and amazon.com
- Walden Farms:
  - Calorie Free Chocolate or Strawberry Syrup
  - Calorie Free Caramel Dip
  - Sugar Free Ranch Dressing
- Sweet Leaf Liquid Stevia
- DaVinci Sugar Free Syrup
- Julian Bakery Carb Free Bread



# AMAZON STORE – ALL THINGS KETO



<http://astore.amazon.com/ketocook-20>



# FOOD SAMPLE: PIZZA

- Ingredients:

- 30 g egg whites (whipped into stiff peaks)
- 17 g macadamia nuts (ground into butter)
- 15 g mayonnaise
- 13 g olive oil
- 14 g canned tomato puree
- 9 g Parmesan cheese (block style, grated)
- Salt and pepper
- Pinch of garlic powder
- Pinch of dried Italian herb blend

- Preheat oven to 375°F. Fold the macadamia nuts, mayonnaise, and olive oil into the egg whites.
- Pour the egg white mixture on a baking sheet lined with a piece of parchment paper.
- Spread into a circle about ½” thick.
- Carefully spoon the tomato sauce on the pizza.
- Sprinkle the grated cheese on top along with the optional seasonings.
- Bake for 20 minutes until lightly browned. Let cool and serve or freeze.



# FOOD SAMPLE: CHEESE CRACKERS

- Ingredients
  - 18 g macadamia nuts (ground into butter)
  - 4.5 g cheddar cheese
  - 3 g egg whites
  - Pinch of salt
- After measuring all ingredients, mix together and drop “dime” size spoonfuls onto a silicone-or parchment-lined baking sheet.
- Bake in a 350°F oven for about 7-10 minutes or until lightly browned around the edges.

4:1 ratio, 1 g CHO, 151 calories



# FOOD SAMPLE: MACARONI AND CHEESE

## ○ Ingredients

- 37 g 36% heavy cream
- 32 g cheddar cheese
- 22 g butter
- 116 g No NoOodles

- Mix heavy cream, butter and cheese together until warm. Add noodles and mix.

Note: Noodles do not need to be cooked.

4:1 ratio, 1 g CHO, 151 calories



# KETOCALCULATOR

- Access is provided by your dietitian, need a login and password
- Only have access to your child's info and other families would never see your child's info
- Simplifies menu planning
- Once meals completed, need to be “verified” by dietitian before they can be printed



# KetoCalculator

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Welcome to the KetoCalculator© web site. In order to become a member, you must be a licensed healthcare provider. A license number is required for registration. To begin using this tool, you must be a registered member.



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If you are already registered for KetoCalculator, enter your username and password below and click Login. [Forgot your user name or password?](#)

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KetoCalculator© was designed by Beth Zupc-  
Kania and LifeTime Computing, Inc.

Nutrient information from the USDA Database,  
food manufacturers, formula & pharmaceutical  
companies is reviewed annually.

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with epilepsy on the ketogenic diet.



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