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)
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

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 beta-hydroxybutyrate (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**

<table>
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<th>Age (years)</th>
<th>Calcium (mg)</th>
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<tr>
<td>1-3</td>
<td>700 mg</td>
</tr>
<tr>
<td>4-8</td>
<td>1000 mg</td>
</tr>
<tr>
<td>9-18</td>
<td>1300 mg</td>
</tr>
<tr>
<td>19-50</td>
<td>1000 mg</td>
</tr>
<tr>
<td>51+</td>
<td>1200 mg</td>
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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 (Phenobarbitol, Depakote) so 50% more is needed.

<table>
<thead>
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<th>Age (years)</th>
<th>Vitamin D (IU)</th>
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<tr>
<td>1-70</td>
<td>600</td>
</tr>
<tr>
<td>&gt;70</td>
<td>800</td>
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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

Source: The Keto Cookbook
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 (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.

*Source: The Keto Cookbook*

4:1 ratio, 2.1 g CHO, 403 calories
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
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.

To register, please click REGISTER above, or click here.

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

User Name:  Password:  

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

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

This project is made possible from an ongoing grant from Nutricia North America, makers of KetoCal, a medical food designed for individuals with epilepsy on the ketogenic diet.

Charlie and Jim Abrahams - 2006

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