Small Group Curriculum for Fatty Acid Oxidation Conference
(Geared for 2nd -5/6th)

Day1

Part I: Body Basics

I. Introduction: Get to know you game (8:15-8:30)

II. Read Magic School Bus Book: "Inside the Human Body" (8:30-9:00)

III. Flip Chart Discussion (9:00-9:30)

* *What organs are inside your body? And what do they do?* Each time they name something in their body I will give them a sticker with an interesting fact about that part of their body. (Depending on age use Velcro organs game)
*Organs: Bones, Skeletal muscles, Heart, Brain, Stomach, Lungs, Small Intestine, Large Intestine, Liver, Esophagus, Kidneys, Bladder
*Blood and Blood Vessels are also in your body/ explain circulatory system

IV. Snack/ Bathroom break (9:30-9:45)

V. *Make a Body* Activity (9:45-10:25)

*Trace a child's body on a large sheet of paper. Then have each child choose a couple of organs to draw and glue onto the body.

Part II: What Gives Our Body Energy

I. What gives our body energy?

*Food: Protein, Carbohydrates (fiber, sugar, starches), Fat (Hang pictures of the molecular structures)

II. Creating Molecular Structures

(Materials: box of toothpicks, bag of small marshmallows, tape, multi-colored construction paper with ten slits cut on each side, beads, pipe cleaners, small Styrofoam balls or metal rings)

1. **Carb Creations**: As a group, create as many basic carbohydrates you can in **five minutes** using tooth picks and marshmallows. Structures should be shaped similar to a hexagon.

2. **Protein Creations:** As a group, create as many protein balls as you can in five minutes. (Have approximately 20 pieces of construction paper cut ahead of time. When the paper is horizontal cut 10 slits on each side to make a total of 20 rectangle slits. The middle of the protein ball will be tapped together to create a circle. Then each individual slit will be folded to represent a different amino acid in a complete protein.) Proteins are special they are not only used for energy but to rebuild muscles!

3. **Fatty Acid Structures:** As a group, create as many fatty acids as you can in five minutes. Assign kids to short chain (4 carbons) medium chain (8,10, 12 carbons), long chain (16, 18, 20 carbons), very long chain (22 carbons). Use pipe cleaners and thread beads through a pipe cleaner. Children should count out the number of beads based on the fat chains they are supposed to create. Once the beads are thread through the pipe cleaner and a knot or stopper is placed on the end, the pipe cleaner will either be poked through a small Styrofoam ball or wrapped around a metal ring, to create a fatty acid.

III. Discover

***Which structures do we have the most of?** Carbohydrates! Just like it was super quick to build this molecule, it is quickly broken down in the body.

***<u>We have less proteins and fats</u> because they were more complex** or difficult to make. In the same way it takes our body a little longer to break these molecules down. (Depending on age, can discuss "Complex Carbohydrates")

***Everything we eat has these three kinds of molecules**. Depending on what we eat there may be more or less of a particular kind of molecule. These molecules work together to give us "quick" energy and "longer-lasting" energy.

***Have a couple different pictures of foods**, and have them try to guess what kinds of molecules/ratio they would find in these foods. Then discuss that this is why eating a variety of food is so important because you need a combination of quick energy and longer lasting energy.

***Digestion**: (If time allows) Discuss what digestion is: Process of breaking food down into smaller and smaller pieces. Food is chewed then moves through the esophagus, churns in the stomach, then the energy is absorbed and used. Take the molecules off the printed paper with food, then have food represent waste.

Day 2

How My Body Works (90mins)

I. Review: What three things does your body use for energy? Fat, Sugar, Protien

II. What is special about how your body uses energy?

***It has a hard time using fat for energy**

***Activity**: Pull out the body they created the day before. Place a piece of paper with small dots on top of one of the organs and explain that every organ is made up of hundreds and thousands of cells. Each of these "cities of cells" have "homes". "Now we are going to zoom in and look at one cell." Lay a picture of one basic cell on top of the picture with all of the dots. Discuss what is in the cell, including the mitochondria. Then lay a picture of a mitochondria on top of the cell. Explain that this is where fat is broken down to be used for energy. This sheet will have different boxes labeled: SCAD, MCAD, TFP/LCHAD, VLCAD. Then I will take the fat molecules made the previous day on top of each box and discuss how kids with MCAD Def. have a hard time using Medium Chain fats for energy, kids with TFP/LCHAD Def. have a hard time using long chain fats for energy ect.

***What have you noticed that you might have to do differently compared to friends who do not have your metabolic condition?**

**Possible Answers:
>Eat More Frequently
>Hydrate Seriously
>G-tube
>Supplement: Medical Formula, medicine, MCT/C7 oil
>Limit foods high in fat
>Count Fat

***Every kid is different!** So how your doctor wants you to take care of your metabolic condition may have both similarities and differences to your friends here. But don't be afraid to ask questions! It's important for you to understand why you have to do certain things, and how to care for your body! How many kids in here have asked a question of their doctor at their appointment? (Encourage them to do so at next appointment if they haven't yet) If the kids have not asked many questions of their doctor, have them right down a question on an index card that they can take home to ask their doctor. (Or maybe we can have Dr. Vockley come in so they can ask some questions)

III. What happens if you eat too much fat? (time pending)

*Discuss briefly how different conditions allow for different amounts of fat. Then use the "Marble Run" toy to show how when you just have one or two "fats" (represented by marbles) go into your body at one time, your body uses the marble for energy just fine (the marble goes down the marble run and comes out the other end). BUT if you overload the marble run (or your body) with 10 marbles at one time the marbles get stuck. In the same way if you eat a lot of fat that your body cannot process, the fat can get stuck around your heart or in your liver.

IV. Who has heard of the term *rhabdomyolysis*?

What does this mean? Muscle breakdown; using your muscle for energy

*When/why does your body break down muscle? This is an area clinicians are still learning a lot about. (Use carb, fat, protein models they built the first day for visuals.) Discuss how it is easier for their body to use carbs and protein for energy. It can use fat for energy, just not quite as well as the average person. Sometimes if you are sick and you can't keep food down or it's hard to eat/drink, you might not have enough energy stores that your body can breakdown…so it will go to the muscle instead. Or if you are playing or exercising and you don't stop to take breaks for hydration or food (which both have the carbs, fat and protein you need)…your body won't have enough energy and it will try and use the muscle for energy again. This is when your muscles "breakdown" and this is called "rhabdomyolysis"

**Unknown reasons for rhabdomyolysis*: Sometimes kids and young adults who have FODs can go into rhabdomyolysis and the reason is not as clear as the two above scenarios. Clinicians are still trying to understand this.

V. Rhabdomyolysis Activity

**Materials*: Syrap wrap, ground coffee, large measuring cup, three clear jars, 6 rubber bands, 1 water bottle filled with water, 2 thermos with warm water, coffee filters (kidneys

Set Up:

1. Create a muscle fiber by rolling up coffee grounds into five 4-5 inch long cylindrical bundles. Use 2-3 rubber bands to bind them together.
2. Have a clear measuring cup with warm water set up in front of the kids with three empty jars right next to it. Put a coffee filter so it is hanging a couple inches inside of the jar and bind the coffee filter to the top of the jar. The first coffee filter put three tiny holes in the bottom, so the water can flow a little quicker through the filter

Activity:

1. Re-discuss when are some of the times that they might go into rhabomyolysis. "What is happening when you are experiencing rhabdo? Yes, your muscles are breaking down. So Dave is going into

rhabdomyolysis, which means his muscle fiber is breaking to be used as energy." Take the "muscle fiber" that has been created and puncture two of the syran wrap cylinders ("Myofibrils) and let the coffee go into the measuring cup.

2. Explain that when our muscles breakdown that there is a substance released called myoglobin, and that is what gives our urine the dark color. Explain that doctors know how much muscle has broken down based on how much "myoglobin" is in their blood. But they can't draw their blood and check for myoglobin, so they check their "CKs" (Creatine Kinase) which tells doctors how much myoglobin is in their blood. (Stir the coffee mixture while you do this)
3. "But our body doesn't like extra myoglobin running through our blood, so our kidneys are there to filter it out." Explain while you are pouring the dark water through the first filter that the filter represents the "kidneys" because kidneys filter out the myoglobin. The jar represents the bladder
4. "Myoglobin can be really hard on our bodies and kidneys if left in there, so doctors have you drink extra water…" (Pour more warm water into the first jar.)
5. Take the coffee filter off the first jar and pour half the water into the second jar. Then fill the jar up with clear warm water from your thermos. Repeat steps 4 &5, while asking, "Each time you drink more water and pea what do you notice happens to the water?" Answer: It gets lighter Why? Because it has less of this myoglobin. Eventually all of the extra myoglobin gets out of your bloodstream, and that is why your cks come back down.