Six 200's descending on five minutes. Twenty-five 50's on :58. Whatever your "favorite," every set during every workout and dryland session requires energy.

Nutrients are the "chemicals" that supply the body with energy. Carbohydrate, protein and fat supply energy in the form of calories. These are your "Energy-Yielding Nutrients." Vitamins, Minerals and Water don't supply energy in the form of calories, but their presence is required in order for the body to access the energy provided by carbohydrate, protein and fat.

During exercise, the body gets its energy primarily from carbohydrate and fat. It likes to save protein for other things (building and repairing muscle tissue, hormones and red blood cells, and supporting the immune system). The only time the body uses protein as an energy source during exercise is when carbohydrate and fat are not present in sufficient quantities. This happens when the total caloric intake is too low over a period of months, and or the bout of exercise is so long that the body's accessible sources of carbohydrate and protein become exhausted. Neither of these scenarios is desirable for swimmers.

Think about money. When you have lots of it, you don't mind paying full price for things. But when money is scarce, or there is just too much you have to buy, you look for bargains. You're not being cheap, just thrifty. Simplified to some extent, your body knows how to shop.

Now instead of dollars, think of your currency as oxygen. When swimming is "easy," say during warm-up or your easiest sets, there is plenty of oxygen available to support the exercise. The body perceives itself as "rich" and doesn't mind splurging on fat (1 gram of fat costs 9 oxygens). In fact, it automatically does so because it knows it might need carbohydrate at a later time.

When exercise is hard (we're talking tough sets, definitely your hardest sets), oxygen is not plentiful. In fact, the body needs every bit it can get to support the exercise, but even that is often not enough, and the body is forced to derive energy in ways that do not require oxygen (i.e. anaerobic metabolism). In this situation, the body perceives itself as very "poor" and becomes very thrifty with its "purchase" if fuel. Since carbohydrate costs less than fat (1 gram of carbohydrate costs 4 oxygens), the body chooses to rely primarily on carbohydrate for its energy.

Keep in mind that this entire fuel burning process is never a case of "all or none." In other words, the body is always using some combination of carbohydrate and fat, but the intensity of the exercise dictates which fuel source will be the dominant one. When swimming is easiest, fat is the primary fuel source. When swimming is toughest, carbohydrate is the primary fuel source. When swimming is about 50% of maximum effort, carbohydrate and fat contribute about equally.

Let's face it – the majority of workouts are hard. Above 50% for certain. If you consider

the typical swim workout, it's pretty safe to say that the primary fuel source for swimmers is carbohydrate.

What are the first three foods that come to mind when we say "carbohydrate?"

1. Pasta
2. Rice
3. Bread

Each if these is excellent. But what do they have in common? They're all white!

One of the most overlooked sources of carbohydrate is fruit. Yes, FRUIT. Fresh, canned, frozen, dried or juiced. No matter how you look at it, fruit is an excellent source of carbohydrate. Not only does fruit provide carbohydrate in the form of natural sugars (versus refined sugar), the bright colors of fruits indicate that they are also excellent sources of vitamins and minerals, including a sub-group called anti-oxidants.

You might recall that exercise is the stimulus that leads to training adaptations. And that adaptations to training occur ONLY is you give the body the right kinds of fuels during periods of rest.

Well, one of the side effects of exercise is the generation of "free radicals." Free radicals are molecules that can actually cause damage to muscle tissue above and beyond the damage caused by exercise. The damage caused by exercise is normal. It serves as part of the stimulus for training adaptation to take place. But damage caused by free radicals is NOT a desired part of the training process. Damage caused by free radicals (aka "scavengers") circulating in the bloodstream after workout can continue well into the recovery period. This is when the body is supposed to be adapting!

Anti-oxidants "absorb" free radicals, neutralizing their effect in the body before their damage to muscle tissue can amount to much. A diet consistently rich in fruits (and other colorful foods, such as VEGETABLES) is apt to keep the body consistently supplied with anti-oxidants, which will assist the body in keeping free radical formation to a minimum. This a good reason to eat lots of colorful foods during the recovery time between workouts.

Colorful foods include, but are not limited to:

Apples, Strawberries, Blueberries, Bananas, Oranges, Kiwi, Watermelon, Raspberries, Grapes, Mango, Papaya, Apricots, Red peppers, Broccoli, Corn, Squash, Carrots, Peas, Green beans, Tomatoes

Colorful foods DO NOT include: Skittles, Jelly Beans, M&Ms, Mike&Ikes, Fruit Loops, and so on.

Keep in mind that in order for nutrition to have an appreciable impact on your performance, you have to eat the right way on a year-round basis. Not that you can't occasionally indulge in some fast food, or sweets; just make sure that your daily diet follows the 80% rule, meaning that you make the right choices at least 80% of the time and reserve the other 20% percent for some of your favorite "cheat" foods. This way, you'll know you're supplying your body with the nutrients it needs to feel and perform at your best.

The following recommendations will help you stay on the right path:

The Right Kinds of Carbs
Make sure that the bulk of your diet comes from complex carbohydrate sources (approximately 50-60% of your total caloric intake). It's important that these carbs are predominantly in the form of whole grain breads and cereals, whole wheat pasta, brown rice, yams (or sweet potatoes) and beans. Try to stay away from white pasta, rice, breads and bagels as much as possible. They have an unfavorable effect on blood sugar levels and can really hamper your performance.

Protein Intake
Try to opt for quality, low-fat protein sources like skinless, white meat chicken and turkey, lean beef, eggs, tuna, flounder, sole and cod, skim and low fat milks, low-fat yogurt (not the "fruit on the bottom kind") and tofu. Limit your intake of high-fat cuts of beef and pork, hot dogs, chicken nuggets, fried chicken and pretty much all fast food, as much as possible. Proteins should make up anywhere between 20-25% of your total caloric intake.

Watch the Fat
Keep an eye on your fat intake. As a general rule, try to limit your intake of saturated fats, or any type of "hydrogenated oils" and "trans" fats. You can do this by cutting down on higher-fat cuts of beef and pork and all types of fast food. Also try to read as many nutrition labels as possible, as most clearly list the breakdown of both total fat, and saturated fats. Make sure that any food you choose has no more than 3 grams of fat per every 100 calories (i.e. in a 200 calorie food, 6 grams of fat is the limit), and that no more than about 1/3 of the total fat comes from saturated fat. So, that same 200 calorie food with 6 grams of total fat should have no more than 2 grams of saturated fat. Overall, fats should comprise anywhere from 15-20% of your total caloric intake.

Don't Forget Fruits and Vegetables
Eat as many fresh vegetables and fruits as you possibly can. Most kids fall way short of the recommended 5-9 daily servings of fruits and vegetables. They provide tons of vitamins and minerals, as well as much needed fiber.

Hydrate!

Proper hydration is absolutely key! You can't drink next to nothing for several days and think that jumbo Powerade you're swigging in the car on the way to the pool is going to do anything. Here's a breakdown of how much you should be drinking and when:

Overall water consumption for kids age 9 to 13 should be 2.0 to 2.5 liters per day, whereas 14-18 year-olds should strive for 2.5 to 3.5 liters, with girls falling near the lower end of the range, and boys at the higher end. Keep in mind, we're talking about water here, not juices, sports drinks, or soda. This should be your target for each and every day, with your fluid requirements increasing with athletic activity.

Sports drinks are really only necessary for activities lasting at least one hour in duration, but can otherwise be consumed in moderation if they encourage young athletes to drink. Watch the sugar content, though. When choosing a sports drink, look for one with a 6-8% carbohydrate concentration, or 50-80 calories per 8 ounces, with 120-170 milligrams of sodium.

Eat Breakfast

Start out with a proper breakfast. This does not entail grabbing a bagel with cream cheese and eating it in the car with a large orange juice on the way there. The bagel, especially if it's made with white flour can really jack up your blood sugar levels. Granted, the fat in the cream cheese will blunt this affect somewhat, but add in the OJ and you'll be all fired up for warm-ups and likely crash shortly thereafter.

The best-case scenario is to sit down and eat some slow cooked oatmeal (prepared the night before) with fruit, or some eggs and whole grain toast, or whole grain cereal with skim, or low fat milk. If it's an early meet and you must eat on the run, at least make it a whole grain bagel with peanut butter, as the these two foods together make up what is known as a complete protein by providing your body with all the essential amino acids it needs. Trade in the OJ for a lower sugar sports drink and you're good to go. Some more foods to stay away from include bacon, sausage, croissants, doughnuts and sugary breakfast cereals.

As far as what you should have in your bag for snacking, I think the best way to address this is with a list of what you should bring, vs. what you should not bring.

What to Bring:

1. At least 32 oz. of water to drink during and after the meet.

2. No more than 16-20 oz. of sports drinks that meet the above criteria.

3. Energy bars: Try to stick with bars that have less than 10 grams of fat, and less than 35% of their calories from sugar (the lower the better). To calculate this: multiply the number of grams of sugar by 4 and then divide that number into the total calories. Some recommended brands include: Kashi TLC Bars, and Odwalla Bars.

4. Whole grain pretzels, crackers and cereals.

5. Nuts, seeds and dried fruit (in limited quantity due to the relatively high sugar content).

6. Lower Sugar Fruits: Strawberries, Apples, Cantaloupe, Blueberries, Raspberries and peaches.

What not to bring, or bring less of:

1. Chips of any type. Most are loaded with fat and calories.

2. Goldfish, Cheese Nips, or any other types of crackers made with white, enriched flower.

3. White Bagels and Breads.

4. High Sugar Fruits: Bananas, Raisins, Pineapple and Grapes.

5. High Sugar Energy Bars: Many types of Power Bars fall into this category.

6. Fruit Juices of any type: Too high in sugar and don't clear the gut as rapidly as sports drinks, possibly leading to stomach cramping.

7. Soda. This one's an absolute no-no!

8. Cookies, candy, gummy bears, or anything else along those lines