

Atkins or “Fadkins”?

by

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Part I – Macronutrients and Energy

Two friends of yours, Janine and Mitchell, join you at lunch. During your conversation, Janine comments on Mitchell’s choice of food: a small bowl of cottage cheese, a chicken salad with vinegar and oil dressing, and a glass of ice water.

“What, are you on some kind of a health kick?” Janine asks, as she plows her way through a cheeseburger and a basket of fries. “First jogging every morning, now rabbit food?”

“It’s this new diet I’m trying,” Mitchell says. “Someone told me it’s really good. And I thought I could lose some weight.”

“From where?” Janine asks, looking Mitchell up and down. As you look at your friend, you have to agree with Janine: tall, lanky Mitchell doesn’t look like he has an ounce of spare fat on him.

“Wait a minute,” Janine says, “You’re not on that Fadkins diet, are you? That diet where you eat all protein and no carbs?”

“Yeah, I am,” Mitchell says, defensively. “I hear it’s really good. Someone my brother knows lost ten pounds in like a month.”

“Don’t you know those high-protein diets are bad for you?” Janine says, taking another sip of her milkshake. “If you eat way too much protein and not enough carbs you can ruin your kidneys forever because of all the nitrogen you have to process breaking down the protein,” Janine says. “Haven’t you heard that in the old days, the mountain men used to get really sick and sometimes die if they had nothing to eat but venison and rabbits and lean meat like that? And there was some high-protein, low-carb, no-fat diet back in the 70’s or 80’s or something that people were dying from. Besides, if your brain doesn’t get carbs—well, glucose, anyway—you get really cranky. You have to have enough carbs.”

“Well, yeah,” Mitchell says, “that’s if you only eat lean protein and nothing else. But this diet lets you have fat, and you burn that for energy so you don’t get problems like the mountain men had. See,” Mitchell goes on, before Janine can interrupt him, “the thing is, carbs are like easy energy or something, so your body burns carbs when it can get them and leaves your body fat alone. If you cut down on carbs, you train your body to burn fat instead. Once you get your body trained, then you can start eating some carbs again, and you keep your weight down.”

Janine snorts in laughter. “*Train* your body to burn fat?! Like it doesn’t know how already? Come on! If you’re gaining weight, it’s because you’re taking in more calories than you’re burning up. Everyone knows that. A calorie is a calorie. It’s just a measure of energy in your food. If you want to lose weight, what you have to do is either cut back on the calories you take in or exercise to burn up calories—or both. But why

are we even talking about this? You don't need to lose weight at all, so what are you dieting for, anyway? It's better to like yourself just the way you are."

"What do *you* think?" Mitchell says, turning toward you. "You're taking biology. Don't you think high-protein diets make a lot of sense? You think I should stick with this one?"

"Tell him he's being ridiculous!" Janine insists. "He's going to make himself sick."

Questions

1. First, find out what nutrients Janine and Mitchell are talking about. Using a biology textbook and the resources listed, describe what the following molecules are and what they are used for in the human body. List some specific examples of each. Also list major dietary sources of each.
 - a. Proteins
 - b. Carbohydrates
 - c. Fats
2. Janine made this statement: "... if your brain doesn't get carbs—well, glucose, anyway—you get really cranky. You have to have enough carbs." Find out if Janine is right. How does the nervous system use glucose?
3. Janine also said: "If you eat way too much protein and not enough carbs you can ruin your kidneys forever because of all the nitrogen you have to process breaking down the protein." Find out if Janine is right about this, too. Check a biology textbook for information on protein, fats, and carbohydrates. To find out how these substances can be used for energy, look up information on cellular respiration.
4. The words "calorie" and "energy" come up a lot in discussions of diet and nutrition. Use a biology textbook to define both of these terms. Then suppose you found a product that was labeled "calorie-free energy drink." Why would that label be misleading?
5. Which substances supply energy to the human body?

Resources

USDA My Pyramid:

<http://mypyramid.gov/index.html>

National Institutes of Health nutrition information:

<http://health.nih.gov/topic/Nutrition/WellnessLifestyle>

<http://health.nih.gov/topic/WeightLossDieting>

Part II – Metabolism and Detox

Recall that you, Janine, and Mitchell were talking about the high-protein, low-carb diet that Mitchell decided to go on. Now you're sitting down to lunch with the pair again. While you still don't have a full answer for them, the conversation turns to diets again.

"What is that green glop you're drinking?" Janine asks, staring at a cup that Mitchell is holding.

"It's this great new herbal detoxifier that I found at the health food store," Mitchell says.

"Detoxifier?" Janine asks. "What the heck is a detoxifier?"

"Obviously you've never studied dieting," Mitchell says, with a superior air. "You see, if you eat a lot of junk food like *some* people do"—here Mitchell gives the evil eye to Janine's milkshake and pizza—"you get all these toxins building up in your cells. That changes your body's set point for fat. If you don't get those toxins out, especially out of the fat cells, your body can't get rid of fats. So if you drink herbal detoxifiers like this, you get rid of toxins, and then you can raise your set point and rev up your metabolism so that you lose a lot of weight. I just started this and I dropped like two pounds in a day."

"Two pounds?" Janine asks. "Do you have the container? Let me see the ingredients."

Mitchell digs into his back pack and pulls out a plastic canister of green powder. Janine reads the label.

"Ah hah!" she says. "Just as I thought. Parsley, dandelion, green tea—those are herbal diuretics. You're not losing fat, my friend. You're just losing water. That can be dangerous, you know. Too much diuretic can mess up your system."

"But it says it flushes fat from your body," Mitchell protests. "Look, right there on the label."

Janine gives him a patient, though pained, look. "Have you ever noticed an oil slick in the toilet after you've used it?"

"Um... no?"

"Then what exactly does 'flush fat' mean?"

"Um, maybe it makes it break down or something?"

Janine shakes her head. "You're drinking the stuff and you don't even know what it's doing to your body."

"Look, all I know is that it works," Mitchell says. "I believe in this stuff."

"Believe all you want," Janine says. "It's still a crock. And I still don't see why you think you need to be on a diet to lose weight. Eating healthy, yes, but losing weight? You?"

"I just really feel fat sometimes," Mitchell mumbles. "I look in the mirror at gym class and all these other guys look so buff. And there's Steve in my dorm who keeps poking me in the stomach and yelling 'marshmallow!'"

Janine nods in understanding. "Maybe all you need is a little more exercise to tone up. But really, Mitchell, you're on the thin side. Maybe you have a body image thing going here."

“What do you think?” Mitchell asks, handing you the canister of green powder. “Isn’t there something to the idea of detoxifying the body? Isn’t set point a real thing?”

“Tell him all he really needs is to eat healthy foods and get a little exercise,” Janine says. “Muscles use up lots of calories, so the only way to increase your metabolism is to gain some muscle. This green glop is going to drain his wallet and make him sick.”

Questions

1. Find out how the medical community defines “obesity.” What factors contribute to obesity?
2. What is “set point theory”? Are toxins involved? Describe how body size and homeostasis are related.
3. What is “metabolism”? What does human metabolism have to do with energy balance and body weight?
4. Janine said that increasing muscle mass increases metabolism. Is she right? If so, how does this work? If not, why not? Check a biology textbook for information on the structure of muscle cells for clues.
5. Mitchell said that the herbal product “detoxifies” the body. Janine said it’s a diuretic. Find out what a diuretic is and what effect it has on the body. How does its action affect homeostasis of fluid balance?
6. What body systems remove toxins from the body? What are “toxins,” and where do they come from? Are all “toxins” alike? Do toxins really cause you to gain body fat or prevent you from losing weight?
7. Body image and dieting go hand-in-hand. When body image is distorted, people can diet to excess. Do you think that Mitchell has a body image problem? What further health problems can result from a body image problem?

Resources

Set Point Theory (MIT Medical):

http://medweb.mit.edu/pdf/set_point_theory.pdf

WebMD article on detox diets:

<http://www.webmd.com/food-recipes/features/detox-diets-purging-myths>

BBC news article on detox diets:

<http://news.bbc.co.uk/2/hi/health/7808348.stm>

National Institutes of Health information:

<http://health.nih.gov/topic/WeightLossDieting>

<http://health.nih.gov/topic/EatingDisorders>

Part III – Hormones and Homeostasis

It's lunch time, and once again you meet Janine and Mitchell at lunch. You notice that today Janine has chosen a turkey sandwich on whole wheat, a green salad, and a carton of milk instead of her usual burger, fries, and milk shake.

"Yeah," Janine says, a little self-consciously. "With all this talk about diets, I've been reading up on nutrition and health. I figured that eating more veggies and fiber and a little less fat wouldn't be a bad thing. I'm going to start taking walks, too. I've been eating a lot of fast foods this school year because it's convenient. Between that and sitting around studying a lot more than I used to I've seen my weight go up a few pounds—well, okay, more than a *few*," she adds, ruefully. "Switching to healthier habits just makes sense. I figure a few small changes at a time will be easier to manage than trying to change everything at once."

Mitchell now arrives at the table with a large green salad, two hard boiled eggs—and a small muffin.

"Low-carb muffin?" Janine asks with a grin.

"Nooo," Mitchell admits. "It's just that, well, I get pretty hungry and tired and cranky eating nothing but the low-carb stuff I'm supposed to have. And I was getting headaches. Okay, so I'm cheating a little bit. But man, you can't believe the cravings I've had for bread and cereal and stuff. So I started eating some, and I feel better."

You give Janine a quick nudge before she can say, "I told you so."

Janine changes her smug expression to a sympathetic one. "It's a blood sugar issue," she says. "If your blood sugar dips too low, you can get tired and cranky. And get headaches, too. It has to do with insulin, if I remember right."

Mitchell looks surprised. "I'm not diabetic. I don't take insulin."

"No," says Janine, "but insulin is a hormone we all have and it controls blood sugar. I forget how it works, but if you don't get enough sugar in your blood, you have problems. And if you get too much sugar in your blood, you can get problems, too. It has something to do with the hormones, and the carbs and sugars you eat, and if the sugar is moving into the cells or not ... oh, I forget how it works."

"Oh," Mitchell replies. "I thought blood just carried oxygen. I didn't know it had any sugar in it." He looks worried. "Sugar is unhealthy, right? What if I have sugar in my blood? Is that a bad thing?"

Janine has learned some empathy, you think, as this time she visibly restrains herself from laughing and puts on a serious look. "You have to have *some* sugar. It's what your brain needs. It's just that you don't want to have too much or too little blood sugar, but the right amount."

Mitchell looks a little quizzical. "How do I know if I've got the right amount?"

"Your doctor can do a glucose test at your next check-up. It's pretty routine. Or you can ask about it at the student health center."

"Oh." He looks puzzled again. "So is that what's making me hungry? Low blood sugar? I heard some guys in the gym saying something about low blood sugar."

“Kind of,” Janine says, then stops to think about it. “I *think* low blood sugar can make you crave carbs or something. But appetite, being just plain hungry—well, there’s a bunch of hormones someone discovered that affect appetite. There’s an article in a magazine I ran across the other day. I’ll have to dig that out.”

Mitchell looks a little downcast. “The fact is I’m tired of this diet. It’s hard to stay on it, and after those first few pounds dropped, I haven’t lost any more. It’s frustrating.”

“Then let it go,” Janine urges him. “You’re fine just like you are. Stop worrying about counting carbs or protein or calories or grams of this or that or whatever. Just eat good food, not too much of it, and get some exercise. That’s what I’ve decided to do.” She gestures to her lunch selections. “Nothing extreme. I threw away the chips and stuff in my room, but if I want an ice cream bar once in a while, that’s okay. I figure if I eat sensibly most of the time, and start getting more active, like taking a walk every day, I’ll improve my health. That’s the important thing.”

“But still,” Mitchell insists, “the diet seems like it should work. It worked for other people. Why isn’t it working for me?” Mitchell now turns to you. “What do you think? How come I’m not losing weight on this low-carb diet? Am I doing something wrong?”

“Tell him to quit dieting,” Janine insists. “He doesn’t need to diet at all.”

Questions

1. What is meant by “sugar”? What is a “carbohydrate”? How are sugars and carbohydrates related?
2. Janine mentioned blood sugar levels, which puzzled Mitchell. What does blood have to do with sugar? How do endocrine hormones control blood sugar levels? Why is the homeostasis of sugar balance important for overall body health? Include a brief discussion of diabetes and hypoglycemia in your answer.
3. What other hormones could affect Mitchell’s appetite? Where do these hormones originate, and what are their effects? Use the textbook and the resources from the resource list (*NOVA* video, *Science News* article, NIH website) to answer this question. Note that this is a relatively new area of research and new information may arise at any time.
4. Why could a low-carb diet cause headaches, fatigue, and carbohydrate cravings?

Resources

NOVA Science Now: Obesity

<http://www.pbs.org/wgbh/nova/sciencenow/3313/03.html>

Science News articles, “The Hunger Hormone?” (February 16, 2002; Vol. 161 #7), and “Still Hungry?” (April 2, 2005; Vol 167 #14). Check the *Science News* website at <http://www.sciencenews.org/> for this and the newest findings on appetite hormones. Also check your library to see if they carry print copies of this magazine.

National Institutes of Health Weight Loss:

<http://health.nih.gov/topic/WeightLossDieting>

Part IV – Summary Essay

Now that you've explored some answers to questions that came up during your conversations with Janine and Mitchell, give Mitchell the advice you think he needs. Throughout this case you've been exploring homeostasis in weight change and hormone systems, so be sure you thoroughly discuss homeostasis of these systems in your response. Janine had concerns about Mitchell's body image, so discuss body image and factors affecting both actual weight and perceived body size in your response. Include the information that you've collected about: proteins, carbs, and fats; obesity and body image; hormonal control of blood sugar levels, water balance, and appetite; possible effects of low-carb diets on the brain and the kidneys; a definition of metabolism and what controls it. Finally, state your advice about what Mitchell should do, if anything, about his diet.

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