

## Comments on Physiology

Richard E. Ecker, Ph.D.

Reprinted from *Ultrarunning*, January-February 1982, pp 8-9

‘The thoughtful comments by Richard Ecker (Nov., p.6) are probably correct as far as sedentary people are concerned, I don't know... but what I fear is that nutritional demands of running ultramarathons are quite different from those of a sedentary spectator. My family has run ultras for over ten years, and I recently took my wife and 3 kids (ages 10, 12 and 14) to the AMJA "sissy 50" in Chicago where all finished and all had a wonderful time. Three of us were in the Tahoe 72 miler and one ran both the Western States 100 and the Pacific Crest Trail 50. It frightens me that some novice runner might follow the advice in Ecker's article and die. I have been collecting data on deaths in marathoners who restrict their diets - two were ultrarunners - and I have published my fears in Runners World (Nov 61), The American Journal of Clinical Nutrition 1981, 34:1639-40 and the Journal of the A..M..A. 1980, 244:1437. Short reports have also appeared in the British Medical Journal, Running, and the Jogger. I really try to let people know what is killing runners!

Some points:

Protein: Endurance running burns "significant" protein—see Lemon & Nagle's article "Effects of exercise on protein and amino acid metabolism" in Med Sci Sports Exercise 1981, 13:141-149.

Fat: A low-fat diet, by definition, supplies only 100 kcals of essential fatty acids *per day* while ultramarathoning utilizes up to 300 kcals of essential fatty acid *per hour* New Engl J Med 1975, 293:1076.

Sugar: There is now a fifth Basic Food Group, the "energy group" which includes fat, sugar and alcohol (West J Med 1961, 135:252-256). The so-called "junk food" may be absolutely essential for survival if you are an ultramarathoner.

In the course of running over 100 marathons myself, and reviewing the autopsy reports on dozens of marathoners, I have learned one thing about diet - "Eat What You Crave"!! Never take dietary advice from a sedentary "expert." Eat what the champions (who survive) eat.

Thomas J. Bassler, M.D.’

Dr. Ecker responds:

I don't really feel that this magazine is a very appropriate place to conduct a scientific debate on the subject of applied physiology, but Dr. T. J. Bassler's suggestion that someone might die as a result of the advice I gave in this magazine compels me to respond. I will be as brief and as non-technical as I can, consistent with a proper rebuttal of this serious charge.

When I initially agreed to write this column, I viewed the task as one of interpreting the scientific literature for the average, non-scientist runner. My goal has been to promote a background of understanding in those aspects of human physiology that are particularly important to

people who run long distances. It certainly never occurred to me that my authority in this regard might be considered less valid because I am not an ultrarunner myself.

Many readers are probably aware that there is little available scientific literature specifically on ultrarunning. Perhaps the most complete study was the one I conducted on Stan Cottrell during his 48-day transcontinental run in 1980. Regrettably, this study will not be published because of persistent charges that this runner is not capable of performing as he claims. In the absence of a literature on ultrarunning, I have derived most of my information from studies on cross-country skiers, who are probably the best-studied group of athletes with endurance demands similar to those of ultrarunners. There is an abundance of excellent scientific studies on cross-country skiers, particularly from the Scandinavian laboratories.

However, I do not want to engage Dr. Bassler in a shootout using the scientific literature as artillery. He clearly feels very strongly about his position in this matter. Unfortunately, in his zeal for his cause, he has abandoned the objectivity that is so essential to productive scientific enquiry. It is not my intention to make light of his fears. The unexplained deaths among runners that he has studied should be a cause of concern for all of us. But he is wrong. He is wrong to give up his objectivity. He is wrong to suggest that my advice might endanger the life of anyone. He is wrong in his reading of the scientific literature. And, he is wrong in the recommendations his theories have led him to make. To see why, let us examine the evidence he has presented to support his position.

In his own articles, Dr. Bassler documents the deaths of three runners. All died of cardiac arrest, two in their sleep and one during a training run. At the time of death, all were low in body weight and "all were restricting their dietary intake of calories, fat, cholesterol, alcohol or salt." Although he was "at a loss to explain the mechanism of these deaths," Dr. Bassler theorized that the mechanism involves a deficiency of essential fatty acids, caused by a restricted intake of fat in the diet, high training mileage and low body weight. He provides no specific information on the dietary intake of these runners prior to death, but indicates that they may have been restricting their consumption of dietary fat to as little as 10% of total calories. No measurements of essential fatty acids were made.

Even if I advised the maintenance of below-normal body weight for runners (which I do not), and even if I advised severely fat-restricted diets (which I do not), Dr. Bassler's evidence is too limited and too incomplete to justify a charge that such advice might cause someone to die.

Furthermore, I can find little in the other articles he has cited to support the position he has taken. In the article on protein metabolism, the evidence presented demonstrates that protein utilization can contribute significantly to calorie expenditure during exercise, but *only after carbohydrate fuel reserves have been exhausted*. As pointed out in another article Dr. Bassler cited, because of the body's preference for carbohydrate as fuel (particularly in the brain, where it is essential), the breakdown of tissue protein necessarily occurs in carbohydrate-depleted athletes so that it can be converted into the carbohydrate essential for continued effort.

After thorough review of the article Dr. Bassler cites to support his argument concerning fat, I have found no reference to either the cited definition of a low-fat diet or to his statement that "ultrarunning utilizes up to 300 kcals of essential fatty acids per hour." The closest thing to the latter statement I can find is a graph indicating that, after four hours of prolonged exercise, 62% of the subject athletes' oxygen uptake was contributed by the oxidation of free fatty acids (the form in which fats are transported in the circulation). Because the article says nothing at all about either essential fatty acids (a fraction of the free fatty acids) or about ultrarunning, I must assume that Dr. Bassler has made his own interpretation of the data in the graph and then

credited the authors with the interpretation. Unfortunately, he tells us nothing of the assumptions that went into this interpretation.

But what about this high level of fat utilization in prolonged exercise? Can it deplete our bodies of something essential? During exercise, free fatty acids come mostly from the body's stores of fat. They increase significantly in the circulation *only when carbohydrate fuel reserves begin to run out*. In athletes of normal body weight, fat stores are almost inexhaustible, even when body fat constitutes as little as 8% of total body weight (about 50,000 calories in a 150 pound runner). But if, because of dietary restriction, the athlete has limited his carbohydrate fuel reserves and has to draw extensively on that supply of stored fat during prolonged exercise, it may be that some important physiological imbalance could occur. At this point, no one knows. But the solution is not to increase fat intake. The solution is to limit the draw on those fat reserves by assuring the supply of the primary fuel, carbohydrate.

In the Danish study I cited in my November column, the authors demonstrated 50 years ago the same point Dr. Bassler has used in developing his theory—that, during prolonged exercise, the proportion of fat utilization increases with the duration of the exercise. But, the important conclusion of the Danish scientists was that the amount of *carbohydrate* in the diet was the factor determining how soon in exercise significant utilization of fat stores will begin.

The literature citation Dr. Bassler used to support the existence of a "fifth food group" is not a scientific paper, but an editorial on nutritional cultism. The reference in this paper, that a "fifth food group (fats, alcohol, sugar) has recently been added by Canadian and American federal agencies," is not documented, so I could not check its validity. I reviewed my copy of the U.S. Government's "Dietary Goals for the United States" and could find no such suggestion. I did find the following:

Goal 2. Increase the consumption of complex carbohydrates and "Naturally-occurring" sugars...

Goal 3. Reduce the consumption of refined and other processed sugars...

Goal 4. Reduce overall fat consumption...

I think that Dr. Bassler's recommendation to "eat what you crave" is bad advice, not because any of you are likely to die as a result of it, but because the best evidence suggests that it will limit your performance unnecessarily. There are, after all, many alternatives between severely restricted diets and totally unregulated eating. I will continue to recommend to ultrarunners those alternatives that will safely provide the best opportunity for peak performance.