**A Food Chemist's Perspective on "In Defense of Food"**

In reading Michael Pollan's thought-provoking book, I was struck by his mostly negative impressions of food science and food processing. The food scientists that I work with here in this department, in industry and in my classes, are highly creative people that are driven by a passion for food or cooking. I have been a food scientist for more than 20 years, and I think it should be noted that the food science discipline serves several critically important functions or roles in our society. Firstly, with the shift in population from rural to urban areas, food science has provided the means to feed consumers who no longer have the opportunity to grow their own crops or tend their own animals. Foods such as milk or fruits are now produced in the Mid-West and Florida and transported to every corner of the US. In order to safely transport foods over these long distances, food scientists study how to preserve foods (e.g. using pasteurization of milk or juices, blanching or mild heating of vegetables, or refrigeration of fruits), they study what organisms might grow on these foods and develop methods to destroy those organisms that pose a danger to consumers and they explore how to maintain the quality (i.e. flavor and taste) of the food that the consumer expects.

In nature, most foods do not need to have a long shelf-life as foods were designed to be consumed immediately, e.g. milk. As humans migrated into regions that had harsh winters or climates they learned how to preserve foods available in summer for the winter time, they preserved meats by salting or smoking, and milk by fermenting into cheese. Modern day Food Scientists have responded to the current pressures that consumers are under, in particular and especially over the past 50 years, more women have joined the workforce, often full-time. This has greatly limited the time that is available to prepare meals for their families in the home. Food Scientists have responded by providing a variety of foods or meals that are either in a ready-to-eat format or require only a short cooking/preparation time. The reality in many people's lives is that they simply do not have the time or the passion to prepare the traditional home-cooked meals that Pollan suggests.

Food processing involves the transformation of raw ingredients into foods fit for human consumption, e.g. converting wheat into flour and then into bread (this makes bread a "processed food" but I was not sure if it could also be one of those "food-like products" that Pollan mentioned as that definition was pretty vague). As an aside we need to remember that the fruits and vegetables that we buy in the store or farmer's market are nothing like their ancestors, humans have "improved" these foods over millennia by techniques such as breeding to yield the products that we see today. Food processing is also performed for several reasons including food preservation as discussed above, other reasons include the

fortification of components into food that have important health benefits (e.g., addition of vitamin D to milk), the production of novel textures (e.g. breakfast cereals) and tastes/flavors (home-made popcorn), as well as the destruction of intrinsic components of the foods that are harmful to consumers (e.g. digestive inhibitors in soy beans). The drawbacks of food processing were discussed in Michael Pollan's book such as the loss of vitamins during cooking but I want to make sure that this discussion was balanced by including the benefits of processing. Many of the ingredients that are added to foods nowadays are added to extend the shelf-life, e.g. to slow down the staling of bread, partly because of the distances foods are now transported but also because many of us do not go to the store every day. Other ingredients are added to slow down bacterial growth or spoilage. Pollan encourages us to only consume foods that have ingredients that we can recognize. That sounds very reasonable. But that will approach will depend on how familiar an individual consumer is with the names and function of these common food ingredients. With that standard most of us would definitely avoid consuming chemicals as strange sounding as Acetylsalicylic acid and Calciferol, right? Acetylsalicylic acid happens to be better known as Aspirin and Calciferol is better known as Vitamin D. We should note that the use of additives in food is regulated by the United States Food and Drug Administration, the same organization that regulates medicines and drugs.

The foods we consume today are considerably safer than those consumed by our great grandparents a hundred years ago. For example, pasteurization of milk was introduced less than a century ago to reduce the risk of contracting Tuberculosis from cows that were infected with TB. Unfortunately many people died in the past from the consumption of raw foods like milk. Our improved food safety is due to the efforts of food scientists who studied how pathogenic (harmful) bacteria grow in foods, they developed approaches to limit the contamination of foods and methods to kills these pathogens. Food scientists and regulatory authorities continue to work vigilantly on this topic to try to ensure that the foods that consumer eats is safe. It is a daunting challenge to feed more than 300 million people every day in the US!

Any balanced discussion of the growing health problems facing many individuals in the US must include recent changes in our lifestyle. For example, reports indicate that as many as 50 million Americans are now living sedentary lives and more than 25 million are inactive, i.e. they have no physical activity and are inactive at home or at work[1]. In Michael Pollan's book I was concerned about the absence of any

[1] http://www.sciencedaily.com/releases/2009/08/090810024825.htm

comment on the role of (the lack of) exercise in the current health problems facing the US. In fact ignoring the obvious links between our health/wellness and even limited exercise is greatly surprising to me. For example, in the Aborigine experiment mentioned in the book, the researcher (O'Dea) who conducted the study was quoted as concluding that health indicators had improved by the reversion to the hunter-gatherer *lifestyle*. Pollan argues that by avoiding the focus on single nutrients that this type of experiment demonstrated that once we avoided the Western diet and reverted to traditional foods we would improve our health. A different and simpler (and more obvious conclusion) could be that the health of these Aborigines improved because they consumed less calories now that they had to find their food and their lifestyle must have involved considerably more exercise than before!

In the discussion or criticism of the approach labeled "Nutritionism", Pollan rails against providing consumers nutritional information as labels on food products. But nutritional labels were never meant to be the key to understanding a food. However, many of us have friends or families that have medical conditions like hypertension or diabetes. Knowing how much sodium or sugar is present in foods is vital for these individuals. When I am buying fruit juice for my kids I like to select products with less added sugar. Nutritional labels therefore play a useful role in allowing consumers to make informed choices of the foods they decide to purchase. It was not clear to me what other healthy components did Michael Pollan believe were present in foods, beyond those listed in the nutritional label?

For generations, parents have encouraged their kids to eat their "greens" or vegetables. Producing foods that consumers do not purchase is a sure recipe for failure for any food company. Companies must produce foods that taste good if they want you to consume something they consider is good for you but if it is not affordable then who will buy it? That is the challenge and dilemma faced every day by food scientists who work in product development for food companies.

The nutritional policy of the US government is focused on trying to promote healthy eating or food choices and to that end they created the food pyramid and now the MyPyramid. Grains, vegetables, and fruits all featured heavily in this scheme, as do other food categories, such as milk and meat. It is acknowledged in Michael PoIlan's book that there are many examples of different types of diets that can result in populations that appear healthy, including groups that have a heavy dairy-based diet or groups that consume little dairy, as well as people that eat almost no fruits. Again we cannot focus just on individual foods without realizing the impact of lifestyle and exercise on health/wellness.

Lastly, one should be careful of the difference between a "theory" or "hypothesis" and a proven cause and effect relationship. A theory or hypothesis is something that should be subjected to rigorous scientific scrutiny to determine if it is correct. In Michael Pollan's book, there was an extensive discussion about omega-6 fatty acids with the implication that their consumption promoted heart disease in contrast to omega-3 fatty acids that were viewed as good. According to Pollan "omega-6s are involved in fat storage, the rigidity of cell walls, clotting, and the inflammation response." Pollan goes on to say that because omega-3s and omega-6s "compete" for space in our cell membranes, the ratio between the two may be of utmost importance to our health. However, since the publication of his book this "hypothesis" was carefully examined by the American Heart Association and refuted; in fact they strongly encouraged greater consumption of omega-6 fatty acids and warned that "To reduce omega-6 PUFA intakes from their current levels would be more likely to increase than to decrease risk for CHD (coronary heart disease)"[2]. I agree with Pollan's point that consumers should show greater skepticism about "claims" for their foods and drinks. But that may not be a popular viewpoint. For example, recent reports have concluded that "there is no evidence of a difference in nutrient quality between organically and conventionally produced foodstuffs."[3] Evidently many consumers think there is a difference and that difference is worth paying considerably more than the conventionally produced foods. Similarly, it is not clear if bottled water is any better or purer than tap water but again consumers pay a lot more for bottled water.[4]

It is possible that foods are more than the sum of each of the individual components as Pollan argues but again this is just an opinion, it is not a proven fact. Ultimately, it is the consumer that makes the choice on what to eat and how much they are willing to pay for food; blaming the government, nutritionists or food scientists for our purchasing decisions is easy but avoids us taking responsibility for our actions. To put things very simply, if we consume more calories than we need (and it does not matter to our bodies whether these calories come from carbohydrates or fat), then the body will start to

[2] Harris WS, Mozaffarian D, Rimm E, et al. 2009. Omega-6 fatty acids and risk for cardiovascular disease: a science advisory from the American Heart Association Nutrition Subcommittee of the Council on Nutrition, Physical Activity, and Metabolism; Council on Cardiovascular Nursing; and Council on Epidemiology and Prevention. Circulation, 119:902–907.

[3] Dangour, Alan D. et al. 2009. Nutritional quality of organic foods: a systematic review. American Journal of Clinical Nutrition 90(3), 680-685.

[4] http://www.ewg.org/health/report/bottledwater-scorecard

store these extra calories (as fat). We have two choices, consume fewer calories or burn the extra calories by performing some activity/exercise. There is evidence that increasing our activity can reduce the amount of calories stored so there could be benefits beyond just the calories burned. Unfortunately, when I look around I see more opportunities for individuals to be more sedentary, e.g. by playing computer/video games, by sitting in front of the TV/computer, using the drive-thru, etc. As a society we have to include our trend towards a sedentary lifestyle in our conversation about our health and wellness.

I believe it was the Roman playwright Terence that said “Moderation in all things”; we would do well to follow this common-sense advice in what we eat rather than follow the latest fads or diets. Michael Pollan makes it clear that in his book he is giving us his opinion or as he describes it “his manifesto” concerning food. As a scientist I hope we will grasp the opportunity provided by the selection of Michael Pollan’s book to have an informed discussion about what we eat, how that food is produced and how we can promote better food choices and ultimately promote greater health/wellness for all consumers.

Professor John A. Lucey
Department of Food Science
University of Wisconsin-Madison