Science, Society, and the Supermarket: The Opportunities and Challenges of Nutrigenomics, by David Castle, Cheryl Cline, Abdallah S. Daar, Charoula Tsamis, Peter A. Singer. Hoboken, NJ: Wiley-Interscience, 2007. xi + 163 pp. $60 (hardback). ISBN 0-471-77000-0.

The title of *SSS* is too broad; the sub-title should have been the main title. Nutrigenomics seems to be a contraction of nutritional genomics, the study of how food and supplements may interact with defective genes, and how to improve health knowing these interactions. Very specific assays are applied to samples containing DNA from a cheek swab. Ideally, this might indicate which foods or supplements should be increased or added, or decreased or eliminated to maximize health and lifespan. The authors emphasize that the science is in its infancy, and that they concentrate on the ethics, the delivery mode of tests and results, confidentiality, payment for tests and nutrigenomic advice, as well as conflicts of interest among those who sell both tests and foods and/or supplements that might be indicated by the test results. They did not wish to be bogged down in details of a science that is changing rapidly. Their exposition maintains a high level of abstraction, while I longed for at least one concrete example of one of the *new* tests. They wrote that this is the first book on these aspects of nutrigenomics.

Many aspects of nutrigenomics are elaborated. Chapter 1 discusses how nutrigenomics provides the possibility of personalization of dietary advice, consumer empowerment, reducing health disparities by economic class, and health care savings (p. 14). Here and elsewhere in *SSS* the inescapable costs of better health and longer lives are ignored: an older and larger non-working population will strain the finances of any insured health system.

Chapter 2 *is* on the science, and a concrete, *old* example is given of a genetic defect in DNA that leads to changes in the enzyme methylene tetrahydrofolate reductase, decreasing its activity, leading to accumulation of the undesirable amino acid homocysteine (p. 31). There was no explanation of the risks and benefits from acting on the results of the DNA test, compared with those from a simple homocysteine assay, either of which might indicate that supplemental folic acid was desirable. The other supplements for this purpose were ignored (vitamins B6 and B12). There was no evidence whatever for any benefit (desirable clinical end-point) in terms of *absolute* risk reduction (Kauffman, 2006, p. 321), either here or elsewhere, for *any* nutrigenetic test.

Chapter 3 nicely covers a range of ethical considerations: informed consent, confidentiality, consequences for family members, testing children, and the dreaded non-medical use of nutrigenomic information by employers and insurers. One of the bases for informed consent is clearly delineated risks and benefits of the implied treatment based on DNA test results. It seems that such does not exist in *SSS* for any test. But the discussion is valuable, including the right *not* to know something by *not* undergoing a DNA test.

Chapter 4 discusses the modes of providing nutrigenomic testing and acting

on the results. This can be direct-to-consumer, which has the best chance of maintaining confidentiality. However, Sciona, Ltd., formed in the UK in 2000, used this method, combining a DNA assay from a cheek swab, a lifestyle questionaire, and a dietary assessment (p. 88). In 2003 the Human Genetic Commission of the UK recommended that these tests should be regulated, and there were objections from other sources. So Sciona moved to Boulder, Colorado. Another mode can be through the specialist health practitioner, general practitioner, or nutrition specialist. Blended modes are covered. Little bias is shown, with nutrigenomics being said to fall most naturally into the bailiwick of nutritionists and dieticians; but it is assumed that nutritionists and dieticians act on solid scientific evidence now; see below. A problem the authors noted here is that insurers generally have no compensation at present for discussion of nutrigenomics, provision of tests, interpretation of results, and implementation of results.

Chapter 5 discusses food and supplement regulation and labeling in several countries around the world. As the authors are mostly Canadian, it was appropriate for them to give several examples of allowable health claims from Health Canada, including this one: "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease." Aside from the non-definition of a "healthy diet", or "high", the nebulosity of such a claim has been discussed in a recent book (Kauffman, 2006, pp. 105–129). Several other Health Canada proposed generic claims for food were cited (p. 128), most of which should have generated some criticism, not acceptance. This Chapter had a number of text editing failures, and a pair of citations to Ommen, 2004, which did not lead to the full reference at the end of the Chapter.

Chapter 6 is a lamentation on the unequal access to nutrigenomics based on socio-economic status and country of residence; this is curious, since no solid benefit of any diet or nutrient modification based on the result of of any DNA test was given, certainly nothing with absolute risk or benefit. The website of Sciona, Inc., mentioned above, had no such benefits listed. One would think that limited finances in underdeveloped countries should be used for proven methods of health care. Later (p. 158) there was a comment on whether nutrigenomics would serve only the 600 million people in the world living in affluent countries, or everyone. A quick count shows that there are 1200 million people in the world who could afford a DNA test. There is a good theme on surmounting current political correctness by allowing the idea of a biological basis of race or ethnicity so there can be preferential testing of minorities to shrink any health gap between them and the general population.

Chapter 7, Conclusions and Recommendations, summarizes the findings of each Chapter. "Despite our belief [as no persuasive evidence was given] about nutrigenomics' promise for the future, we have argued throughout this book that unless there is social acceptance of nutrigenomics, the field may stall." (p. 153).

My question is: why should there be any social acceptance of nutrigenomics *now* before any evidence of effectiveness has been shown?

The pages of *SSS* reek with conventional diet dogma of mainstream nutritionists and dieticians (Kauffman, 2006, pp. 46–56, 293–415), much of which is parroted but intelligently ignored by the general public. Cholesterol as something bad, even the pejorative "bad" cholesterol (LDL) is mentioned on pp. 11, 13, 26, 102, 115, 117, 121 and 142. Attempts by others to find the basis of claims that dietary or high serum levels of cholesterol increase mortality did not locate any real evidence; indeed examples of fraud were found (Ravnskov, 2000; Colpo, 2006); these results were ignored even though they are easy to find. Similar nonsense crept into *SSS* on saturated fat ("bad"), polyunsaturated fat ("good"), and whole grains ("good"), the latter despite strong evidence that $\geq$10% of the USA population have gluten or grain allergies (Kauffman, 2006, pp. 62–63, 298–299, 311–313).

"We are seeing an increasing move to diets geared to issues and health concerns that include diabetes: vegetarianism, low-fat, low-sodium, non-dairy... and diets that avoid nuts and gluten." (p. 124). Actually, none of these diets will aid those with diabetes, and the major move in the 1990s was to low-carb diets, not low-fat. Why is this important? There was never any real scientific evidence for the value of low-fat diets (Ravnskov, 2000; Ravnskov, 2006; Colpo, 2006). Nevertheless, mainstream nutritionists and dieticians clung to their nonsense and each other, ignoring all evidence not tainted (Kauffman, 2006, pp. 49–56). Now we have just had the findings from the Women's Health Initiative Randomized Controlled Dietary Modification Trial published in February 2006. It was designed to study the low-fat diet, a dietary approach to prevention of stroke, cardiovascular disease, colorectal cancer, and breast cancer that, although disproven, was considered irrationally by nutritional scientists to be promising. After 8.1 years of followup, the trial result was — no significant change in any of the endpoints! "There appeared to be general agreement among nutritionists that the results from the WHI diet study will not have any effect on the advice they will give to clients concerning a low-fat dietary protocol." (Ottoboni & Ottoboni, 2007). Here is the reason that nutritionists and dieticians should be kept away from nutrigenomics. They have a demonstrated inability to follow experimental evidence. Thus, they will be unable to make recommendations based on DNA assays that should lead to low-carb, low-whole grain, low-wheat, or high fat diets. Therefore, the opinion in Chapter 4 of *SSS* that nutritionists and dieticians are natural choices to provide nutrigenomic advice cannot be supported.

Another example of the authors of *SSS* accepting an unproven claim is the quotation from the UK's Human Genetics Commission that driving a sports car is dangerous (p. 65). Using the injury frequency data for 2003–2005 models in the USA, where the relative risk (RR) of injury of an average vehicle is set to 1.00, and comparing midsize sports cars (RR = 0.90) with midsize two-door

cars (RR = 1.17) and small sports cars (RR = 0.87) with small two-door cars (RR = 1.44), the sports cars are clearly safer (HDLI, 2006).

The authors of *SSS* gave an overall negative report on the use of St. John's wort for treatment of depression (p. 123). A review in the highly respected *British Medical Journal*, now *BMJ*, said: "A systematic review of 23 randomised controlled trials found the herb to be significantly superior to placebo and therapeutically equivalent to, but with fewer side effects than, antidepressants such as amitryptyline." (Vickers & Zollman, 1999).

While *SSS* is referenced in Harvard style, like *JSE*, the authors were too prone to repeat dogma. The index was inadequate, with no entries for cholesterol or diabetes, for example. Although the main title indicated a wish for a wide audience, the content, in my opinion, would most interest potential members of government committees who would try to regulate the availability and claims for nutrigenomic tests and products intended to implement the results of the tests. For a brief review of the science, see Mariman, 2006.

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