Coevolution of nutrigenomics and society: ethical considerations

Michiel Korthals

ABSTRACT
To optimize the coevolution of nutrigenomics and society (ie, the reciprocal stimulation of both developments), I analyzed chances for a fruitful match between normative concepts and strategies of both developments. Nutrigenomics embodies ≥3 normative concepts. First, food is exclusively interpreted in terms of disease prevention. Second, striving for health is interpreted as the quantification of risks and prevention of diseases through positive food-gene interactions. The third normative idea is that disease prevention by the minimization of risks is an individual’s task. My thesis was that these concepts of nutrigenomics would not easily match with concepts of food and health of various food styles in Western societies which, for instance, parents in the case of metabolic programming endorse and with a philosophical view of the relation between food, health, and the meaning of life. Next, I reflected on the nonsynchronized coevolution of nutrigenomics and society because of this mismatch and introduced the concept of the fair representation of food styles in nutrigenomic developments. To synchronize and optimize the coevolution of nutrigenomics and society, I propose that the research policy of nutrigenomics should change to a research partnership with society on the basis of fair representation. Am J Clin Nutr doi: 10.3945/ajcn.110.001289.

INTRODUCTION
Science and society continuously coevolve. Scientific and technological developments can take place only because societies continuously appreciate the effects of the developments and because of that appreciation stimulate these developments; and vice versa, scientific and technological developments stimulate societal developments by their innovations. This idea of coevolution is now a common idea in most social studies of science. Jasanoff (1) has broadened the term by calling it coproduction by transcending the context of science in replacing science with knowledge and states “co-production is the simultaneous production of knowledge and social order.” Jasanoff (1) makes it clear that the production of technologies means addressing and resolving problems of nature and of society. Technologies embody natural and social (normative) concepts and strategies, which imply that they differ according to choices that technologists and scientists make about how to organize human life with technologies, and vice versa, the social order embodies concepts and strategies regarding problems such as the improvement of food and health that technologies try to tackle.

The topic of this article was to scrutinize the current coevolution of nutrigenomics and society, identify mismatches, and put forward a strategy to optimize this coevolution, which, for instance, can be fruitful in the case of metabolic programming. I did this in 4 steps. First, I looked for social and normative concepts that are embodied in nutrigenomics and reported about a previous study by Komduur et al (2) about normative concepts of a prominent view of nutrigenomics. The prominent view was strongly oriented toward food as a preventive means for personalized health, the prevention of calculable risks, and personal responsibility. Second, I showed that these concepts of nutrigenomics are out of step with the concepts of foods of various food styles in Western societies (3) and with a philosophical view of the relation between food, health, and the meaning of life (4). Third, I reflected on the nonsynchronized evolution of nutrigenomics and society and that only one food style is represented in the current trajectory of nutrigenomics. The mismatch between the normative concepts of nutrigenomics and those of society indicated a one-sided and unfair representation of the various food styles. To synchronize and optimize the coevolution between nutrigenomics and society, in a fourth step, I proposed that the research policy of nutrigenomics should change to a research partnership with society and also consider different views on food and health on the basis of the concept of a fair representation of food styles. Metabolic programming can be made more effective by taking this partnership into account because the views of parents on food and health can differ from the views that are prominent in nutrigenomics (5).

PROMINENT SCRIPT IN NUTRIGENOMICS
In the first step, I provide an overview of the results of a study by Komduur et al (2) on normative assumptions of a prominent script in nutrigenomics. On the basis of a selected set of scientific journal articles, we (2) explicated 3 normative assumptions embedded in the current nutrigenomics research covered by these articles. Together, these most salient normative assumptions on health and food, which were qualitatively identified and analyzed, comprise a prominent script in nutrigenomics (2).

1 Applied Philosophy, Social Sciences Group, Wageningen University, Wageningen, Netherlands.
3 Supported by the Centre for Society and Genomics (funded by the Netherlands Genomics Initiative/Dutch Science Foundation (NGI/NWO)) and the Wageningen University.
4 Address correspondence to M Korthals, Applied Philosophy, Social Sciences Group, Wageningen University, Hollandseweg 1, 6706 KN Wagenin- gen, Netherlands. E-mail: michiel.korthals@wur.nl. doi: 10.3945/ajcn.110.001289.
As a result of our analysis, it turned out that, first, food was exclusively interpreted in terms of disease prevention in the texts chosen. Therefore, health was seen as a state that preceded a sum of possible diseases, and food had an intervening role in delaying these possible diseases. Second, it was assumed that health should be explained as a calculable interaction between food and genes. Health is minimized to quantifiable health risks and disease prevention through food-gene interactions by the right food choice. The third assumption is that disease prevention by minimization of risks through the right food choice is in the hands of the individual; via this individual responsibility through finding out personal risks, revealed through personal tests, or belonging to a risk group, the individual has to act and spend time to make a good food choice. The individual has to play a large role in disease prevention by minimizing personal risks through tests or belonging to a risk group and eating the right foods.

Together, these 3 concepts suggest that the meaning of life is interpreted as a healthy life, in which risks should be preventively calculated and balanced and in which the individual should have the prime responsibility to act in accordance to the outcomes of tests by selecting the right type of food. Persons who do not accept this task do not act responsibly.

However, in our study (2), we concentrated on a current dominant view of nutrigenomics, and we did not exclude that nutrigenomics incorporates other potentialities and food and health concepts, which could be of use in research trajectories that are more in line with societal concepts of food and health or with, eg, public or collective health and food programs.

VARIOUS FOOD STYLES AND THEIR CONCEPTS OF FOOD AND HEALTH

In the second step, I discuss concepts of food and health of various food styles in Western societies and justify them in the next section with a philosophical view on the relation between food, health, and the meaning of life. It turns out, in the third step, that concepts of nutrigenomics do not match concepts of various food styles (6).

The number of studies on views on health and food in different cultures are increasing, and 1 concentrated on important sociologic literature on views about health and the relation with food. The most fundamental idea of the studies is that food choices are part of a food style and lifestyle and express and explicate the identity of the person making the choices. Food choices are generally based on attraction or disgust of which Rozin and Fallon (7) stated, “Disgust is triggered not primarily by the sensory properties of an object, but by ideational concerns about what it is, or where it has been. In fact, we conceptuate disgust as a distinct form of food rejection, different from rejections based on bad taste or on fear of harm to the body.”

The multiplicity of food styles and lifestyles that represent multiple, and sometimes unconventional, forms of mutual solidarity and socialization are, according to sociologists such as Giddens (8), Beck (9), and Schulze (10), typically for Western people who live in a late or postmodern society in which individualization is the main structural trend. Food styles and lifestyles are in a state of flux to a significant degree because of technological and scientific developments such as food innovations, computer technology, modern means of communication, or new means of transport. These studies all agree on a similar general frame of 4 or 5 food styles. In his magnificent empirical and conceptual study of late-modern lifestyles, Schulze (10) distinguished the 5 lifestyles connected with a specific food style as follows: The integration lifestyle stands for sociability (against upper culture and for mass culture) and the regular consumption of traditional foods; the harmony lifestyle stands for formal and proper behavior and a sense of security (for upper culture) and the frequent consumption of fast food; the upper-level lifestyle stands for the pursuit of better and higher things in life (for upper culture) and the frequent consumption of slow foods; the self-realization lifestyle is focused on being more artistic, visiting bars, being into ecotourism (for upper culture and action culture) and is focused on slow food and urban community farming; and the amusement lifestyle is focused on television stars, fitness and gambling (mass culture and action culture), and the frequent consumption of fast food and functional (health) food.

What an adherent to the upper-level food style would call good and tasty (such as a 3-star Michelin dinner), the adherent to the amusement lifestyle would call boring or arcane. What the an adherent to the upper-level lifestyle would call primitive or trivial, such as a meal of McDonald’s food, an adherent to the amusement lifestyle would call exciting and judge the upper-level lifestyle as arrogant or aloof. In the amusement food style and lifestyle, health is only a dominant value in terms of making life worthwhile.

The different food styles and lifestyles comprise different conceptions of food and health (11). In general, we can distinguish different ways of relating to food, such as the dichotomy expressed in whether one eats to live or lives to eat (12). Rozin et al (3) have done extensive research on the different conceptions that people in different cultures have with respect to food and health. They concluded that “generally, the group associating food most with health and least with pleasure is the Americans, and the group most food–pleasure-oriented and least food–health-oriented is the French.” Rozin et al (3) emphasized that the pleasure orientation toward food and the minor role of health considerations is probably an important factor in the explanation of the French paradox (ie, that overweight and obesity are less prevalent in France although the fat intake is as large as that in the United States, stating, “One account of the French-American contemporary differences has to do with different traditional eating patterns in the 2 countries, with a French emphasis on moderation and high quality, and an American emphasis on high quantity.”

On the basis of a structural theoretical background, Douglas (13) has empirically analyzed 4 broad types of food styles or food cultures. Douglas (13) distinguished a traditional (hierarchical) food culture in which food is seen as unspoiled nature (a regional, authentic cuisine), an exclusive food (individualist) culture in which food counts as an exclusive identity item (high culture), an information and fast food (egalitarian) culture in which food is viewed as fuel, and an eclectic (individualist) food culture in which food is seen as part of an enlarged global conversation of a plurality of cuisines (slow food) (14).

The 4 cultures distinguished by Douglas (13) are quite similar to the first 4 cultures distinguished by Schulze (10); the harmony and amusement food styles of Schulze (10) can be interpreted as being combined in the information and fast food style of Douglas (13). Of the 4 cultures distinguished by Douglas (13), only the information (egalitarian) food culture is exclusively concerned with scientific information on food quantities such as the number of calories, types of fat, food safety, and the contribution to nourishment and health.
The 4 food cultures are interesting research tools although they probably do not cover all possible food styles (15). The findings were confirmed in recent books by Singer and Mason (16) and Pollan (17) that also distinguished the first 3 types (fast food, natural, and exclusive), without, however, referring to the scheme and argumentation of Douglas (13) or Rozin et al (3).

PHILOSOPHICAL JUSTIFICATION OF A BROADER VIEW ON FOOD AND HEALTH

Most philosophers argue that a human life requires a personal examination of preferences, capacities, and context to find out the best way to live. Consequently, it is expected that many individuals consider what food and health can mean in living a good life. Still, most individuals have not examined the following questions: What is food? and What is health? (18). One of the few and interesting philosophers who posed these questions is Erasmus, who was a Renaissance philosopher from the 16th century. According to Erasmus, a meal without conversation and pleasure does not contribute to a life that is worth living. In his very popular Moriae encomium, sive Stultitiae laus [Praise of Folly; originally printed in 1511 (19)], he praises pleasure and witty talk while enjoying food and sitting around the table, and he warns of dry conversations during a meal. The body and mind should enjoy the meal, and good food and crazy conversations belong together. The recipe of longevity is not to study and analyze what ingredients can prolong life but to become more crazy around the table. His conception of food and health was one of enjoyment and social conversation. Health should not be the aim of life or the exclusive value but should be embedded in the enjoyment and pleasure of being together at the table.

The founding father of human rights, Immanuel Kant, cherished the same opinion as Erasmus on the meaning of food and health. In his very influential essay “What is Enlightenment” [originally printed in 1784 (20)], he connected his ideas about being free, autonomous, and mature with the choice of your own food as a kind of third liberation next to being free in saying how the world is (be elaborated on this issue in his famous first critique of pure reason) and expressing how the world should be (be elaborated on this issue in his second critique of practical reason): “Laziness and cowardice are the reasons why such a large part of humanity, even long after nature has liberated it from foreign control (naturaliter maiorennnes), is still happy to remain infantile during its entire life, making it so easy for others to act as its keeper. It is so easy to be infantile. If I have a book that is wisdom for me, a therapist or preacher who serves as my conscience, a doctor who prescribes my diet, then I do not need to worry about these myself. I do not need to think, as long as I am willing to pay” (20, p. 321).

Kant never wrote the (third) critique on the gastronomical reason and how to reach maturity in that area, but his most suggestive comments on food were shown in his “Anthropology from a Pragmatic Point of View” [originally printed in 1790 (20)]. In this work, he placed humans between nature and reason. According to Kant, man’s capacities does not derive from nature or reason alone but from the 2 capacities together, where nature stands for passions and sensual experience, and reason stands for transcending nature by using the faculty of reasoning to know, will, and appreciate (judge). For instance, to socially enjoy art and food means to transcend Nature; it is to judge something that is given (nature) but structured according to the standards of judgment that are shared in rational beings (reason; beyond nature). The main thrust of Kant’s text was to emphasize what human beings can make of their nature, not how nature has made human beings. Human beings must embrace the drive toward maturity and stand on their own 2 feet, even if they hesitate and stumble in the process. The taste of food plays a special role in this context. According to Kant, the taste of food has an extraordinary ability to stimulate reasonable solidarity through enjoyment. The enjoyment of food once means that you will want to enjoy the meal (together with others) again; this feature marks culture within society. But food is also more than that. A good meal with good people is an occasion on which experience and reason are united in the individual’s enjoyment at a given moment, which is a moment that can be repeated again and again. Food, as a kind of starter, occasion, or even an excuse to have an interaction and communication with other people, is seen as a social device par excellence to maintain and deepen preferred social relations and to have conversations. Meals and drinks together are the most preferable mechanisms to maintain social networks and to share opinions about prospects and problems of life with people one likes. Good meals engage reason, which acts on the emotions, which in turn stimulate solidarity and humanity. Therefore, eating according to reason means to have meals together and to enjoy the reasoning of others; it also means to let health be only one factor in the choice of food.

This philosophical emphasis on a broad concept of health and the enjoyment if food in a social context underlines the concepts of food and health in several of the discussed food styles and coincides with the definition of the World Health Organization from 1948 (21), where health was seen as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

WHICH FOOD STYLES CAN MATCH WITH NUTRIGENOMICS CONCEPTS OF FOOD AND HEALTH?

In a third step, I evaluate the relation between the concept of food and health of nutrigenomics and the sketched food styles and lifestyles. The 3 assumptions of the prominent script seem to be contradicted by ≥3 of the 4 food styles. Most of these food styles and life styles do not emphasize the role of health in food choices in a direct way but only in an indirect way by stressing the importance of pleasure experiences of food. Only a few cultures have shown a negative link between eating and health and have a more stress oriented view on food as a prevention against diseases. Other food styles are less likely to adopt nutrigenomics, especially those that adopt a traditional, social, culinary, or slow food approach. Petrinii (22), who is the founder of the Slow Food movement and a fierce defender of the social and cultural aspects of enjoying food, approvingly quoted Madame Sevigny as follows: “Health is enjoying the other enjoyments. When the other enjoyments are taken away, we live longer, but we lose our health.” The Slow Food movement, which is gaining considerable momentum in the Western world, does not subscribe to the narrow definition of health propagated by personalized nutrition and nutrigenomics.

In the same vein, the traditional and cosmopolitan food styles have objections against the identification of food and the prevention of diseases. Proponents of these styles would say that society is not a hospital, meaning that health should not be the all-determining
value in food choices. Food contributes to the values of society (traditional food style) or to the conversation of humankind (cosmopolitan style), and if food is only produced with a view toward health, or more specifically, with a view toward disease prevention, these other values may be lost (4). The English Food Ethics Council views the exclusive orientation on health in food choices as a transformation of society into a hospital (23). Seen from this perspective, it is no wonder that government campaigns to stop people (in particular adherents of traditional, natural, and cosmopolitan food styles) who live according to so-called unhealthy life styles are without avail (24, 25).

Nutrigenomics (both in its current form as personal nutrition and as a potential for public health and collective nutrition (such as in the case of battling chronic diseases) may conflict with some food styles by emphasizing the paramountcy of food as a means to achieve the prevention of diseases. The conclusion of my reasoning in these 3 steps is that there is a considerable mismatch between most of the concepts of food and health of current lifestyles and those of nutrigenomics. The mismatch between the normative concepts of nutrigenomics and those of various food styles cannot be corrected by the production of information or new products, or more generally, by a one-sided informative offensive from the side of nutrigenomics and nutrigenomics-inspired innovation networks (24). The concepts of food and health in food styles that are not health dominated are normative choices that are not based on information but on views of life. Nutrigenomic-innovation networks probably also have to change their normative concepts and research trajectories and to take into greater account the complicated web of responsibilities with respect to health.

THE IDEA OF FAIR REPRESENTATION OF FOOD STYLES

A key ethical issue in this plural landscape of food styles concerns how these styles can positively coevolve with scientific and technological innovations in the field; it is possible that both food styles and technological innovations can learn from each other to eliminate mistaken assumptions and improve strong points. I (26) have introduced the concept of a “fair representation of food styles” in production and consumption from a liberal ethical framework in which individuals have the right to freely choose a life style and food style as long as it does not harm the public interest and in which food styles are stimulated to flourish and improve themselves under the same condition (26).

According to the definition of Pitkin (27), representation “involves treating something as present which is ‘nevertheless not present literally or in fact.’” In Pitkin’s book (27), the “something” covers the various opinions of citizen consumers on political issues such as power distributions, responsibilities, and other public issues. Most citizens, in democracies at least, have a voice, but because of all kinds of reasons and constraints, citizens are not present in the decision-making process. Instead, they decide to let others speak for them and act and decide on their behalf. Thus, citizens have a voice and the right to delegate this voice to their representatives and the right to hold their representatives accountable.

A fair representation of food styles is not directly connected with these political issues but with making the voices of different food styles present in food chains and innovation networks. A fair representation of food styles covers the production and availability of food products and everything connected with it, such as information, labeling, marketing, public debates, and public regulations, on markets (eg, industry, farming, communication, and information) and research. The absence of representation would mean that food styles do not have a voice in the food chain (be it in super markets, food production, food research, or food regulation). Because food is an important aspect of social and cultural identities, individuals and groups deeply appreciate their food choices (and implicitly or explicitly the production processes) and are very often unwilling to change their eating habits.

NUTRIGENOMICS AND FAIR REPRESENTATION OF FOOD STYLES

What is the implication of the concept of fair representation of lifestyles and food styles for nutrigenomics? According to this concept, food science and research should pay as much attention to research for food as health as for food as taste and the food concepts of other food styles. In short, nutrigenomics should broaden its conception of (healthy) food toward a concept of good food, which requires a reorientation of the current research agenda toward the food styles currently present.

First, with respect to a research policy of nutrigenomics, the contradictions between the concepts of food and health of genomic innovations and those of society are best tackled by taking into account a fair representation of food styles and the positive synchronization of the coevolution process between science and society. Research managers should organize the research agenda of nutrigenomics in a representative way and not exclusively oriented toward personalized nutrition but toward the prevention of common illnesses, common conditions, and chronic diseases and toward nonhealth values of food. The main research policy aim in nutrition should be the encouragement of the formal and informal ties by pleasurable eating that has the improvement of health as one among other conditions. Because of the plurality of food styles, health should be a secondary goal in eating, and consumer groups should be empowered as stakeholders [most trusted according to the Eurobarometer: 33% of interviewed persons trusted consumer groups most (28)] and be given a voice not only downstream of nutrigenomics (with respect to the end products) but also upstream of the nutrigenomics research agenda (29). By taking into account the different concepts of health and food, nutrigenomic researchers can formulate more social acceptable research priorities. The full complexities of health can even better be incorporated by the organization of end-user panels in the different genomic research trajectories.

Second, many scientists of nutrigenomics feel the urge to produce recommendations of food intakes, but they forget that their competences and knowledge do not lie in that quite complex field. Monsen et al (30) argued that “the scientist who is convinced that diet and health are related and that changing diet patterns will benefit health, even though this relationship has not been conclusively proven, faces an ethical dilemma. The principle of beneficence requires making the strongest, most convincing presentation of this perspective when speaking to the public. However, treating people as capable of making their own choices requires the nutrition scientist to provide the public with arguments of other experts who interpret differently the current scientific knowledge or the public health implications of that knowledge” (30, p. 5).

In this case of food-intake recommendations, the concept of fair representation implies a strategy of respect for the autonomy of
consumers regarding their food choices and, for a second strategy, the urges to choose. An implication of this concept is that it seems advisable to let recommendations of food on the basis of nutrigenomics to be accompanied by social research of their applicability.

Third, one last way to identify positive forms of coevolution is to look for alternative research trajectories in nutrigenomics, and there are some alternatives, such as the ones that can be called public health nutrigenomics and taste genomics. Rather than start from a narrow personalized health perspective, these other research trajectories start from a broader health perspective or even from a total different perspective (ie, the genomics of taste). El-Sohemy (31) from the University of Toronto in his “Nutrigenomics of Taste—Impact on Food Preferences and Food Production,” for example, outlined issues of the relation between food, health, and taste. Other authors, such as Khoury and Mensah (32), developed nutrigenomics in close connection with considerations on common chronic diseases.

CONCLUSIONS AND OUTLOOK

In this article, I discussed several views on the meanings of food and health and showed that the normative concepts of food and health of a prominent script of nutrigenomics are at odds with those of several food styles and philosophies and, therefore, do not positively stimulate the process of the coevolution of nutrigenomics and society (ie, the reciprocal stimulation of the development of nutrigenomics and society). To stimulate metabolic programming and, more generally, to foster a happy match between normative concepts and strategies of both, an improved interaction between science, ethics, and food styles could guarantee more fruitful results. I introduced the concept of the fair representation of food styles to structure this new type of interaction. This interaction would result in research priorities and innovations that, in a fair way, represent the most dominant foodstyle and lifestyle products and not only one food style or lifestyle. The advantages of this change of research policy of nutrigenomics to a research partnership with society and its normative considerations are that, by better listening to normative views on food and health and taking these views seriously, science and innovation can have a better effect and can be a more trustworthy partner in tackling the complexities of social life. As I view it, the successful coevolution of science and society without moral pain means making explicit normative concepts inside science, comparing these concepts of science with those of society and ethics, and looking for agreements and fair representation (33).

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