

Nutrigenomics: public concerns and commercial interests

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Nutrigenomics studies the relationship between cell processes, diet and health. Although it builds on research into the human genome, it includes fields besides genomics such as transcriptomics, proteomics and metabolomics. Commercial interest in nutrigenomics is, of course, focused on its practical applications. Currently, these fall into two main areas. One is the sale of individual genetic tests, which can be used to create 'personalised' dietary advice (some scientists wish to distinguish this from the field as a whole, and therefore call it "nutrigenetics"). The other is creating functional foods. A food is "functional" when it is attributed a health benefit beyond simply providing adequate nutrition. In bridging these two areas, nutrigenomics is at the leading edge of a trend towards "personalised nutrition", which has it that people's health needs cannot be met by a one-size-fits-all approach. Personalised nutrition lies at the heart of a bigger shift in the food industry towards "wellness". Thus, for instance Nestlé's head of nutrition told the *Economist* that the company is "moving from an agrifood business to an R&D-driven nutrition, health and wellness company" (1). Major food manufacturers including Nestlé, Unilever, Kraft and Cargill have investments in this area. But public interest groups have expressed concerns over how nutrigenomics research will be used.

PUBLIC CONCERNS

In a saturated food market, amidst rising obesity levels, growth in sales is difficult to achieve through increasing volumes alone, so many companies are taking a different approach, focusing on differentiating products and adding value. Personalised nutrition and functional foods offer obvious scope for both. Growth in the functional foods market is high, 20 percent between 2002 and 2004 (2). Functional foods are expected to comprise five per cent of the global food market by 2010 (3). Nutrigenetics also has considerable commercial potential. But how will these developments affect the public? Concerns have been voiced about the proliferation of functional foods and the use of genetic testing.

In effect, functional foods are like a supplement or a medicine carried by a foodstuff. This raises to two issues. First, it promotes a particular view of diet. Functional foods are all marketed on the basis of a small number of functions they perform. This runs against the grain of the standard nutritional advice that the best diet is a varied and balanced one. Second, there is a risk that people will overconsume functional foods in an attempt to gain maximum benefit. It is often assumed that if something is supposed to be good for you, then the more of it you eat the better. This can be seen in the way in which vitamins, minerals and supplements are used, where people use very high doses which in some cases have been shown to have little effect or even to cause harm.

Not only is it important to establish, in the public interest, whether functional foods carry risks of harming consumers, but also to ascertain whether they live up to the benefits that are

claimed for them. Quite aside from the specific health claims made on individual products, some major food companies and scientists working in nutrigenomics envisage "personalised nutrition" making a significant contribution to public health in general (4). But will they reach the people who really need them? Functional foods carry a hefty price premium - otherwise there would be no incentive to invest in them. Functional foods are likely to be consumed primarily by the "healthy wealthy". But major public health problems such as obesity hit poorer people hardest (5).

Health can always be improved of course, but it is difficult to make public health claims for products that are not readily available to all members of the public. Is there any risk in marketing health products to people who are already in good health? As that relies on persuading people that they are not as healthy as they could be, does it have negative implications? Just as certain sectors of the mass media contribute to promoting a body image which is unattainable for the majority of people (6), will food marketing do the same thing with health?

Nutrigenomics has also reignited debates about genetic testing. Nutrigenomics research requires large banks of genetic data, and nutrigenetics requires individual genetic tests. Issues therefore arise as to how this data will be used. Who else might have access to it?

Insurers already have the right to demand disclosure of particular factors affecting health. While you can choose not to disclose these factors, this invalidates the policy. Genetic tests create a further set of information that insurers may require. If I am told that I have a genetic susceptibility to heart disease, how is this going to affect my life insurance?

Currently, there are no laws in place to prevent employers from using genetic test results to refuse someone a job. While there is a voluntary code, this has not proven sufficient to put minds at rest. Might high susceptibility to particular diet-related diseases make some people unemployable, even though they are currently fit and well? And how might pensions be affected by such predictions of future illness?

Another problem is how one deals with one's own genetic information. A UK Department of Health white paper on genetics states that information on genetic factors in disease causation will "allow people with certain genetic profiles to avoid foods, chemicals or environmental factors, such as smoking, which are particularly risky for them" (7). If I am not at high risk from diabetes, shall I no longer worry about overindulging in refined sugars? There is a risk here that individualised advice could confuse broad public health messages.

Alternatively, what if I discover I am at high risk from, say, suffering from a stroke? I might become fatalistic - if it is going to happen anyway I can enjoy smoking, drinking and eating whatever I want. Or perhaps the news really would scare me into changing my lifestyle. But the fear generated by this

revelation might not only decrease my quality of life, but could increase my blood pressure, increasing the risk of stroke.

PUBLIC CONCERNS ARE COMMERCIAL CONCERNS

Public concerns over nutrigenomics are relevant to science and to the food industry. This becomes clear if we see nutrigenomics in its broader context. In Europe, a series of controversies over food, from mad cow disease to genetically modified (GM) crops, have greatly increased public concern over the safety of what we eat. Indeed, the ongoing wrangling over GM crops, although raising different issues, demonstrates how important it is to be fully aware of public concerns.

The European public has not accepted GM in the way US consumers have. In the United States, GM soybeans and corn became widespread. This has been lucrative for companies like the agro-industrial giant Monsanto. But in Europe, the industry has faced much greater challenges. Environmental groups have been vocal in their challenges to GM, and negative media coverage has increased public scepticism. By 1999, public hostility towards eating the products of genetic science had seriously damaged the market in GM crops. Monsanto's stock prices slumped. Robert Shapiro, then president of the company, stated that: "Our confidence in this technology and our enthusiasm for it has, I think, been widely seen - and understandably so - as condescension or indeed arrogance" (8).

The debate over GM continues, but the story so far demonstrates that public reactions need to be taken seriously. In the UK, marketing of nutrigenomics has already seen one major setback. In 2001, Sciona began marketing gene tests through the Body Shop, which were used as the basis for dietary advice. For a fee of £120, customers were given "genetically tuned" advice on what to eat and what to avoid. An article in the Guardian warned that the public were being "misled by gene test hype". The article cited concerns from scientists that Sciona and the Body Shop were exaggerating how much was known about the interaction between genes, diet and health, and understating the potential consequences of genetic testing (9). Concern was also raised by public interest groups, most notably Genewatch UK. These criticisms forced Sciona to withdraw their tests from public sale in the UK.

EARNING TRUST

Given the current investment in nutrigenomics, it is important to engage with public concerns. A prerequisite of public trust is a clear system of regulation. Health claims on products can provide a way for consumers to select healthier products, but only if they can trust these claims. This means that functional foods need to not only do no harm, but be demonstrably beneficial in practice. Before a medicine is made available to the public, it has to show not only that it is safe, but that it is efficacious. If health claims in foods are to be trusted, they need to be made on the same basis.

Regulation is also important for genetic testing. The controversy over Sciona's genetic tests generated negative publicity for nutrigenetics. Scientists such as Paolo Vineis and David Christiani have expressed concern that exaggerated commercial claims could damage the field of genetic research as a whole (10). Companies working on the commercial applications of nutrigenomics research therefore need to take into account the effect their work could have on the field as a whole.

Clear regulation of the use of nutrigenomics research will help to prevent companies acting irresponsibly. For this reason, it is important to develop a mandatory rather than a voluntary regulatory system. While responsible companies would adhere to a voluntary code, stricter regulation helps prevent less

responsible companies slipping through the net. Industry should also work with the public sector to regulate the use of genetic testing data. This would guide good practice in industry and therefore help to reassure the public that data will not be used for any reason but to offer health advice.

ENGAGING THE PUBLIC

A second route, which should be pursued simultaneously, is to engage with the public "upstream" in the R&D process. This means that decisions about priorities in R&D should be informed by public opinion from the outset. While scientists play a crucial role in developing products, it is important to listen to non-scientists as well. Engaging with a broad cross-section of people during product development - exploring their aspirations and concerns in greater depth than market research usually allows - should lead to products that perform better in the marketplace (11).

The value of "upstream" public engagement is now widely accepted in the public sector, and several bodies provide guidance. In the UK, for example, the "Government's approach to public dialogue on science and technology" (12) underlines the importance of constructive dialogue between scientists and the public. It envisages public engagement as a two-way process, rather than a unidirectional act of researching the public then informing them. These guidelines not only see the value of public engagement as a way of increasing public trust but also recognise its potential as a way of harvesting information and ideas. Crucially, it is only worth businesses and scientists listening to public concerns and ideas around such fields as nutrition and health if they are prepared to act on what they hear. Framing public engagement with preconceived ideas about which approach or area of product development is best, for the public or for business, will make the process fruitless.

Nutrigenomics research has the potential to improve our knowledge of the interaction between biology and diet, and its commercial applications could be profitable. But nutrigenomics is a young science, and this must be understood by food manufacturers and retailers as well as scientists. Past and present food scares, such as GM, demonstrate the importance of addressing public concerns sooner rather than later, and of taking the social issues around science as seriously as technical ones. Regulation is necessary both to ensure responsible use of research and to assure the public that products can be trusted. Manufacturers need regulation and public engagement both for the guidance they provide and to demonstrate a will to improve the safety, honesty, reliability and health benefits of their products.

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