

Public Understanding of Science

<http://pus.sagepub.com/>

"It just goes against the grain." Public understandings of genetically modified (GM) food in the UK

Alison Shaw

Public Understanding of Science 2002 11: 273

DOI: 10.1088/0963-6625/11/3/305

The online version of this article can be found at:

<http://pus.sagepub.com/content/11/3/273>

Published by:



<http://www.sagepublications.com>

Additional services and information for *Public Understanding of Science* can be found at:

Email Alerts: <http://pus.sagepub.com/cgi/alerts>

Subscriptions: <http://pus.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations: <http://pus.sagepub.com/content/11/3/273.refs.html>

“It just goes against the grain.” Public understandings of genetically modified (GM) food in the UK

Alison Shaw

This paper reports on one aspect of qualitative research on public understandings of food risks, focusing on lay understandings of genetically modified (GM) food in a UK context. A range of theoretical, conceptual, and empirical literature on food, risk, and the public understanding of science are reviewed. The fieldwork methods are outlined and empirical data from a range of lay groups are presented. Major themes include: varying “technical” knowledge of science, the relationship between knowledge and acceptance of genetic modification, the uncertainty of scientific knowledge, genetic modification as inappropriate scientific intervention in “nature,” the acceptability of animal and human applications of genetic modification, the appropriate boundaries of scientific innovation, the necessity for GM foods, the uncertainty of risks in GM food, fatalism about avoiding risks, and trust in “experts” to manage potential risks in GM food. Key discussion points relating to a sociological understanding of public attitudes to GM food are raised and some policy implications are highlighted.

1. Introduction

This paper reports on data from one aspect of a qualitative study of public understandings of food risks. The aim of this paper is to provide insights into the range of public understandings of genetically modified (GM) food, in order to contribute to a greater scientific understanding of “the public” and provide building blocks for a more developed sociological analysis of public attitudes and responses to GM food.

The fieldwork for the research was conducted between 1998 and 2000 in the United Kingdom and was based mainly, although not exclusively, in the southwest of England. Essentially, the study explored public understandings of food risks from the perspective of a range of “experts” and “lay” people. Data from the first phase of this research, involving interviews with “expert” stakeholders, has been reported previously.¹ The second phase of the research explored “lay” understandings of a range of food risks, including food safety, Bovine Spongiform Encephalopathy (BSE), and genetically modified (GM) food. This paper will focus on qualitative data relating to “lay” understandings of GM food specifically by outlining some key themes and conceptual issues that may help build a sociological understanding of the GM food debate and food risk issues more widely. Some policy implications will also be highlighted briefly.

2. Background

In recent years, debates about the potential risks in food have become ever more common and passionate across a range of groups in society. Scientists, health professionals, food industry leaders, farmers, policy-makers and public interest groups have become engaged in a variety of disputes about the healthiness and safety of the food we eat. With intense media coverage of a range of high-profile food “scares,” scientific arguments about risk have widely penetrated the everyday discourses of the lay public.

Since the 1980s, there has been a range of food issues that have become the focus of public and political concern in the UK. These have included anxieties over chemical additives in food, salmonella in eggs and BSE in beef. More recently, debates have centered on genetically modified (GM) foods. During the course of the research reported in this paper, coverage of GM food was intense in the British media, journalists coining phrases such as “Frankenstein Foods” and “Mutant Crops.”² Discourses from within the biotechnology and food industries have tended to highlight the benefits and have sought to minimize the risks of genetically modified foods. However, discourses from campaigning and consumer groups have focused on the health and environmental risks. Public figures such as the Prince of Wales have also engaged with the debate, arguing that genetic engineering “takes mankind into realms that belong to God and to God alone.”³

Concerns about food safety and methods of food production are not new, having been seen throughout the history of food.⁴ Throughout the 20th century, questions about food safety, health and wider environmental issues have received intensified political attention and have increasingly entered the everyday discourses of western societies, seen for example in the rapid increase in popular publications devoted to food-related issues.⁵ The specific and recurring use of the concept of risk in such discussion, and the framing of food debates as “risk” issues, have become ever more common.

A recent policy response by the UK Government has been the establishment of a Food Standards Agency. The broad purposes of this agency are to protect public health and restore public confidence in food.⁶ These policy developments have been mirrored across Europe, with the White Paper on Food Safety paving the way for the emerging European Food Authority.⁷ Risk is central to the work of these new food agencies, and the challenges of assessing, managing, and communicating risk in the face of scientific uncertainty are increasingly recognized:

In assessing and managing risks, the Agency will need to take careful account of the expectations of the consumer . . . Risk assessment needs to be based on the best available methodology, drawing on expert scientific advice and making appropriate allowances for the inevitable uncertainties involved. Where there is a risk of serious damage to public health, lack of full scientific certainty should not be used as a reason for postponing cost effective measures to reduce the health risks.⁸

Thus, not only has “food . . . become a political issue”⁹ in recent years, but it is also an arena where the concept of risk has become increasingly central to scientific, political and lay discourses. This social and political context sets the scene for the reported study on public understandings of food risks.

While this paper will focus specifically on “lay” understandings of GM food, it is worth briefly outlining the conceptual framework for the whole study. A range of literature on food, risk, and the public understanding of science informed the research. Theoretical work on risk and conceptual analyses by social anthropologists and sociologists, emphasizing the social, cultural, institutional, and political aspects of risk influenced the thinking behind the whole

study.¹⁰ In particular, ideas about risk and knowledge (e.g., debates about "lay" and "expert" knowledge of risk), risk and trust (e.g., the credibility of risk "experts"), and risk and blame (e.g., the way discourses are used to attribute responsibility for risks) shaped the research questions and the interpretation and analysis of the data.

Empirical research from a range of social science disciplines also informed the study. In the wake of concern among scientists and policy-makers about the apparent lack of knowledge and public skepticism in relation to scientific developments such as GM foods social scientists have begun to explore public understandings and responses.¹¹ Psychometric work has given insights into the individual psychological factors that may shape risk perceptions in relation to different food hazards, including GM food.¹² Large-scale surveys have given insights into some of the main areas of public concern about developments in biotechnology.¹³ Qualitative market research on consumer attitudes to GM foods has also been undertaken.¹⁴

However, sociological studies of public understandings of science and lay understandings of food issues particularly shaped the reported research.¹⁵ For example, Macintyre et al.'s research on lay understandings of the food "scares," such as salmonella and BSE, suggested that health and safety risks are balanced against other criteria in people's understandings and practices related to food, such as habit, practicality and identity.¹⁶ Such sociological studies point to the way that people actively negotiate and construct their understandings of science, health and food safety within their immediate social context, shaped by wider social and political factors in society. Of specific relevance is the study by Grove-White and colleagues, which used focus groups in the south and north of England (London and Lancashire) to explore public attitudes to biotechnology and genetically modified organisms (GMOs), including GM food.¹⁷ Their findings highlighted lay people's concerns about the uses of biotechnology, including why genetic modification is being done, which species are being used, whether GM food is safe to eat and the extent of consumer choice.

Informed by this theoretical, conceptual, and empirical work, and drawing on a broadly sociological perspective, the framework for the reported study comprised three core strands:

- First, to focus on the broader social and political influences underpinning food choice and behavior;
- Second, to treat risk as a social as well as scientific concept, seeing risk as subjectively perceived, constructed, and experienced in specific social contexts;
- Third, to move away from a "deficit model" of public understanding (a broad approach which suggests that public understanding of science is deficient and/or erroneous) to focus on the diverse, intuitive knowledge about science as applied to food among different publics.

The purpose of the remainder of this paper is to provide an account of qualitative data that may contribute to a sociological framework for understanding issues surrounding the GM food debate that has been developing over recent years.¹⁸

3. The fieldwork

The fieldwork for this study comprised two main phases. First, key information interviews were conducted with a range of food "experts" across the United Kingdom to map out the fundamental issues and explore their views of public understandings of food risks. The individuals were senior members of organizations involved in shaping social and political debate about food. The sample included 17 representatives from the food and biotechnology industries, government and advisory bodies, food science and technology organizations,

academic and research institutes, public interest groups, and the media. Some of the data from these interviews have been reported elsewhere.¹⁹

Second, “lay” understandings of food risks were explored through in-depth interviews with a range of people in Bristol and the surrounding rural areas. The aim was to include participants with varying perspectives on food and those from a range of socio-demographic backgrounds. Contact was made with several local community groups, through which individual interviewees were identified. Thirty-two interviews were conducted, comprising 19 women and 13 men of a wide age range, from 15 to 85 (Table 1).

Table 1. “Lay” participants.

Interviewee “type”	Participants	Number (gender/age)
Parents with young children	Members of a community cooking club for mothers of children under the age of 5 (relatively deprived area of city)	5 women, age range 24–40
Older people	Members of a community lunch club for people over 50 (relatively deprived area of city)	4 women, 1 man, age range 68–85
Young people	Members of a community youth group (relatively affluent area of city)	2 women, 4 men, age range 15–18
Organic food eaters	Members of a local organic food group (city and surrounding semi-rural areas)	5 women, 1 man, age range 30–59
Vegetarians	Members of a local vegetarian society (city and surrounding semi-rural areas)	3 women, 2 men, age range 24–59
Farmers/agricultural workers	Members of a farming community (rural community in the south west)	5 men, age range 34–65

As is a central feature of any qualitative research, data collection and analysis were interwoven throughout the whole research process and the analysis of the data gathered at an earlier stage shaped the later data collection. This approach is illustrated by the following quote on “Grounded Theory” methodology from Strauss and Corbin:²⁰

Data collection and analysis occur in alternating sequences. Analysis begins with the first interview and observation, which leads to the next interview or observation, followed by more analysis, more interviews or fieldwork . . . Therefore, there is a constant interplay between the researcher and the research act.

Thus, the topics covered in the lay interviews were informed by the themes and issues arising from the key informant interviews. For example, issues raised by the informants included the public acceptability of genetic modification as compared to older or so-called traditional food production methods and ideas about public mistrust in science and expert knowledge. Such issues shaped the content of the interview schedule used with the lay people, to explore whether the key informants’ perspectives were indeed borne-out in the responses of various lay publics. The topics specifically relating to GM food are shown in Table 2.

For some topics, prompt materials were used to elicit responses. For example, a short scientific definition of genetic modification (approved by one of the scientists participating in phase one of the research) was given during the course of the interview, following people’s initial discussion of their understanding and views of GM food. Drawing on this, people were asked to discuss their views about specific aspects of genetic modification, e.g., differences between genetic modification and “traditional” methods of food production. Examples of current and potential future GM products were also provided (drawn from information provided by the industry informants in phase one of the research), to which people were asked to respond.

Table 2. Interview topics relating to GM food.

<ul style="list-style-type: none"> ● Awareness of debates about GM food (e.g., via the media) ● Personal responses to the GM food issue ● Understanding of the term "genetically modified food" ● Views of genetic modification in comparison with older methods of food production ● Views about the availability of information to enable choice as to whether to buy/eat GM foods ● Views about the extent to which they would knowingly buy/eat GM foods ● Examples of specific GM products and reactions to these ● Views about the extent and consensus of scientific knowledge about GM foods ● Views about the government's handling of the GM food issue
--

These prompt materials were useful in facilitating much wider reflections on the personal, social, environmental and political implications of GM food, as will be illustrated by the data.

For the purposes of this paper, the key themes from the data related to "lay" understandings of GM food will be summarized. An interpretative account will be provided, with key themes illustrated by quotes from the participants. Interviewees will be identified according to the community group through which they were accessed: namely, cooking club (C), lunch club (L), youth group (Y), organic food group (O), vegetarian group (V), and farming community (F).

4. Lay understandings of genetically modified food

Lay understandings of GM food: varying "technical" knowledge of complex science

A key theme was the variation in the "technical" knowledge of complex science. While expressing greatly increased awareness of GM foods through widespread media coverage, the majority of the lay participants felt that they had little in-depth knowledge of the precise scientific techniques involved in genetic modification. They perceived such knowledge as complex and uncertain, even for scientists. A common phrase among the participants was "I don't really know much about it" or "I'm no expert":

"I don't really understand (GM food) . . . I've heard about it . . . I've seen it on the TV, it's been on the TV all the time, but I don't really understand this one very much."
(C5)

Despite this recognition of the technical complexity of genetic modification, there was a widespread belief in the potential of ordinary people to understand the basic scientific issues. Indeed, several people called for more effective communication by scientists, the industry, and the media, and for more widespread availability of accessible information through means such as food labeling:

"I wish the media would give us some decent coverage about what the issues are. I think people can understand it, I mean the whole issues are quite complex, but I think people can understand them if put in a certain way." (O3)

"There should be more information (about GM food) . . . consumers should have rights to know exactly what goes into their foods." (C2)

However, a lack of detailed "technical" knowledge was not evident among all the lay participants. In particular, interviewees from the organic and vegetarian groups seemed to possess considerable knowledge of the science of genetic modification and several gave accounts that mirrored the complexity of the discourses of the "expert" key informants. They demonstrated knowledge not only of the scientific methods, but expressed detailed

thoughts about the wider social, political, commercial, and environmental implications of the technology:

“The worrying thing is that, say 60 percent of the soya crops in America is GMO, and that infiltrates into many products, because many processed foods have got soya in them . . . and we don’t know whether the products we buy have got GMOs in them or not . . . The other issue is that any crop spreads . . . and so you’ve going to get a transfer of GMOs . . . and the other thing that worries me is the power of the biotechnology industry . . . they want it to work, and the governments, because of the power and the money can’t really see any reason why not . . . (Genetic modification) is very random, in some cases they literally throw genes at an organism and sometimes it will receive it and sometimes it won’t . . . and if you move on five years even, you don’t know whether there’s going to be a throw-back.” (O4)

Even for the majority of participants who felt they had limited in-depth understanding of genetic modification techniques, quite complex understandings of some of the scientific issues and the relationships between science and society did emerge when prompted in more depth.

Lay understandings of GM food: knowledge and acceptance

As suggested by the “experts” in the previous phase of the research, a key theme in the lay people’s accounts was the relationship between knowledge and acceptance of GM food. The younger participants in particular were reluctant to form a definite opinion on GM food, feeling they needed to know more about the science before they accepted or rejected it:

“It’s difficult to form proper opinions without any hard evidence on genetically modified food . . . I try not to have an opinion, because I don’t really know enough to formulate a proper argument, either way.” (Y3)

Overall, while disclaiming “expert” knowledge, the majority of the other interviewees expressed an intuitive discomfort about GM food, with some expressing strong opposition. The scientists’ suggestions (in phase one of the research) that greater knowledge leads to greater acceptance were not supported by the data. Rather, the lay people who appeared to be most highly informed regarding the science of genetic modification (e.g., members of the organic group) were those who expressed the most opposition to GM food. Similarly, those who were gradually acquiring more knowledge (e.g., the women from the cooking club) suggested that greater knowledge was leading to greater skepticism towards GM foods:

“As far as GM products, I feel strongly about them, and I wouldn’t choose to buy them . . . I’m very angry about them.” (O5)

“This business of GM foods, I am completely opposed to. I would not buy anything wittingly . . . with GM foods in it, I’m that strong on it . . . I’m violently opposed to GM foods.” (L5) “The more I know about GM foods, the more I want to try and stop it.” (C1)

A minority of interviewees took less of an “anti-GM” stance, including a few members of the organic group, who favored small-scale applications in particular geographical regions of the world with specific needs, e.g., for pesticide-resistant crops. However, they rejected the large-scale commercial use of GM techniques in food production, expressing concerns about bio-diversity and the profit motives of producers:

“Genetic modification techniques aren’t necessarily bad, because it actually encompasses a lot of things . . . There are good applications and bad applications I think.” (O2)

"I'm not totally against GM food per se ... there's small scale research ... which could actually be of huge benefit to countries like South America where they have huge pesticide problems ... I'm not against the technology ... What I am against is the sort of whole scale commercial development for quick profit, and the fact that it's promoting large scale farming, not bio-diversity of small farms." (O1)

How much do "they" know and can they control it? The uncertainty of scientific knowledge of GM food

Where the lay people expressed unease about GM food, this seemed to be for a variety of reasons. Across the array of interviewees, concerns about GM food often centered on the perceived uncertainty of "expert" scientific knowledge. A recurring criticism was of the short-term perspective held by scientists, industry and government, who were seen as failing to consider the long-term environmental and health impact of genetic modification. Through the introduction of GM products onto the food market, humans were seen as being used as "guinea-pigs" for a technological development about which there was inadequate scientific knowledge of the long-term effects:

"The experts really don't know what the long term effects could be of genetically modified food ... using the human population as guinea-pigs is appalling ... If you introduce a gene into an organism for a certain effect ... no one can tell whether that gene will have another effect on some future date." (V1)

"Scientists are still learning ... it's a field where you can't predict all the variants you can get and all the things that can go wrong. ... There's just not enough predictability in it about what can happen." (V2)

Several people drew parallels with BSE regarding the degree of scientific knowledge of the long-term consequences. While scientific knowledge about BSE was seen as lacking but being gradually acquired, genetic modification was perceived as being too "young" for the necessary scientific knowledge to have been accumulated:

"There's more hard evidence about the effects of BSE, but genetically modified foods they haven't really, I don't think, got any very hard evidence about the effects." (Y4)

"GMOs are really young, and we don't know, that's really worrying ... What are the long term effects from things we don't know about?" (O4)

Thus, drawing on the experiences of BSE, where the risks are only emerging over time, the over-riding view was the need for caution within industry and government about the development of GM foods. Current lack of "hard evidence" of risks was not seen to mean that environmental and health problems will not emerge in the future as greater scientific knowledge is gained. However, several people felt skeptical that precautionary measures would be taken, perceiving that genetic modification would continue until problems emerged:

"It might be from BSE ... but I think part of the problem is that it seems all a bit of an experiment ... I'm sure that the experts in BSE, they thought then that it was fine ... there probably won't be potential problems with GM food, but you can never be sure." (Y5)

"Whether it will affect anybody, I don't know ... until you get people, like BSE that people say it could be passed to humans, until they find something that's been messed up, or a plant that's gone funny through altering genes, it'll go on." (F2)

Going against the grain: genetic modification as unacceptable "fiddling with nature"

Particularly in response to the prompt materials provided during the interviews, a recurring issue was the unacceptability and unnaturalness of genetic modification. Opposition to the movement of genes across the species barrier was expressed both by people with relatively detailed knowledge of the science and by those who felt they lacked such knowledge. People expressed an intuitive unease about moving genes between species, a feeling that was described by one person as going "against the grain." Across the range of lay participants, there was a "gut feeling" that the transfer of genes across the species barrier represented the 'crossing of a line' that should not be crossed:

"To cross species from one thing to another, I've got very serious questions about that." (F5)

"It just goes against the grain to be putting fish genes in tomatoes." (O2)

"It just seems to be like a line they've crossed, "cos older methods . . . they're changing what's already there, but with GM they're creating new stuff." (Y4)

Several people differentiated between older methods of food production and newer methods of genetic modification. Older methods involved in making products such as bread and beer, and selective plant breeding where crosses are made within species, were seen as techniques that were scientifically well known and acceptable. In contrast, genetic modification was seen as unknown, new, and in several cases, frightening. In particular, scientific intervention to move genetic material across species which would not occur "naturally," and the speed or pace of this genetic change, were seen as the crucial problematic differences:

"With cross-pollination, changes have occurred over many years . . . but that's still within the same species . . . Scientists now want to do something almost immediately, without knowing for sure what the effects might be." (V1)

"If they're joining things together that wouldn't occur naturally I think that's dangerous. I'm quite happy with cross-fertilization of the same thing, say different tomatoes or different potatoes, to improve the strain . . . But to actually invent crosses I think is incredibly dangerous." (V2)

"Making beer and bread and that kind of thing seems quite different to moving genes from one species to another, because that's something that's completely natural." (Y5)

Thus, a recurring theme in the lay people's accounts was genetic modification as inappropriate human intervention in nature. Close parallels were often drawn between BSE and GM food in relation to the question of how far scientists should "interfere" with nature. Some people expressed admiration for science and technology in general and for specific medical applications of biotechnology. However, despite seeing the scientific value of genetic modification, the majority rejected GM foods as "unnatural." They expressed opposition to such scientific alteration of food, and scientists were frequently described as "playing God." Commonly recurring phrases were genetic modification as "fiddling with," "tampering with" or "messing around with" nature:

"It is totally unnatural . . . it's very impressive from a scientific point of view, but . . . they haven't given a lot of thought as to what the end result is . . . genetic modification is tinkering with nature for no particularly good reason." (V3)

"Science, technology ... in some ways it's good ... But other things, like tampering with food ... it's all interfering with nature really." (L1)

"Fiddling with nature to the extent that we put genes from totally different species into another species ... that really is playing God." (V1)

Within these discourses about BSE and GM food, a rather romanticized picture of nature was portrayed. Nature was seen as fundamentally good and human intervention in nature was seen as inherently bad. Furthermore, nature was personified by several interviewees, being portrayed as a powerful "she" who has demonstrated through the BSE crisis that she will "hit back" at inappropriate human intervention:

"I don't like nature being interfered with, because I think she always hits back ... I don't hold with GM food at all ... I don't think they should interfere with nature to that degree ... nature always gets you back ... you won't ever beat her ... like the beef problem, whoever the stupid people were who introduced cannibalism into the beef chain, they wanted their heads examined, it hit back." (L5)

"It's just the ethics of it": acceptability of animal and human applications of genetic modification

A key aspect of the interviewees' unease about the acceptability of genetic modification centered on ethical issues. Across the range of groups, the boundaries of acceptability were most clearly exceeded in the case of animal and human applications. The strength of opposition to GM technology seemed far greater for animal and human applications in comparison with plant applications. Particular concerns centered on the welfare of genetically modified animals, and uses of this technology in animals were seen as "cruel" and "wrong:"

"It's just the ethics of it ... it's all done to make the pig grow more quickly, so the concept of animal welfare goes out of the window ... I've got major objections ... on the ethical side." (V3)

"I'd be more concerned about the animals, I'd think differently about that than about the vegetables and soya." (Y1)

"If it's to make animals grow bigger ... it's not fair on the animals ... I think that's wrong. You shouldn't mess about with animals, that's cruel." (C5)

There were even stronger emotive responses to the uses of human genes in genetic modification. Central to people's objections were ideas about what constitutes "human-ness." In response to the specific case of pigs modified with a human gene, ideas of cannibalism frequently arose, which were accompanied by strong expressions of repulsion. For some people, there was recognition that much genetic material in the human body was not inherently human but was common to other species. Yet accompanying this there was a gut feeling about the uniqueness of humans—that we are fundamentally "more than our genes." Therefore, the majority of the lay people felt that not enough consideration had been given to questions about the ethical dimensions of genetic modification—the issue was seen to be much broader than simply whether the techniques are available and 'do-able' from a scientific viewpoint:

"It sounds more dodgy ... using human genes would be like eating humans, ugh, it could end up kind of nasty tampering with human genes." (Y2)

“It’s one thing to be talking about changing the sort of crops and fruit and vegetables that we eat, but I think that fiddling around with living, breathing animals . . . the ethical questions are a lot stronger and more forceful . . . especially when it comes to using human genes.” (Y3)

“The fact that we share the same, fifty percent of our DNA with an oak tree . . . and ninety eight percent with a chimpanzee, so in some ways we are more than our genes, so, in some senses logically there’s no problem, but a gut feeling is that humans are special, therefore we shouldn’t be chopping and changing.” (O2)

“Messing around with genetics”: the appropriate boundaries of scientific innovation

Ethical objections also often included wider concerns about the appropriate boundaries of scientific innovation. Genetics seemed to be an area of science that provoked particular anxieties. For some people, the terms “unnatural” and “genetics” were intimately connected. As an older participant argued, “producing genetically is unnatural.” So concerns about genetically modified foods seemed to be one part of wider fears about “messing around with genetics” within a laboratory setting. Genetic modification was seen as a new and little known technique involving a higher level of scientific involvement than previous technological developments related to food. For several people, this seemed to produce a “fear of the unknown.” Such fears were not just expressed by older people, who may be thought to be more likely to resist the pace of technological change, but were also expressed by younger participants. They felt uneasy about the ethics of constantly pushing-back the boundaries of scientific knowledge in this field, and expressed concerns about the lack of consideration of the wider social impact:

“Genetics and modifications of food are particularly important because we don’t know enough to start fiddling with the genetic make-up of things we’ve been eating for hundreds of years. It tends to be the way of human society, we tend to fiddle with things and invent new innovations without really checking if they’re safe for the rest of society.” (Y3)

“Because this sort of thing is done in a laboratory, the science behind it, that’s what is frightening about it . . . I think it’s a fear of the unknown, there’s something about messing around with genetics that is frightening and problematic.” (V4)

“I think really GM is going a bit too far . . . Is it really right? . . . Is it going to help society or world food production? Probably not . . . Progress often seems good at the time (but) my feeling is that it’s not the best of ideas. I think it’s pushing the limits of what we know and what we should be doing.” (F3)

Close parallels with other innovations in the field of genetics also emerged with several people referring to cloning, e.g., “Dolly the Sheep.” Connecting concerns between GM food and animal cloning seemed to center on fears about the potential “abuses” of science. This was accompanied by skepticism about the career motives of scientists acting as a primary driving force behind innovation. The image of the “mad scientist” was common, and genetic modification was seen as an example of science for the sake of science:

“These scientists are a bit mad . . . I think what they’re doing is outrageous, this sheep cloning and things like that . . . it’s a bit scary to be honest.” (C2)

“It’s a bit like Dolly the Sheep, it’s coming into that artificial cloning, and where do you stop? Once you open the door, you can easily get an abuse. I don’t hold with it at all.” (L5)

Do we really need them? "Pragmatic" understandings of the necessity for GM foods

At a perhaps more pragmatic level, a recurring theme was the extent to which GM foods are necessary. For the majority, they were seen as unnecessary due to the adequacy of existing foods produced without genetic modification. While there was recognition among some interviewees of the potential economic benefits for producers, consumers' need for GM foods was widely rejected. People across the groups expressed skepticism about the extent to which GM foods would fulfill the claims of benefits made by scientists and the biotechnology industry:

"All these years people have grown tomatoes in the garden . . . and you never heard of anything going wrong . . . I don't think there's any need to change things . . . will it improve things?" (L1)

"I think it just seems unnecessary . . . it's easier and cheaper for them, but . . . we've lived on other things over the years, do we really need such a new thing?" (Y6)

Broader social and political issues related to food distribution, power and exploitation by developed countries were also embedded in these discourses about the necessity of GM food. Scientific and industry arguments about the need for GM crops and foods to feed developing countries was largely contested as a "red herring," particularly by those in the organic and vegetarian groups. They saw the real answer to world hunger as lying in the redistribution of food supplies, and saw little benefit in GM products for the developing world:

"The whole argument that they're creating enough cheap food to feed the world is a complete red herring. There's enough food already, and if we really wanted to be that altruistic we could sort it out without GM products . . . I don't think there's any benefit in having GM food." (V5)

"There's enough food already, and I think there are spurious debates about feeding the world's poor. Generally it's a question of distribution." (O2)

"How risky and when will any risks emerge?" The uncertainty of risks in GM food

For the other food risk issues examined in this study (including food safety and BSE), certain key dimensions of risk emerged. These included the time-scale of the potential risk, the severity of the consequences, the incidence and the likelihood of being personally effected. However, in the case of GM food, uncertainty was the over-riding theme for each dimension.

In terms of health implications, concerns about the long time-scale for the emergence of any risks were particularly common. Importantly, discourses around the time scale of risks in GM food were frequently interwoven with those for BSE. Interviewees often drew upon the BSE crisis and the long period for the emergence of resultant health problems as a basis for interpreting the time-scale for GM food risks as lengthy, while still uncertain. Central to perceptions of the time-scale of the potential health risks were ideas about a cumulative or build-up effect over time, rather than an immediate effect of eating GM foods at a single point in time:

"It may be all right at the time, but what will be the outcome of eating GM food? Because what about BSE? That didn't happen immediately to a person, if you'd eaten it." (L1)

"It's such an unknown thing . . . we don't know whether you eat one thing and it could have a bad effect, or whether it could be a build-up effect over a long time . . . You've got no way of knowing what the effects are, or over what time-scale they're going to take place." (V3)

Thus, the health risks in GM food were generally perceived as uncertain now, unknown even by the scientific community and only know-able in the future after GM foods have been consumed over a lengthy period.

“Can I control whether I eat GM foods?” Fatalism about avoiding potential risks

Related to the issue of risk, another key theme was the extent of control over the consumption of GM foods, and linked with this, fatalism about avoiding any potential risks. The majority of people said that in principle they were opposed to GM foods and would not knowingly choose to buy them. However, several acknowledged that in practice they did little, or felt unable, to avoid them. They seemed resigned to the fact that GM products are here to stay, which bred feelings of fatalism about their capacity to avoid potential risks even should they wish to do so. The young people seemed to express the greatest fatalism, seeing GM foods as unavoidable due to the inevitability of genetic modification as a scientific advance in food production:

“I would probably still buy it anyway . . . if we were not going to buy anything that wasn’t GM-free, we’d probably come away from the supermarket with nothing.” (C1)

“I would not buy anything wittingly . . . with GM foods in it, I’m that strong on it . . . I’m violently opposed to GM foods.” (L5)

“For me it doesn’t make that much difference . . . I don’t really think it’s going to be avoided, I think it’s going to happen anyway.” (Y5)

For many, inadequate information and food labeling, the perceived prevalence of GM ingredients in foodstuffs and the scientific and commercial pressure for these products contributed to the perception that their exclusion from the diet was a near impossibility. Some of the older people expressed frustration about the small print of food labels that is unreadable with poor eyesight and thus does not enable them to know whether products contain GM ingredients. The farmers felt that GM foods were inevitable because of what they saw as the pressures upon the agricultural industry to produce large volumes of food for consumers and retailers. Thus, the majority of participants felt they had little choice but to consume GM products. However, for the organic and vegetarian people, buying organic products was seen as the best strategy for reducing any potential health risks:

“I think (GM foods) are inevitable . . . it’s an expense we’ve had to pay because of the way modern agriculture’s had to go because of the demand that’s been put on it.” (F5)

“It’s very difficult when you get to my age and your sight’s not so good and they say you should read what’s on the packet . . . I’m just hoping that at the moment my normal shopping is not GM . . . It’s quite a frightening thought if you’re really doubtful about whether it’s going to do you any good.” (L3)

“I would avoid genetically modified food if I could . . . I buy organic . . . I read labels carefully if there’s any new product I’m not sure of . . . I go to (bakery) and . . . ask questions like “Do you use genetically modified soya flour in your bread?” (V1)

However, there were age and gender variations in views about the risks. While the majority of the older people saw GM food as a low personal risk, they perceived a greater cumulative risk for younger generations consuming GM foods over a lifetime. Female participants uniquely expressed opposition to the use of GM ingredients in baby food, because of concerns about imposing risks on vulnerable individuals. Several women strongly argued that they tried to avoid feeding GM products to their children or grandchildren:

"I'm not particularly concerned about GM food for the simple reason that when the full effects of it come on, I shan't be here . . . younger people, it will affect them." (L2)

"That's like long term . . . what the baby has in his first few years is important to them and how they grow, so no I don't think they should be mucking about with GM baby foods." (C3)

"I'm absolutely violently opposed to GM baby foods . . . Once you come towards the end of your life . . . well something's got to kill you . . . But you don't start on the babies, that's asking for trouble." (L5)

"Who can you trust?" and "Who's to blame?" Responsibility for managing the risks in GM food

Finally, a theme concerning the trustworthiness of "experts" and the related attribution of blame for the "mismanagement" of risks was recurring. Issues of trust in scientists, industry representatives, and politicians were very evident as people talked about who should be responsible for managing the potential risks in GM food. As described previously, the majority of participants felt a sense of lack of personal control over risks, as they perceived any threats to be hidden due to the unknown nature of the genetic changes to foods and felt helpless in the face of immense commercial pressure for GM foods. But, did they trust others to control those risks on their behalf?

Some groups were trusted to inform consumers and protect them from potential risks. The young people expressed great overall trust in scientists, industry representatives, and politicians and had faith in the regulatory measures for GM food. In the case of the adult interviewees, several appeared to have great faith in what might be seen as "alternative" experts (e.g., those from organic or "green" campaigning groups) who were seen as having no particular "axe to grind" and thus more likely to provide unbiased information:

"I tend to trust them . . . if the government has said that it's not going to kill us then it's probably not going to kill us." (Y3)

"They say GM food is still under research . . . but they're going in the right direction. I kind of trust the experts . . . British safety standards are so high that they wouldn't do anything too dangerous." (Y2)

"I would probably believe things that were written from an organic background or from a non-governmental background." (O4)

However, mistrust in government, industry and science was strongly evident among all the adult participants. Interestingly, perceptions of different "experts" such as government, scientists, and industry almost seemed to be interchangeable, as people seemed to display a generalized lack of trust in what "they" are doing in relation to GM food. Several people questioned the very notion of an "expert." Politicians were particularly mistrusted and the commercial motives of industry in developing GM foods were widely recognized. People also mistrusted scientists' reassurances of the safety of GM foods, seeing scientists as removed from the everyday lives of ordinary people (in their "ivory towers"), and recognizing the subjective aspects of science (e.g., that scientists are human and subject to bias). There were strong suspicions that the desire for scientific advance would cloud scientists' consideration of potential risks:

“What is an expert? My definition of an expert is somebody who tells you that something can’t be done . . . My opinion of politicians is practically zero, and as for scientists, well they’re all wrapped up in their little ivory towers . . . If they turned around and told me GM food is safe, I wouldn’t believe them.” (L2)

“I’ve got suspicion of big companies . . . it’s just about profits . . . I used to listen to government scientists, but they all seem to be fighting it out on GM food particularly.” (V5)

“Scientific experts are humans as well . . . and their expert views are colored by their situations . . . you get so-called experts disagreeing among themselves, so who do you believe? Scientists . . . are not unbiased . . . they see any scientific advance as an advance for mankind, and they’re liable to ignore possible health risks because of the excitement of the advance.” (V1)

Once more people drew close parallels between GM food and BSE, where the risks were seen as having been deliberately hidden by politicians and scientists and thus imposed on the public. Drawing on these experiences, the majority of adults mistrusted these groups to protect them from potential risks in GM food that may emerge. In the same way that these “experts” were blamed for the human health problem of variant Creutzfeldt-Jakob disease (CJD) arising from BSE, people implied that they would equally hold them accountable for any health problems that may emerge from GM food in the future. Further, due to the perception of conflicting views among “experts,” some people argued that decisions about risks have become a matter of self-judgment. While expressing hope that the government would adopt a more cautious approach in its regulation of GM foods than it did during the BSE crisis, there were widespread doubts that this would be the case. Rather, powerful stakes were seen to be at play, with political, scientific and commercial concerns taking priority over public health:

“We’ve never had any reason to trust politicians in the past . . . a lot of questions have been dodged, and they’ve been trying to wriggle out of answers . . . I just don’t think they’re trustworthy.” (C1)

“By the time they tell you, it’s too late, the damage has been done . . . by the time the government released information about BSE, the meat was a lot better than it was years ago.” (C4)

“You’ll get one chappy who says “Beef is quite all right,” and then another one will say, “No it isn’t.” So, it’s quite hard to trust anybody . . . You get conflicting views . . . In the long run you’ve got to go on your own judgment . . . I don’t think I’d go by anybody higher-up . . . you’ve got to make your own mind up.” (L4)

5. Discussion

This research, drawing on sociological perspectives on food, risk and the public understanding of science, has illustrated the value of an interpretative qualitative approach for exploring the complex meanings, processes and social contexts which shape people’s understandings of food issues such as the GM debate. In this paper, several key themes relating to lay understandings of genetically modified food have been detailed. These have included: varying “technical” knowledge of complex science, the relationship between knowledge and acceptance of genetic modification, the uncertainty of scientific knowledge of GM food, genetic modification as inappropriate scientific intervention in “nature,” the acceptability of animal and human applications of genetic modification, the appropriate boundaries of scientific innovation,

"pragmatic" understandings of the necessity for GM foods, the uncertainty of the risks to health, fatalism about avoiding GM foods, and any potential risks and responsibility for managing the risks in GM food.

The findings of this research link up well with previous sociological research on public understandings of biotechnology in the United Kingdom. While using a different methodological approach (interviews rather than focus groups) and drawing on a sample from a different region of the United Kingdom (the south west of England compared with London and Lancashire), there are strong parallels with findings of Grove-White and colleagues.²¹ In particular, there are overlaps in relation to lay feelings of inevitability and fatalism about developments in GM food, ideas of genetic modification as "meddling with nature," perceptions of deception by the government and scientists with regards to GM food, mistrust of industry and regulatory systems for GM food, and identification with non-governmental organizations who are seen to represent a neutral and moral counter-balance to these "experts." Notably, the close connections between GM food and BSE in this research support ideas about the role of the BSE crisis as a "heuristic" or focal point around which diverse and previously diffuse concerns about food and science have become articulated.²² Further, this research adds to this work by including the views of lay people who have become relatively highly informed about the scientific, social and political issues surrounding GM food (e.g., the organic and vegetarian groups). The views of these individuals have illustrated the potential for the development of "lay expertise" among certain "publics" and thus suggest the fluid and contested nature of the "expert-lay" divide in relation to knowledge of complex and rapidly-changing scientific and technological developments.

What are some of the implications of these themes for the developing sociological perspective on GM foods? While it is not within the scope of this paper to give a detailed conceptual discussion, these data point to certain key issues. Two central concepts appear to be knowledge and risk. Related to these are ideas about public trust in "experts," the uncertainty of science, the relationships and boundaries between "lay" and "expert" knowledge, the appropriateness of conceptualizing a uniform "public" understanding of science, questions about the relationships between science and nature and what can be considered as "natural" food, and the politics of risk discourses.

These issues connect with wider sociological debates in relation to food, science, and health. The range of themes identified link with previous work highlighting the centrality of issues of scientific uncertainty and trust in social institutions in shaping public responses to new technologies.²³ The key role of scientific uncertainty within people's understandings of GM food links with more recent research showing the impact of underlying images of science and the role of uncertainty (or unknown effects) in shaping public understandings of risk.²⁴

This research also links with wider sociological debates about public understandings of health and science. For example, rather than treating "the public" as a uniform group, this research has explored the diversity of understandings across a range of social groups comprising the public. Furthermore, rather than adopting a "deficit model" of lay knowledge, it has demonstrated the complexities and subtleties of people's understandings of the scientific, social and political issues surrounding GM food, giving "a much richer pattern of social relations and personal understandings."²⁵ The data illustrating lay people's questioning of scientific expertise also connect with debates emphasizing the need to recognize the social and subjective aspects of science and the "fallibility of experts."²⁶ In these ways, this research contributes to debates within the sociology of science and medicine about the problematic divide between lay and expert knowledge by highlighting the "lay expertise" possessed by certain publics.²⁷

The themes relating to genetic modification as inappropriate scientific intervention in "nature" and GM food as "unnatural" (unlike food produced by "traditional" means which

is seen to be “natural”), suggest some complex relationships between science, society and nature and relate to wider theoretical ideas within the sociology of nature.²⁸ Concerns with the responses of individuals and social groups to nature and the environment are central to such work. The current research links particularly with ideas about the way varying social practices (e.g., people’s social locations) produce, reproduce and transform different ideas and values about nature and structure what people may consider to be “natural” (e.g., different environments and foods).

In addition, ideas about control, responsibility, and blame for risks emerging from this research link with sociological work on the politics of risk discourses. They connect with arguments within the sociology of the new public health about the ways that risk discourses may serve ideological, moral, and political functions, being used by various social groups and institutions to attribute blame for risks.²⁹ While the focus in the current research has been on individual lay discourses rather than those of institutions, the data from the lay people mirror ideas within this theoretical work. For example, the lay people’s skepticism about the willingness of “experts” to protect consumers from the potential risks in GM food—particularly following the perceived risk communication and management failures of the BSE crisis—illustrates how discourses can serve a blaming function. They attributed fault to government, the scientific community, and the food industry for failing to protect the public from risks and placing political, scientific and commercial agendas above concerns for public health. Furthermore, these institutions and groups were seen as having great power to define risks and manipulate ‘the facts’ to meet their own agendas, which was itself a cause for mistrust.

Thus, following a sociological perspective on food and risk, the reported research has been concerned with the broader social and political factors that may shape lay understandings of GM food. Drawing on the approach of writers such as Nelkin this research has extended “beyond narrow questions of health to include the web of social and political issues associated with risk in different social contexts.”³⁰ Furthermore, by examining popular understandings and practice related to GM food, it contributes to the much needed improvement of our scientific understanding of the public.³¹ By providing insights into the ways different “publics” perceive science and scientists, this research may also inform mechanisms to facilitate a greater public acceptance of science—a need that the scientific community has recognized, as reflected in comments from Fischer:

Scientists definitely have as much to learn about the public as the public about science . . . even scientists themselves often do not understand science . . . Maybe we should forget about the public understanding of science and instead attempt to achieve a better public perception or acceptance of science.³²

It is hoped that this research will not only add to sociological work on food issues but will also contribute to wider work in the fields of risk and the public understanding of science. The issues outlined in this paper can provide further building blocks for a more well thought-out and developed sociological understanding of public attitudes and responses to GM food, as called for by writers such as Murcott.³³

6. Concluding thoughts: policy implications

To conclude, this research also carries policy implications. Risk assessment, communication, and management are central tasks of the UK Food Standards Agency and the emerging European Food Authority. This research points to challenges within these tasks. For example, it highlights the difficulties of communicating risk in conditions of scientific uncertainty, and the need to re-build trust with skeptical consumers. These challenges are recognized by

scientists and policy-makers, who have begun to address the need to re-frame risk problems to take account of scientific uncertainty and the "big-picture" questions that are omitted by traditional risk assessment processes.³⁴ As John Krebs from the UK Food Standards Agency has commented:

While decisions based on science are useful, one of the crucial aspects of the scientific approach is that results are often uncertain. As scientists, we may not like the way that uncertainty is portrayed in the media... but the Food Standards Agency has to interpret the scientific evidence—uncertainties and all—to propose sound policy options, despite uncertainties.³⁵

Thus far, no clear solutions to these challenges have emerged and the task for the food agencies seems daunting and complex. Only time will reveal whether the goals of communicating science and risk more clearly, and restoring public confidence in food and in the social institutions of government, science, and industry, can be realized.

References

- 1 A. Shaw, "What are they doing to our food? Public concerns about food in the UK," *Sociological Research Online*, 4(3) (1999), available at www.socresonline.org.uk/socresonline/4/3/shaw.html; and A. Shaw, "Public understandings of food risks: what do the experts say?" *Food Science and Technology Today*, 14(4) (September 2000): 140–143.
- 2 "Gene switch foods could open door to superbugs," *Daily Mail*, (January 28, 1999): 1; "We can't control mutant crops," *The Express* (February 18, 1999): 1.
- 3 "Prince warns of new tech crop dangers," *Daily Telegraph* (June 8, 1998): 1–2.
- 4 G. Tansey and T. Worsley, *The Food System: A Guide* (London: Earthscan, 1995).
- 5 R. Carson, *Silent Spring* (London: Penguin, 1962); M. Hansen, *E for Additives* (New York: Thorsons Publishing Group, 1984); J. Blythman, *The Food We Eat* (London: Penguin, 1998); and S. Nottingham, *Eat Your Genes: How Genetically Modified Food Is Entering Our Diet* (London: Zed Books, 1998).
- 6 *The Food Standards Agency: A Force for Change* (London: HMSO, 1998).
- 7 *White Paper on Food Safety* (Brussels: Commission of the European Communities, 2000).
- 8 *The Food Standards Agency*.
- 9 M. J. Smith, "From policy community to issue network: Salmonella in eggs and the new politics of food," *Public Administration* 69 (Summer 1991): 235–255.
- 10 U. Beck, *Risk Society* (London: Sage, 1992); U. Beck, *World Risk Society* (Cambridge: Policy Press, 1999); M. Douglas, *Risk and Blame: Essays in Cultural Theory* (London: Routledge, 1992); J. Gabe, ed., *Medicine, Health and Risk* (London: Blackwell, 1995); D. Lupton, *Risk* (London: Routledge, 1999).
- 11 J. Durant, "Introduction," in *Biotechnology in Public: A Review of Recent Research*, ed. J. Durant (London: Science Museum for the European Federation of Biotechnology, 1992).
- 12 L. Frewer, C. Howard, D. Hedderley, and R. Shepherd, "What determines trust in information about food-related risks? Underlying psychological constructs," *Risk Analysis*, 16(4) (1996): 473–486; and L. Frewer, C. Howard, and R. Shepherd, "Public concerns in the United Kingdom about general and specific applications of genetic engineering," *Science, Technology and Human Values*, 22 (1997): 98–124.
- 13 Eurobarometer, *Eurobarometer 46.1: The Europeans and Modern Biotechnology*, report by INRA (Europe)–ECOSA, on behalf of European Commission, Directorate General XI1, Science Research and Development, B-1049 (Brussels, 1997); and Eurobarometer, *Eurobarometer 52.1: The Europeans and Biotechnology*, report by INRA (Europe)–ECOSA, on behalf of European Commission, Directorate-General for Research, Directorate B—Quality of Life and Management of Living Resources Programme, managed and organised by Directorate-General for Education and Culture "Citizen" Centre" (Public Opinion Analysis Unit) (Brussels, 2000).
- 14 *Consumer Attitudes to Genetically Modified Foods: Results of Qualitative Research* (Watford: Institute of Grocery Distribution, 1997).
- 15 B. Wynne, "Misunderstood understanding: Social identities and the public uptake of science," *Public Understanding of Science* 1 (1992): 281–304; T. O'Riordan, C. Marris, and I. Langford, "Images of science underlying public perceptions of risk," *Royal Society Paper* (1997); P. Caplan, A. Keane, A. Willets, and J. Williams, "Studying food choice in its social and cultural contexts: approaches from a social anthropological perspective," in *The Nation's Diet: The Social Science of Food Choice*, ed. A. Murcott (London: Longman,

- 1998); C. Davison, "Eggs and the Sceptical Eater," *New Scientist* (11 March 1989): 45–49; A. Keane, "Too hard to swallow? The palatability of healthy eating advice," in *Food, Health and Identity*, ed. P. Caplan (London: Routledge, 1997); and J. Reilly and D. Miller, "Scaremonger or scapegoat: The role of the media in the emergence of food as a social issue," in *Food, Health and Identity*, ed. P. Caplan (London: Routledge, 1997).
- 16 S. Macintyre, J. Reilly, D. Miller, and J. Eldridge, "Food choice, food scares and health: The role of the media" in *The Nation's Diet: The Social Science of Food Choice*, ed. A. Murcott (London: Longman, 1998).
- 17 R. Grove-White, P. MacNaghten, S. Mayer, and B. Wynne, *Uncertain World: Genetically Modified Organisms, Food and Public Attitudes in Britain* (Lancaster: CSEC, 1997).
- 18 B. E. Adam, B. E. Wynne, F. Berkhaut, T. Dyson, R. Grove-White, T. Marsden, I. Scoones, A. Scott, A. Stirling, and C. Williams, *The Politics of GM Food: Risk, Science and Public Trust* (University of Sussex: ESRC Global Environmental Change Programme, 1999); R. Almas, "Food trust, ethics and safety in risk society," *Sociological Research Online* 4(3) (1999), available at www.socresonline.org.uk/socresonline/4/3/almas.html; A. Murcott, "Not science but PR: GM food and the makings of a considered sociology," *Sociological Research Online*, 4(3) (1999), available at www.socresonline.org.uk/socresonline/4/3/murcott.html; A. Murcott, "Public beliefs about GM foods: More on the makings of a considered sociology," *Medical Anthropology Quarterly*, 15(1) (March 2001): 9–19; and P. Sutton, "Genetics and the future of nature politics," *Sociological Research Online*, 4(3) (1999), available at www.socresonline.org.uk/socresonline/4/3/sutton.html.
- 19 A. Shaw, "What are they doing to our food? Public concerns about food in the UK," *Sociological Research Online*, 4(3) (1999), available at www.socresonline.org.uk/socresonline/4/3/shaw.html; and A. Shaw, "Public understandings of food risks: What do the experts say?" *Food Science and Technology Today*, 14(4) (2000): 140–143.
- 20 A. L. Strauss and J. Corbin, *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*, 2nd ed. (London: Sage, 1998).
- 21 Grove-White et al., *Uncertain World*, 22
- 22 *Ibid.*
- 23 Adam et al., *The Politics of GM food*, and Grove-White et al., *Uncertain World*.
- 24 B. Wynne, "Technology, risk and participation: On the social treatment of uncertainty," in *Society, Technology and Risk Assessment*, ed. J. Conrad (London: Academic Press, 1980): 173–208; and O'Riordan et al., "Images of science underlying public perceptions of risk" (cit. n. 15).
- 25 L. Sjoberg, "Limits of knowledge and the limited importance of trust," *Risk Analysis*, 21(1) (February 2001): 189–98.
- 26 A. Irwin and B. Wynne, "Introduction," in A. Irwin and B. Wynne, *Misunderstanding Science? The Public Reconstruction of Science and Technology* (Cambridge: Cambridge University Press, 1996); H. Otway, "Public Wisdom, Expert Fallability: Toward a Contextual Theory of Risk," in *Social Theories of Risk*, eds. S. Krimsky and D. Golding (Westport, CT: Praeger Publishers, 1992).
- 27 Wynne, "Misunderstood misunderstanding" (cit. n. 15); and B. Wynne, "May the sheep safely graze: A reflexive view of the expert-lay knowledge divide," in *Risk, Environment and Modernity*, eds. S. Lash, B. Szerszynski, and B. Wynne (London: Sage, 1996).
- 28 A. Kerr, S. Cunningham-Burley, and A. Amos, "The new genetics and health: mobilising lay expertise," *Public Understanding of Science*, 7(1) (1998): 41–60.
- 29 P. MacNaghten and J. Urry, *Contested Natures* (London: Sage, 1998); and D. Lupton, "Risk as a moral danger: The social and political functions of risk discourse in public health," *International Journal of Health Services*, 23 (1993): 425–435.
- 30 Lupton, *Risk* (cit. n. 10).
- 31 D. Nelkin, "Communicating technological risk: The social construction of risk perception," *Annual Review of Public Health*, 10 (1989): 95–113.
- 32 S. Macintyre, "The public understanding of science or the scientific understanding of the public? A review of the social context of the new genetics," *Public Understanding of Science*, 4 (1995): 223–232.
- 33 Murcott, "Not science but PR"; and Murcott, "Public beliefs about GM foods."
- 34 E. P. Fischer, "The public misunderstanding of science," *Interdisciplinary Science Reviews*, 21(2) (1996): 110–116.
- 35 I. E. Taylor, "Political risk culture: Not just a communication failure," in *Risk Communication and Public Health*, eds. P. Bennet and K. Calman (Oxford: Oxford University Press, 2001); and J. R. Krebs, "Science, uncertainty and policy: Food for thought," *Toxicology Letters*, 120 (2001): 89–95.

Author

Alison Shaw, PhD, is currently a Lecturer in Primary Care Research at the University of Bristol. She has an academic background in psychology, sociology of health and social science research methods. Her PhD was entitled "What are they doing to our food? Expert and lay understandings of food risks." Dr. Shaw has worked as a researcher in the health field since 1994, and has particular interests in qualitative methodological approaches for studying risk, "expert" and "lay" knowledge, and the public understanding of science. Address: University of Bristol, Division of Primary Health Care, Cotham House, Cotham Hill, Bristol BS6 6JL. E-mail: Alison.Shaw@bristol.ac.uk