

# 18 Risk communication

R. SHEPHERD and L.J. FREWER

## 18.1 Introduction

One of the major issues arising in risk management is the communication between different parties involved. This often comes down to the problem of communication between the scientists, experts and regulators on the one hand and the public on the other. This is not always a straightforward procedure and this chapter will include some consideration of the research which has tried to address the problems in this area.

Risk communication is, of course, closely linked to the subject of risk perception, discussed in a previous chapter, since in order to communicate effectively with the public it is necessary to understand how the public thinks about risks. Following some consideration of what risk communication aims to achieve, there will be a discussion of some of the problems which arise and some of the types of theories which have been put forward in this area. The next three sections cover aspects of communication: the message, the source of the information and the target audience. The role of the media is central in risk communication and therefore will be discussed in some detail, and this will be followed by a consideration of practical issues in communication and how we might learn from previous successful (and unsuccessful) attempts at risk communication.

Much of the work done on risk communication, as with risk perception, has been done in areas other than food and other than chemicals in food. For this reason, many of the examples will be from other types of application, but where work has been conducted on food this will be presented.

## 18.2 Aims of risk communication

In a major review of risk communication methods, the National Research Council (1989) suggested that risk communication can serve two purposes, the first being to inform and the second to influence. Covello *et al.* (1986), reviewing the literature on risk communication, came to a similar conclusion but identified four types of objectives: information and education, behaviour change and protective action, disaster warnings and emergency information, and joint problem-solving and conflict resolution. The emphasis in this last objective on a two-way flow of information has been highlighted by others (e.g. Fessenden-Raden *et al.*, 1987), and represents

something of a departure from traditional conceptions of communication as a one-way process of experts providing information to the public in the most appropriate and useful form. However, most instances of risk communication do centre on some form of information provision and education. Sharlin (1986), in a case study of the action of the Environmental Protection Agency (EPA) on ethylene dibromide, concluded that such an agency has to make sure that the public is informed so that the public can participate in the risk debate and the regulatory process.

The National Research Council (1989) differentiated between two types of settings for risk communication: those of public debate and those related to personal action. This distinction between population and individual perspectives is echoed by other authors (Sharlin, 1986; Covello *et al.*, 1986). Sharlin (1986) suggested that agencies such as the EPA need to perform risk assessment and risk management at a macro level of population statistics for the purposes of regulation, but public information has to be at the micro level of the implications for the individual if it is to be effective. Some of the conflicts inherent in these different perspectives can lead to problems in the communication process.

### 18.3 Problems associated with risk communication

Slovic (1986) points out a number of problems with communicating risk. These are characterized as being related to limitations of technical risk assessment or to limitations of public understanding.

In terms of technical assessment of risks, the tests performed do not provide exact estimates of risk but rather rely on a number of underlying assumptions and produce numbers which have inherent uncertainties and are open to different interpretations. Despite safety margins, the inherent uncertainty is bound to affect people's perceptions of the usefulness of the risk assessments. A second point is the adversarial climate within which risk assessments are discussed. Given the different views expressed by experts, people are likely to say that even the experts do not know what the risks are. The administrator of the EPA, Ruckelshaus (1985), said that the attempt to quantify risks to human health and the environment from industrial chemicals is:

essentially . . . a kind of pretence; to avoid the paralysis that would result from waiting for 'definitive' data, we assume that we have greater knowledge than scientists actually possess and make decisions based on these assumptions.

(Ruckelshaus, 1985, p. 26)

It has been suggested that explicit discussion of uncertainties in risk estimates would have positive effects on public views (B.B. Johnson and P. Slovic, personal communication), but Fessenden-Raden *et al.* (1987) argue that admission of uncertainty may strike the public as surprising ignorance or

evasiveness. Johnson and Slovic report that members of the public tend to be unfamiliar with the concept of uncertainty in risk assessment. In this study, admission of uncertainty had less effect on the people's attitudes towards the risks than it had on their attitudes towards the regulators of risk; admission of uncertainty appeared to facilitate perceptions of source credibility, although not competence. Thus experimental evidence for risk communication being enhanced by including issues of uncertainty is not strong.

Within a message on risk, the measures chosen for expressing risk may make some risks appear worse than others (Crouch and Wilson, 1982). Thus, expressing accidental deaths per million tons of coal mined in the USA shows a reduction over time, but expressing it as deaths per 1000 employees shows an increase: the same source of statistics can thus be used to claim that mining is getting safer or more dangerous. This is an instance of making some information more salient than other information, and an indication of the importance of realizing the different ways in which risks may be presented.

Perceptions of risks are weighted in favour of more dramatic and memorable events (Lichtenstein *et al.*, 1978). One problem with raising issues for debate or consideration by the public is that the 'availability heuristic' (Tversky and Kahneman, 1973) suggests that people are then likely to see this event as more probable. Risk messages may increase feelings of anxiety rather than reducing them as intended (Covello *et al.*, 1986), and in attempts at behaviour change the use of high-threat or fear communications tends not to be successful (Covello *et al.*, 1986). Rosenberg (1978), for example, cites the experience of recombinant DNA researchers in raising the issue of contamination by new organisms and finding that:

Speculation abounded and the scarier the scenario, the wider the publicity. Many of the discussions of the issue completely lost sight of the fact that the dangers were hypothetical . . . (Rosenberg, 1978, p. 29)

An alternative procedure would be not to raise the issue of risk for debate, but this too presents problems. Even where there is little current public concern, e.g. about biotechnology, the strategy of 'letting sleeping dogs lie' is likely to be counterproductive, since when a negative event does occur this will lead to maximum public outrage.

Strongly held beliefs may be very difficult to change. New evidence may be noted if it fits with preconceptions, but contrary evidence may be dismissed as unreliable or unrepresentative, or it may be interpreted using existing beliefs. The same information may thus be interpreted as supportive of both of two competing positions: for example, the Three Mile Island accident might be interpreted by those supportive of the nuclear industry as evidence of its safety because there were no fatalities, while those opposed to the industry would be more likely to interpret the accident in terms of the 'catastrophic potential' of the industry.

Where people do not have strong initial views, the presentation of the information may have a dramatic effect, due to framing (Tversky and Kahneman, 1986). There is strong evidence that people are sensitive to the wording of decision problems: that is, their choice between two 'risky' options will be influenced by the ways in which those choices are worded, even when the expected outcomes are similar for each option. This is thought to arise because the way in which a choice is presented will make some considerations more salient in the person's thinking. People with mixed attitudes (compared to people with relatively fixed attitudes) are likely to be susceptible to these 'context effects'. McNeil *et al.* (cited in Slovic, 1986) found that subjects choosing a certain type of therapy dropped from 42% to 18% when the outcome was couched in terms of likelihood of dying rather than surviving. Those preparing information have a great responsibility to provide the information in an impartial way, but this type of framing effect means that in adversarial circumstances opponents can use the same statistics to favour contradictory arguments and hence add to possible public confusion.

A further problem in risk communication is whether the target recipients actually pay attention to the risk information transmitted. 'Optimistic bias' refers to an effect where individuals believe that negative events are relatively unlikely to happen to them, but are more likely to affect other people: this effect has been demonstrated for a number of food-related hazards (Frewer *et al.*, 1994). Optimistic bias is related to the need by an individual to feel that he or she has control over a situation. Clearly, some hazards are easier for the individual to control than are others, and thus it might be predicted that those hazards where perceived control is higher will also be more likely to exhibit optimistic bias. Optimistic bias has been shown to be greater for lifestyle hazards (e.g., a high-fat diet) than for genetic engineering, although the effect was still observed for the latter (Frewer *et al.*, 1994). In addition, individuals think they know more about food-related risks than do other people (Frewer *et al.*, 1994). It is implicit that, if individuals consider others to be at greater risk and less knowledgeable about a particular risk than themselves, they will consider risk communications to be directed towards these vulnerable and ignorant others. The solution may be to make information more directly and personally relevant to people.

#### **18.4 Implications of models of risk perception and psychological theories for communication**

In order to communicate risk information effectively, it is important to take into account the social construction of risk perception. Jasanoff has noted that:

risk analysts, regardless of their disciplines, would probably agree that risk assessment is not an objective, scientific process; that facts and values frequently merge when we deal with issues of high uncertainty; [and] that cultural factors affect the way people assess risk. . . . (Jasanoff, 1993, p. 123)

To illustrate the social construction of risk perception, it is useful to examine the disparities between expert and lay concerns regarding the nature and relative importance of different hazards. Research in the USA has shown that the lay public and experts differ not only in their opinions of risk magnitudes associated with the handling of nuclear waste, but also in the conceptualization of what types of risks represent a serious threat (Flynn *et al.*, 1993). Expert and lay judgements of chemical risks have been found to differ markedly, although assessments of experts were also sharply divided according to membership of different organizations (Kraus *et al.*, 1992). Clearly, even the risk information provided by 'experts' is likely to be influenced by the social constructions surrounding the communicator. For example, scientists in universities or local government may see the risks of nuclear energy and nuclear waste as greater than do scientists who work as business consultants, for national government or for private research establishments. Such disagreements in risk communications between 'experts' is likely to result in confusion and mistrust at a public level, as the message which is conveyed is that of uncertainty. Implicit differences between 'experts' are likely to exacerbate conflict over potentially risky policies due to the mismatch between different 'scientific' findings, and the legitimacy of science can be undermined as a determinant of policy formulation.

Slovic (1987) has argued that the lay 'conceptualization' of risk is much richer than that of experts. To be effective, risk communication must be structured as an interactive process, as both experts and the public have important insights to offer. Instead of utilizing a traditional 'source-receiver' model of risk communication (where messages are transmitted from an official organization to the lay public), it may be more fruitful to adopt the 'convergent' model (where an open dialogue is established between the experts and the public, such that consensus agreement about key concerns is established).

Research on models of risk perceptions (discussed in Chapter 15) obviously has major implications for risk communication. Communicators need to understand how the public perceives risks and hazards in order to know how to structure risk-related messages. In short, they need to be aware of the public's 'models' of risk. In risk communication it is clearly necessary to have this basic information before effective communication can be attempted. However, while there is a growing body of research in risk perception, the research specifically addressing risk communication is much more limited (Covello *et al.*, 1986) and the processes of effective

risk communication are far from being well-understood (e.g. Slovic *et al.*, 1990).

It is likely that some hazards may be more amenable to attitude change through effective risk communication than others. Alhakami and Slovic (1994) have observed that there is an inverse relationship between perceptions of risk and benefit for a range of different hazards. It would therefore seem possible to change perceptions of risk by changing perceptions of benefit, and vice versa. Thus for a technology perceived as high in risk and low in benefit, reducing risk perceptions may be brought about by increasing perceptions of benefit rather than heightening perceptions of safety. Attitude change has been found to be small in the case of nuclear energy (Alhakami and Slovic, 1994), but this might be because the technology is stigmatized in terms of its public image. There may be greater potential for attitude change in the case of technologies which are relatively unknown and poorly understood, such as genetic engineering, where there is little *a priori* public knowledge regarding the potential risks and benefits of the technology.

Although there is relatively little research work on risk communication, there are developments in the field of persuasion and attitude change which might profitably be applied to this area. There is a very extensive and long-standing literature relating to this area. Recent contributions have included the work of Petty and Cacioppo (1986) who have developed a theory of persuasive communications called the 'elaboration likelihood model' (ELM). This basically posits that there are two routes to persuasion: one route is via a careful and thoughtful assessment of arguments (central route) and the other is based on some cognitive, affective or behavioural cue in the context of the persuasion which allows a simple inference about the merits of the argument without recourse to complex cognitive processing (peripheral route). Despite extensive work on this model in the area of attitude change, it has not been applied to the communication of messages on risk. It is a model which acknowledges the importance of individual differences and the need to bear this in mind when messages are structured.

In the following sections various factors important in risk communication will be considered. These will be discussed under the headings of the contents of the message, the source of the information and the target audience. These factors are highlighted in models such as the ELM but also relate to more traditional models of persuasion and attitude change.

### **18.5 Contents of the risk message**

One of the most important initial steps in designing risk communications is selecting what information should be contained. Fischhoff *et al.* (1993)

criticize many existing communications on the basis of arbitrary selection of information, citing as an example the case of AIDS transmission. Whilst the concern of medical authorities focused on the low percentage of the population who knew that transmission of the disease was caused by a virus, it is arguably people's behaviour which is the key message to be transmitted in the risk communication. The salient issue is whether there are incorrect beliefs about the hazard which could result in inappropriate behaviours, not a fundamental misunderstanding of the scientific underpinning of risk precautions.

Slovic (1986) points out the lack of hard empirical tests of how risk statistics should be presented. There are, however, some general rules in this area. Many authors have argued that risks need to be put into a wider context of other risks. Despite the seeming simplicity of this notion, the means for doing it are far from clear and its usefulness as a method continues to attract debate (Slovic *et al.*, 1990).

Crouch and Wilson (1982) presented data on annual fatality rates per 100 000 persons at risk, showing a comparison, for example, between the saccharin in one diet soda per day representing a rate of 1, aflatoxin in four tablespoons of peanut butter per day as 0.8, and motorcycling at 2 000 or smoking at 120 (from lung cancer). One problem with fatality comparisons is that they fail to capture the fact that some hazards (e.g. motorcycle accidents) cause death at an earlier age than do others (e.g. cancer), and hence other authors have prepared comparisons of estimated loss of life expectancy from different causes. Another alternative is to present activities which would each increase the chance of death in a year by 1 in 1 000 000. Here, for example, eating 40 tablespoons of peanut butter (aflatoxin) or drinking 30 cans of diet soda (saccharin) would be equivalent to cycling 10 miles or spending 1 hour down a coal mine.

Such comparisons can provide a quick guide to relative risks, but comparisons of this type have also been advocated as a means for making decisions about priorities. Such an approach has been criticized (National Research Council, 1989), since the comparisons do not include relative costs and benefits, or indications of uncertainty or of how people may view relative risks (e.g. natural and unavoidable risks against non-natural risks). Also, the use of comparisons may give the appearance of selecting risks which play down the risk in question.

While providing a potentially useful overall framework, such schemes can be uninformative for some people; for example, a single takeoff or landing on a commercial airliner reduces life expectancy by 15 min, whereas in terms of the reality of possible outcomes it either has no effect or reduces life by much more than 15 min (Slovic *et al.*, 1982). A better form of comparison is between risks of a similar nature where the comparison is realistic. Slovic (1986) gives the example of comparing

the risks associated with radiation from non-natural sources, e.g. medical X-rays, with naturally occurring background radiation. However, in many instances such straightforward meaningful comparisons are difficult to provide.

### 18.6 Information sources

The source of information about a particular risk is likely to be very important for a number of reasons. Sources may be seen as high in expertise, hence often increasing their persuasiveness, although they may also be seen as having a vested interest in withholding information or in presenting information in a biased manner.

There is evidence for expertise increasing persuasion (McGuire, 1985). Within the ELM (Petty and Cacioppo, 1986), in order for persuasion to occur, source factors such as expertise need to be accompanied by quality arguments when the issue of concern is very relevant to the individual. On the other hand, where the issue is of low relevance, source factors may serve as a simple inferential cue as to the quality of the arguments. For issues of intermediate personal relevance, source factors can influence the amount of information processing (Petty and Cacioppo, 1986). The persuasive impact of sources high in expertise is short-lived: in fact, it is a major proposal of the ELM that persuasion via the peripheral route is generally of limited duration.

In a study of group discussions on irradiated foods, a group leader who was expert in the area was found to reduce fears and to increase general consumers' willingness to buy irradiated products (in comparison with a non-expert group leader), possibly by being able to address specific questions raised (Bruhn *et al.*, 1986). However, the expert leader failed to have this impact on 'alternative consumers' who were already decided in their views.

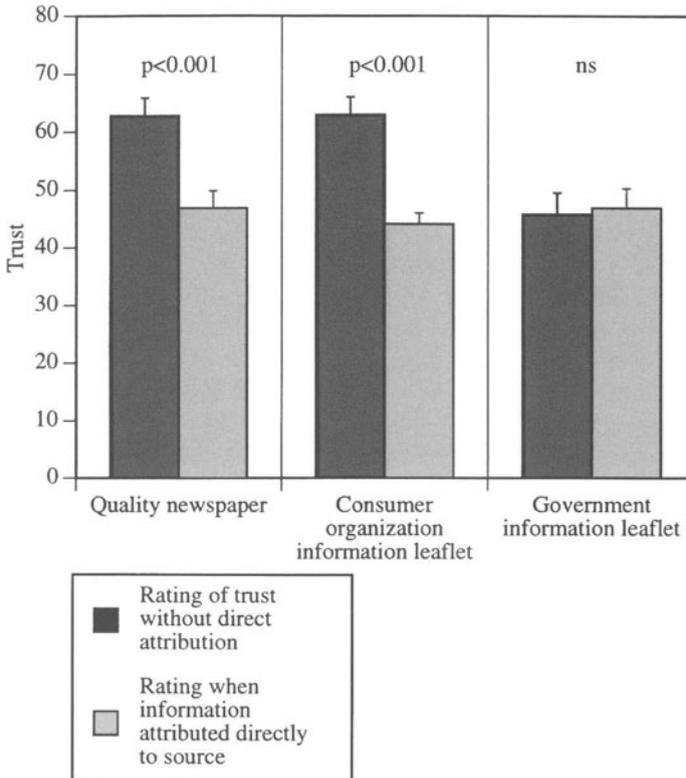
Source knowledge/expertise appears to have little impact if not accompanied by trustworthiness and may even reduce persuasiveness by emphasizing the remoteness of expert sources from ordinary people. Likewise, expertise will have a negative effect if the source is perceived to be personally involved and so less objective. A message will have maximum effect if the person is seen to be arguing against personal self-interest. For example, a political candidate may effect more opinion change when he is perceived to be arguing against his own self-interest. In real-world examples this would rarely be the case, although there may be examples, such as an industrial company identifying a safety problem in its own product, where it is not to the short-term advantage of the company to argue that the problem exists. Institutions also differ in how much they are trusted (McGuire, 1985) and, again, this is

likely to be affected by perceived self-interest. Credibility is likely to be one of the most important determinants of effective risk communication.

Despite source credibility being raised as a major potential problem in the context of risk communication, there has been little applied research on the actual effect of credibility. Dissent between sections of the public and scientists over the relative risks associated with particular technologies can be interpreted as reflections of underlying public distrust of scientific institutions. Consumer trust in the regulation of the food supply has declined. A survey conducted in the USA into consumer attitudes towards the use of pesticides indicated that these were determined by three underlying dimensions: safety of pesticides, necessity of pesticides, and trust in industry (Dunlap and Beus, 1992). As the public believes governments work closely with industry, who may be seen as having vested interests in putting forward a particular point of view, trust in regulation may be reduced. Thus one of the central questions addressed by the risk communication literature is why some individuals and organizations are trusted as sources of risk information and others are not. In particular, industry and government often lack public trust and credibility (Frewer and Shepherd, 1994), partly due to perceptions of lack of proactivity in communication with the public. Many government officials are perceived as being insensitive to the information needs and concerns of the public. Improvements in co-ordination and collaboration with organizations publicly perceived to be trustworthy may increase public perceptions of trustworthy behaviour.

An additional factor must be taken into account when assessing questions linked to trust and credibility. This relates to the nature of the hazard, and the context in which information is presented. For example, Frewer and Shepherd (1994) have shown that self-reported trust in hypothetical situations (where no information is presented) may not equate with behavioural responses to actual information when attributed to a particular source (Figure 18.1).

In this experiment, people were presented with information about genetic engineering in food production attributed to either a quality newspaper, a consumer organization information leaflet, or a government information leaflet. Respondents were asked to rate the extent to which they trusted the information. A fourth group of subjects was asked to rate trust in the same sources, but did not receive any information. A control group was asked to rate the extent to which they trusted the different sources, but were not provided with any information. When no information was presented, trust in the government source was significantly lower. However, differences in trust disappeared when actual information was provided (Figure 18.1).



**Figure 18.1** Trust in information attributed to different sources compared to stated trust in these sources when no information is presented. (Adapted from Frewer and Shepherd, 1994.)

### 18.7 Target recipients

A number of authors point to the need to consider the public as a heterogeneous rather than as a homogeneous group (Covello *et al.*, 1986; National Research Council, 1989). Members of the public may differ in their knowledge of particular issues and in how much they care about those issues. These factors are likely to be of great importance for risk communication strategies. The 'public', therefore, needs to be considered in terms of substantive differences between sub-groupings.

There are certainly demographic differences in the perception of risk. For example, women tend to perceive greater risks to be associated with various hazards than men, partly because of their tendency to perceive risks in terms of the consequences should they occur rather than the probability of occurrence. Flynn *et al.* (1993) have reported that European

males tend to associate less risk with environmental health hazards than women and members of other ethnic groups, suggesting that socio-economic and political factors such as empowerment, status and trust in risk regulators are as important in determining risk perceptions as actual estimates of the risks themselves.

Individual reactions to risk communication are likely to reflect social relations implicit in maintaining a particular way of life (Dake, 1991). This is related to the anthropological notion of 'cultural bias'. It assumes that there is a close relationship between general attitudes towards the world and how people think about different types of risks and how much they trust different sources of information. The individual differentially selects certain information sources as trustworthy so that they are consistent with the predominant world view held by that individual (Dake, 1991).

Cultural biases are defined as shared values and beliefs, and correspond to different patterns of interpersonal relationships, or perspectives on the structure of society – egalitarian, individualist, hierarchist, and fatalist. The combinations of cultural bias and social relationship are defined as 'ways of life'. Ways of life are not necessarily stable through an individual's lifetime, but may be subject to change. However, if the predominant cultural bias of an individual can be quantified at any given time, it should be possible to predict what that individual perceives as risky at that time.

Research has indicated that individualists (who are in favour of self-regulation and the free-market economy) are more likely to trust risk information from government and industrial sources. Hierarchists prefer a social organization where there is a clear structure of authority. Egalitarians value equality of outcome in the sense of diminishing distinctions between individuals in terms of economic inequalities. They tend to distrust industry, but rather favour those organizations or institutions which are seen as primarily concerned with collective outcomes rather than expansion of market economies. Fatalists see themselves as excluded from any formal organization of social life, and are thus more likely to distrust risk information from any organized social structure.

Given the results discussed above, it would seem unlikely that the same type of risk communication strategy would be equally effective for all target groups. Thus effective risk communication might best be 'tailored' to the predominant risk perception 'style' of different groups.

## **18.8 The role of the media**

The mass media are obviously important in modern societies for disseminating information. Certain media sources have been shown to be among the most trusted sources about food-related risk – in particular, the quality press and television news broadcasts are highly trusted, certainly in

comparison with government and industry (Frewer and Shepherd, 1994). Although the media have been accused of distortion and misinforming the public on issues of risk, this may be somewhat unfair (National Research Council, 1989). Given the technical difficulties involved in covering such stories, the frequent controversy surrounding them and the lack of any specialist knowledge by journalists, there are always likely to be problems. Slovic (1986) recommends schemes to encourage journalists to specialize in science writing and for professional bodies to set up information services. Fischhoff (1985) has suggested a number of checklists that reporters might use in evaluating information on risk. If used correctly, these would assist in accurate reporting. However, it is not clear whether reporters would be motivated to use such a complex procedure, particularly if it might ruin a 'good story'. It needs to be borne in mind that the media are in the business of entertainment and selling newspapers and advertising and not in the business of education. Those seeking to use the media to inform the public better have to play by the media rules.

What is the impact of media risk reporting on the behaviour of the public? The media have been shown to play an important part in the determination of societal risk perceptions, in a number of different cultures. Research has indicated that the media, as a source of information about food-related risk, have a high potential for influencing consumer behaviour. For example, Smith *et al.* (1988) examined the sales reduction following a food contamination incident (heptachlor found in fresh milk in Hawaii in 1982). They reported that the media coverage following the incident had a significant impact on milk purchases. Negative coverage was a more important determinant of consumer behaviour than positive coverage, and reporting of reassuring statements from government or manufacturers was ineffective in the restoration of public confidence. Similarly, media reporting following the Alar scare in the mid-1980s resulted in sales losses in the region of 30% (van Ravenswaay and Hoehn, 1991).

Media risk reporting also seems to influence risk attitudes. For example, Wiegman *et al.* (1989) investigated whether the quantity and content of newspaper coverage of technological and environmental hazards is related to the reactions of readers on that issue. Increased exposure to risk information was associated with more negative attitudes towards the hazards.

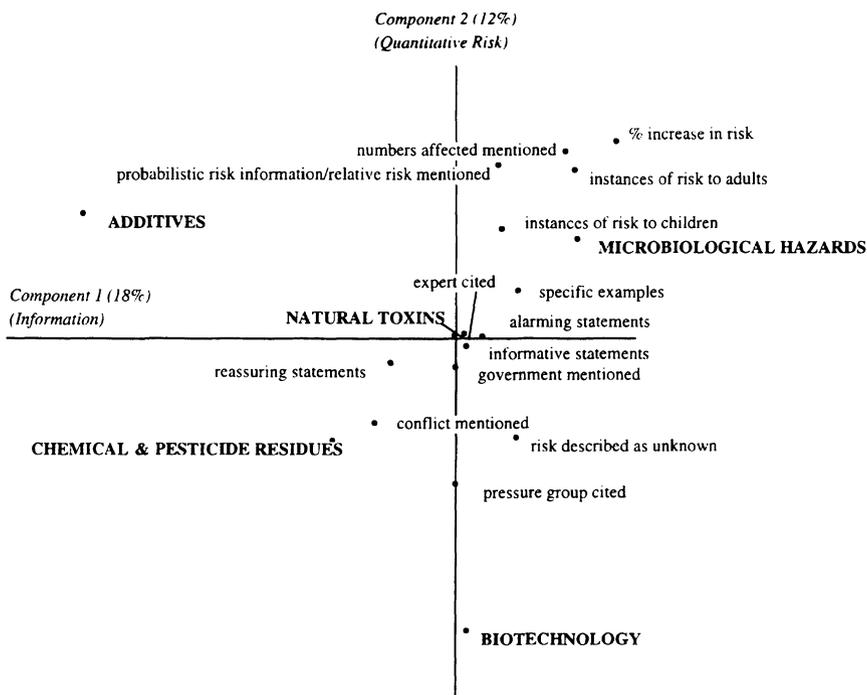
One of the key questions in this area is whether the information is seen to be trustworthy. It has been reported that trust in television news and newspaper reporting is dependent on the four attitudinal components of direction, intensity, closure and involvement (Stamm and Dube, 1994). Direction refers to the initial attitudinal perspective of the receiver of message information, such that agreement with the message is more likely to increase source credibility. Intensity refers to the extent to which the

source puts forward a particular view, and involvement the degree to which the receiver relates to the issue. The fourth component, closure, represents the extent to which the attitude is subject to change. All four components were shown to contribute to credibility of information presented. Credibility is clearly multi-dimensional, and cannot be predicted by single components.

The question arises as to what type of risk information is provided in the media, and whether there are differences according to the type of hazard. Sharlin (1987) has observed that there is a preference for media reporting to be presented in 'microrisk' terms (i.e. the impact on individual members of the population), and does not focus on the long-term, chronic, 'macrorisk' presentation of information favoured by government agencies and other risk communication specialists. This reflects the media tendency to present information in sensational and dramatic terms. Intuitively, this is because of both the need to engage an audience, and the competition between different journalists for editorial space in the newspapers.

There is evidence that different types of food-related hazards are linked to very different types of risk reporting. Frewer *et al.* (1993/4) conducted a content analysis which examined risk reporting of different food hazards in the British quality press over a period of 1 year, from February 1992 to January 1993. The risk information associated with a range of different food hazards ('intentional food additives', 'biotechnology and genetic engineering', 'chemical and pesticide residues', 'food irradiation', 'microbiological food contamination' and 'natural toxins') was identified and quantified. The resulting data were analysed using correspondence analysis to produce the plot shown in Figure 18.2.

Component 1 represents the quantity of risk information associated with different hazards. Hazards to the right of the figure are linked with more information. Component 2 represents the extent to which different hazards are associated with quantitative, as opposed to qualitative, information. Hazards to the top of the figure are linked with more statistical risk information than those towards the bottom. The results show that different food-related hazards are associated with different types of risk reporting. For example, microbiological hazards are associated with quantitative, statistical information. In contrast, the potential risks associated with biotechnology are presented in terms of value statements, and are linked to statements associated with the risk being unknown, and to conflict between the different 'actors' in the risk debate. To some extent, this might be predicted by the nature of the hazards themselves. However, food additives (where a great deal of quantitative risk information is available) are presented with very little risk information at all. Rather, food additives are presented as a risk, with no qualifying risk (or safety) information, thus implying that they should be avoided by the public.



**Figure 18.2** The type of risk information associated with different food hazards in the UK press. (Adapted from Frewer *et al.*, 1993/4.)

Factors that contribute to perceptions of personal risk are not necessarily the same factors that contribute to perceptions of societal risk. The media are likely to influence social-level risk perceptions to a greater extent than personal risk perceptions, although it is important to determine whether information-seeking by the public is active, and, if so, what caused it to be initiated.

One form of explanation of the role of the media in risk issues is that they act as part of a process of 'social amplification of risk' (Kasperson *et al.*, 1988). The social amplification of risk results from the notion that public perceptions of the dangers from hazardous events are defined not only by technical risks but also by the social environment. Amplification refers to the process whereby risk messages become more intense when the risk is discussed. The individuals or groups who collect information about risks communicate with others, and reported degree of risk is increased each time the risk message is passed on; this is the process of amplification.

If a risk is incorporated into the amplification network, various effects relating to the social processing of the risk may result (e.g. social stigmatization of the hazard and social disruption). The pattern of media

coverage may be one of the most important determinants of the social amplification of risk. The number of news stories, the duration of coverage and the 'half-life' of coverage are all factors of relevance. Risk attenuation, where risk communication ceases because the hazard is no longer seen to be dangerous, was found to occur at a local level, whereas risk amplification occurs at a national level (Kasperson *et al.*, 1988).

One effect of amplification processes is that chronic hazards may suddenly enter the arena of public awareness, despite the fact that the hazard has been present for many years. In general, new hazards are perceived as being riskier than older hazards. However, sudden media 'awareness' of the hazard induces public awareness of the hazard, an amplification effect in itself, which might be further amplified by media attention. Thus a 'chronic' hazard may appear to be 'episodic' through the process of media amplification.

### **18.9 Practical concerns in risk communication**

While the development of theories of risk perception and communication remains an important and necessary objective, there are also other ways of looking at the processes involved in risk communication. One useful procedure is to use case studies in order to examine in some depth particular instances of risk communication in order to see what we might learn from these specific examples. Although there is a dearth of published case studies of risk communication (National Research Council, 1989), examination of such cases as do exist (e.g. Sharlin, 1986; Fessenden-Raden *et al.*, 1987; Weterings and Van Eijndhoven, 1989; Chess *et al.*, 1992) can give an insight into the problems of risk communication.

Weterings and Van Eijndhoven (1989), for example, studied three cases of soil pollution in The Netherlands. They concluded that, despite efforts at communication of risk to residents, there were problems in all of the cases. These problems included the use of technical language, the lack of explicit mention of health risks despite indications of how to reduce risks to health, and the lack of discussion of uncertainty in the risk assessments. In two cases this led residents to employ their own experts, who then made 'worst-case' estimates of the risks. Although the authors suggest that communicators should present not only a 'probable case' but also a 'worst case' and a 'best case', this seems likely to confuse people, and the presentation of worst cases would be expected to have a very negative effect (based upon the availability heuristic) (Tversky and Kahneman, 1973).

Qualitative case studies were carried out by Fessenden-Raden *et al.* (1987) into a series of incidents involving chemical contamination of water. Their analysis stresses the role of the receivers of the information and the

nature of the community rather than the individual in these types of cases. They highlight a number of common themes. If the public is the first to identify the problem rather than the authorities, it will view subsequent risk communications from the authorities with suspicion. They also highlight other aspects of the community, such as other current community concerns, attitudes towards local government, attitudes towards state and federal agencies and attitudes towards the presumed polluter (is it a member of the community or an outsider?). Individuals still varied in their reception of the information within communities based on personal experience, although some of the interpretation of risk information may be influenced by the views of others in the community. They point to the problems of interpretation of technical statements such as 'parts per million'. They also point out the reduction in the effects of use of phrases such as 'carcinogenic in mice', showing the reduced shock value with repeated use. Oversimplification of the problems is mentioned by Fessenden-Raden *et al.* (1987), e.g. the use of maximum contaminant levels below which people are said to be safe and above which they are said to be at risk. This again highlights the problems that people may experience with statistical concepts.

Chess *et al.* (1992) have used the case study approach to explore the question of what organizations must do internally in order to increase the effectiveness of their risk communication with the public. They report that an accidental release of ethyl acrylate (which poses a low degree of hazard if exposure is intermittent and at low doses) was effectively handled in terms of risk communication by the chemical company concerned. This was partly because immediate responses could be made to community concerns because of the close links between those personnel managing the risks and those involved in communication about the risks, with some people even having a dual role. However, the authors add the caveat that findings from a small organization in a crisis management situation do not necessarily generalize to the management of chronic risks in larger organizational contexts.

Case studies provide a useful means for assessing the real-world application of risk communication techniques. However, they are not sufficient to provide the basic scientific underpinning of this area. This must be provided by systematic investigation and the implications tested in real risk communication contexts. Case studies in themselves tend to be idiosyncratic and, hence, problems of generalization abound.

### **18.10 Conclusions**

While it is reassuring to the public to know that legislation exists to control potential hazards, simply legislating to control for risk is not the answer

to risk communication, because the concerns of the public are not necessarily the same as those of science. Publishing risk information does not facilitate risk communication unless issues of public concern are directly addressed, unless the communicators are trusted, and unless legislation is the result of public discussion regarding regulatory needs.

Of course, there are many actors in the area of risk communication. The regulators, industry, pressure groups and the media may all have different agendas in terms of communicating on risks. However, if risk communicators are to be effective, they need to consider a number of issues concerning how they go about such communications.

Risk communication should focus not only on the risks and benefits of the hazards themselves, but also on the risks and benefits associated with alternative courses of action. This is likely to be the only way to facilitate the process of informed choice regarding lifestyle choices or acceptance of technology and its products.

The first stage in effective risk communication is to understand what the public knows and believes, rather than to initiate communication from the perspective of what scientists think the public ought to know. The use of interview techniques, surveys and focus groups may facilitate this process of understanding what it is that the public understands (or does not understand) and what it needs to know, as well as establishing a dialogue between expert and public.

A set of general guidelines for effective risk communication cannot be given. It is crucial to develop a complete understanding of the characteristic public risk perceptions of the particular hazard in question. However, some elements of effective risk communication are common to all hazards; for example, credibility and trust in the source of the information is one of the most important determinants of effective risk communication. Furthermore, not all individuals will react to risk communications in the same way. The concerns of the minority should not be considered irrelevant if they are not the concerns of the majority.

It is also crucial that the issues surrounding ambiguity and the concept of science as a process be fully addressed. If the public is to understand the messages of risk communicators, and make informed choices about the relevant issues, information about the fundamental uncertainty implicit in science and scientific research should be included in the risk message.

### **Acknowledgements**

Parts of the work reported here were funded by the UK Ministry of Agriculture, Fisheries and Food and by the Biotechnology and Biological Sciences Research Council.

## References

- Alhakami, A.S. and Slovic, P. (1994) A psychological study of attitudes. *Risk Analysis*, **14**(6), 1085–1096.
- Bruhn, C.M., Schutz, H.G. and Sommer, R. (1986) Attitude change toward food irradiation among conventional and alternative consumers. *Food Technology*, **40**(1), 86–91.
- Chess, C., Saville, A., Tamuz, M. and Greenburg, M. (1992) The organizational links between risk communication and risk management: the case of Sybron chemicals Inc. *Risk Analysis*, **12**(3), 431–438.
- Covello, V.T., von Winterfeldt, D. and Slovic, P. (1986) Risk communication: a review of the literature. *Risk Abstracts*, **3**, 171–182.
- Crouch, E.A.C. and Wilson, R. (1982) *Risk/Benefit Analysis*,. Balinger, Cambridge.
- Dake, K. (1991) Orientating dispositions in the perception of risk: an analysis of contemporary worldviews and cultural biases. *Journal of Cross Cultural Psychology*, **22**(1), 61–82.
- Dunlap, R.E. and Beus, C.E. (1992) Understanding public concerns about pesticides: an empirical examination. *Journal of Consumer Affairs*, **26**, 155–171.
- Fessenden-Raden, J., Fitchen, J.M. and Heath, J.S. (1987) Providing risk information in communities: factors influencing what is heard and accepted. *Science, Technology and Human Values*, **12**, 94–101.
- Fischhoff, B. (1985) Environmental reporting: what to ask the experts. *The Journalist*, Winter, 11–15.
- Fischhoff, B., Bostrum, A. and Quadrel, M.J. (1993) Risk perception and communication. *Annual Review of Public Health*, **14**, 183–203.
- Flynn, J., Slovic, P. and Mertz, C.K. (1993) Decidedly different: expert and public views of risks from a radioactive waste repository. *Risk Analysis*, **13**(6), 643–648.
- Frewer, L.J. and Shepherd, R. (1994) Attributing information to different sources: effects on the perceived qualities of the information, on the perceived relevance of the information, and on attitude formation. *Public Understanding of Science*, **3**(4), 385–403.
- Frewer, L.J., Raats, M.M. and Shepherd, R. (1993/4) Modelling the media: the transmission of risk information in the British press. *Institute of Mathematics and its Applications to Technology and Industry*, **5**, 235–247.
- Frewer, L.J., Shepherd, R. and Sparks, P. (1994) The interrelationship between perceived knowledge, control and risk associated with a range of food related hazards targeted at the self, other people and society. *Journal of Food Safety*, **14**, 19–40.
- Jasanoff, S. (1993) Bridging the two cultures of risk analysis. *Risk Analysis*, **13**(2), 123–129.
- Kasperson, R.E., Renn, O., Slovic, P. et al. (1988) The social amplification of risk: a conceptual framework. *Risk Analysis*, **8**(2), 177–187.
- Kraus, N., Malmfors, T. and Slovic, P. (1992) Intuitive toxicology: expert and lay judgements of chemical risks. *Risk Analysis*, **12**(2), 215–232.
- Lichtenstein, S., Slovic, P., Fischhoff, B. et al. (1978) Judged frequency of lethal events. *Journal of Experimental Psychology: Human Learning and Memory*, **4**, 551–578.
- McGuire, W.J. (1985) Attitudes and attitude change. In: Lindzey, G. and Aronson, E. (eds) *Handbook of Social Psychology*, 3rd edn, Vol. 2, pp. 233–346. Random House, New York.
- National Research Council (1989) *Improving Risk Communication*. National Research Council, Washington DC.
- Petty, R.E. and Cacioppo, J.T. (1986) *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. Springer-Verlag, New York.
- Rosenberg, J. (1978) A question of ethics: the DNA controversy. *American Educator*, **2**, 27–30.
- Ruckelshaus, W.D. (1985) Risk, science, and democracy. *Issues in Science and Technology*, **1**(3), 19–38.
- Sharlin, H.I. (1986) EDB: a case study in communicating risk. *Risk Analysis*, **6**, 61–68.
- Sharlin, H.I. (1987) Macro-risks, microrisks and the media: the EDB case. In: Johnson, B.B. and Covello, V.T. (eds) *The Social and Cultural Construction of Risk*. Reidel, Dordrecht, pp. 183–198.
- Slovic, P. (1986) Informing and educating the public about risk. *Risk Analysis*, **6**(4), 403–415.
- Slovic, P. (1987) Perception of risk. *Science*, **230**, 280–285.

- Slovic, P., Fischhoff, B. and Lichtenstein, S. (1982) Facts versus fears: understanding perceived risk. In: Kahneman, D., Slovic, P. and Tversky, A. (eds) *Judgment under Uncertainty: Heuristics and Biases*. Cambridge University Press, Cambridge, 463–489.
- Slovic, P., Kraus, N. and Covello, V. (1990) What should we know about making risk comparisons? *Risk Analysis*, **10**, 389–392.
- Smith, M.E., van Ravenswaay, E.O. and Thompson, S.R. (1988) Sales loss determination in food contamination incidents: an application to milk bans in Hawaii. *American Journal of Agricultural Economics*, **70**, 513–520.
- Stamm, K. and Dube, P. (1994) The relationship of attitudinal components to risk in the media. *Communication Research*, **21**, 105–123.
- Tversky, A. and Kahneman, D. (1973) Availability: a heuristic for judging frequency and probability. *Cognitive Psychology*, **4**, 207–232.
- Tversky, A. and Kahneman, D. (1986) Rational choice and the framing of decisions. In: Hogarth, R.M. and Reder, M.W. (eds) *Rational Choice: The Contrast between Economics and Psychology*, pp. 67–94. University of Chicago Press, Chicago.
- Van Ravenswaay, E.O. and Hoehn, J.P. (1991) The impact of health risk information on food demand: a case study of Alar and apples. In: Caswell, J.A. (ed.) *Economics of Food Safety*. Elsevier Science Publishing, New York, pp. 155–174.
- Weterings, R.A.P.M. and Van Eijndhoven, J.C.M. (1989) Informing the public about uncertain risks. *Risk Analysis*, **9**(4), 473–482.
- Wiegman, O., Gutteling, J.M., Boer, H. and Houwen, R.J. (1989) Newspaper coverage of hazards and the reactions of readers. *Journalism Quarterly*, **56**, 844–852.