BEST COMMUNICATION PRACTICES IN COMMUNICATING A DRINKING-WATER-RELATED PUBLIC HEALTH EMERGENCY

A paper prepared for the Walkerton inquiry

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This draft paper has been prepared as a background document for the Walkerton Inquiry. It is intended to generate and inform discussion about the safety of drinking water among parties with standing, relevant experts, and the public. It does not represent the findings, views or recommendations of the Commissioner. Written comments in response to the paper are welcome and will form part of the public record of the Inquiry. They should be submitted to:

Part 2 Comments
The Walkerton Inquiry
180 Dundas Street West, 22nd Floor
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Executive Summary

The E. coli O157:H7 waterborne outbreak in Walkerton, Ont., Canada, in May 2000, presented a clear and present danger of risk to citizens who consumed that water -- at least in retrospect. More challenging though, is to know when a risk is severe enough to warrant extraordinary communications and how best to compel citizens to comply with health advisories.

Risk theory, involving assessment, management and communication, is important to underpin discussions of how regulators, industry and citizens incorporate and act on information about risks -- such as the hazards posed by E. coli O157:H7 in drinking water. Today it is well accepted that the three components of risk analysis cannot be separated and are, in fact, integrated, and that communication involves the multi-directional flow of information.

Evidence from recent water-borne disease outbreaks illustrates the importance of timeliness in health related warnings. Timeliness of message delivery is dependent on how quickly a problem is identified, and how the message is delivered. The public can passively receive information on health related risks from the media or the utility, or actively seek out information from information sources such as the Internet, telephone hotlines or library services (Casman et al., 2000).

In determining when to go public with health advisories, health authorities report that every outbreak of food- or water-borne illness must be examined using factors such as severity, potential impact and incubation time of the suspect pathogen. The health risk outcome of microbiological hazards to the public should be assessed, discussed and quantified among workers from diverse disciplines, including health officials, veterinarians, food processing experts, microbiologists, medical doctors, risk analysis experts, and consumer behavior experts.

Once sufficient evidence exists to issue a public health advisory, risk messages must be designed that accurately describe the risk to individuals and provide concrete steps that individuals can take to reduce the chances of risk exposure. Further, the number of suspected or confirmed illnesses related to the particular
outbreak should be included as a matter of course in any public communications. And once health advisories have been created, a variety of message delivery techniques need to be employed, again depending on the severity of the hazard, the size of the impacted population and local circumstances.

For a severe and immediate hazard such as E. coli O157:H7 in drinking water, a mixture of low-to-high technology message delivery mechanisms should be employed, including door-to-door, the buddy system, the use of existing community networks such as Neighbourhood Watch, emergency hubsite information centers and even mobile megaphones, complimented by more broader mechanisms such as local media, posting information on a website, automated telephone messages, broadcast faxes, and electronic mail distribution. However, the key to using any of these technologies effectively is to plan ahead and be prepared. Effective planning will establish which techniques are best for the size of the community and the existing infrastructure. No one technology can reach all members of the target audience, therefore combining delivery methods is essential.

The current state of risk management and communication research suggests that those responsible with food and water safety risk management must be actively seen to be reducing, mitigating or minimizing a particular risk. The components for managing the stigma associated with any food safety issue seem to involve all of the following factors:

- effective and rapid surveillance systems;
- effective communication about the nature of risk;
- a credible, open and responsive regulatory system;
- demonstrable efforts to reduce levels of uncertainty and risk; and,
- evidence that actions match words.

This report has been concerned with the second point, the ability to effectively communicate about the nature of risk. E. coli O157:H7 is not regular E. coli. It is a highly virulent and dangerous pathogen that sickens tens of thousands annually in North America and kills hundreds. Each year since the 1993 Jack-in-the-Box outbreak has brought a high profile and deadly outbreak of E. coli O157:H7 from some corner of the developed world; outbreaks that receive significant media coverage and provide new insights; Australia in 1994 (involving the related E. coli O111); Scotland and Japan in 1996; a waterpark in Atlanta, Ga in 1998. While many Canadians may be unfamiliar with such outbreaks -- media coverage in Canada is superficial at best, frequently focused on the hypothetical risks posed by various food-related technologies while ignoring the carnage associated with food and water-borne pathogens.
Any local efforts must be supported by a national culture of awareness regarding a risk such as E. coli O157:H7, which has been known to cause outbreaks and severe illness, and sometimes death, for almost 20 years. When compared to outbreaks and response in the U.S., it is observed that outbreaks, particularly of E. coli O157:H7 bring a sustained policy response from the highest levels of government, including the Office of the President. While there have been many private-sector initiatives in Canada to enhance the safety of the food supply, these efforts are rarely communicated or discussed by government, short of admonitions to "cook hamburger thoroughly."
Chapter 1: A review of risk analysis and risk communication
Introduction

The E. coli O157:H7 waterborne outbreak in Walkerton, Ont., Canada, in May 2000, presented a clear and present danger of risk to citizens who consumed that water -- at least in retrospect. More challenging though, is to know when a risk is severe enough to warrant extraordinary communications and how best to compel citizens to comply with the warnings. This paper seeks to review what is known about risk theory and the communication of risk, emergency communications from other outbreaks of food- and waterborne illness, available technologies and techniques to communicate in an outbreak scenario, and what would constitute a best practices approach to communications in future outbreaks.

An Overview of Risk Theory
Risk theory is a relatively new scientific endeavor and can be defined as the science of understanding scientific and technological risk and how it is communicated within a socio-political structure (Starr, 1969).

Risk theory is important to underpin discussions of how regulators, industry and citizens incorporate and act on information about risks -- such as the hazards posed by E. coli O157:H7 in drinking water.

Over the past decade, an understanding of how the public perceives risk, how the media translates this information, and how government, industry and other organizations can better relate risk information over a wide range of disciplines has been developed.

Covello and Merkhofer (1994) define risk as a combination of something that is undesirable and uncertain. More specifically, "the possibility of an adverse outcome, and uncertainty over the occurrence, timing or magnitude of that adverse outcome."
Within this definition there are three components of risk analysis:

**Risk assessment:** Risk assessment, it has been argued, is a scientific assessment of the so-called actual risk. It is the process of characterizing a risk. Questions that should be asked include: What can go wrong? How likely is a bad outcome? How long will it take before it occurs. What might be the importance of the loss?

**Risk management:** the process of deciding what to do about a risk.

**Risk communication:** involved the communication of a policy decision.

This three-component definition of risk analysis was first formalized by the U.S. National Academy of Sciences—through its U.S. National Research Council—in 1983, in a publication commonly referred to as, The Red Book. The 1983 NAS-
NRC model explicitly distinguished and separated these three stages of risk analysis: assessment, management and communication.

However, by the 1990s, the NAS-NRC paradigm became more widely criticized as unworkable and unrealistic. Covello and Merkhofer (1994) argue that, “The current state of the art of risk assessment does not permit questions of science to be clearly separated from questions of policy. In practice, assumptions that have potential policy implications enter into risk assessment at virtually every stage of the process. The ideal of a risk assessment that is free, or nearly free, of policy considerations is beyond the realm of possibility.”

Even the use of conservatism—the risk assessor errs on the side of safety—is a value judgment deliberately introduced into risk assessments to account for uncertainty which can produce highly distorted risk assessments which affect the pattern of regulation, preventing limited resources for health and safety from being efficiently allocated.

**Integrating risk assessment, management and communication**

Soby et al. (1993), in a review of risk communication research and its applicability for managing food-related risks, developed the concept of the risk management cycle. In this model, public and other stakeholder concerns are actively sought at each stage of the management process—including assessment. “Unless the risk assessment procedure involves an element of interactive public participation and mutual questioning the decisions and conclusions reached may be more likely to be challenged” (Simpson, 1994).

This integrative approach to risk analysis was endorsed in a report by the U.S. National Academy of Sciences' National Research Council Committee on Risk Characterization (1996), which urged risk assessors to expand risk characterization beyond the current practice of translating the results of a risk analysis into non-technical terms, calling this limited approach "seriously deficient" and one that should be replaced with an analytical-deliberative approach that involves stakeholders from the very inception of a risk assessment. The report reframed risk characterization from an activity that happens at the end of the risk assessment process, as many people understand it, to a continuous, back-and-forth dialogue between risk assessors and stakeholders that allows the problem to be formulated properly, and depends on an iterative, analytic-deliberative process.

Similarly, the U.S. Presidential/ Congressional Commission on Risk Assessment and Risk Management (1997) developed an integrative framework to help all types of risk managers—government officials, private sector businesses, individual members of the public—make good risk management decisions. The framework has six stages (Fig. 1):
• define the problem and put it in context;
• analyze the risks associated with the problem in context;
• examine options for addressing the risks;
• make decisions about which options to implement;
• take actions to implement the decisions; and,
• conduct an evaluation of the action’s results.

Of particular importance is that the Framework is conducted in collaboration with stakeholders and using iterations if new information is developed that changes the need for, or nature of, risk management. As Pollak (1996) has argued, due to the inadequacy of scientific knowledge and the lack of public trust in government and in experts, risk regulators should be concerned both with creating institutional arrangements likely to foster trust and mechanisms for providing concerned individuals with credible reassurance.

Fig. 1. The risk management cycle. U.S. Presidential/Congressional Commission on Risk Assessment and Risk Management (1997).

The current state of risk management and communication research suggests that those responsible with food safety risk management must be seen to be reducing, mitigating or minimizing a particular risk. Those responsible must be able to effectively communicate their efforts and they must be able to prove they are actually reducing levels of risk. As Slovic (1997) has noted, “We live in a world in which information, acting in concert with the vagaries of human perception and cognition, has reduced our vulnerability to pandemics of disease at the cost of increasing our vulnerability to social and economic catastrophes of unprecedented scale. The challenge before us is to learn how to manage stigma and reduce the vulnerability of important products, industries, and institutions.
to its effects, without suppressing the proper communication of risk information to the public.”

Stigma is a powerful shortcut consumers may use to evaluate food- and water-borne risks. Gregory, et al. (1995) have characterized criteria that can lead to the formation of stigmata:

• the source is a hazard;
• a standard of what is right and natural is violated or overturned;
• impacts are perceived to be inequitably distributed across groups;
• possible outcomes are unbounded (scientific uncertainty); and,
• management of the hazard is brought into question.

The potential for stigmatization of food and water is enormous. Well-publicized outbreaks of foodborne pathogens and the furor over agricultural biotechnology are but two current examples of the interactions between science, policy and public perception. Current risk management research indicates that it is essential for risk managers to show that they are reducing, mitigating or minimizing a particular risk. Those responsible must be able to effectively communicate their efforts and must be able to prove they are actually reducing levels of risk.

The components for managing the stigma associated with any food safety issue involve the following factors (Powell, 2000):

• effective and rapid surveillance systems;
• effective communication about the nature of risk;
• a credible, open and responsive regulatory system;
• demonstrable efforts to reduce levels of uncertainty and risk; and,
• evidence that actions match words.

Today it is well accepted that the three components of risk analysis cannot be separated and are, in fact, integrated, and that communication involves the multi-directional flow of information.

**Risk Communication:**

"The usefulness of communication though is limited by the timeliness of the message. Speeding up utilities ability to detect pathogenic organisms in water samples would allow consumer communications to significantly limit the progression of an outbreak." (Casman et al, 2000)

Risk communication, the science of understanding scientific and technological risk and how it is communicated within a socio-political structure, is a relatively new scientific endeavor. Starr's 1969 paper was the first attempt to offer a
scientific basis for thresholds of risk that were accepted by the public. As public concerns regarding nuclear power gained prominence in the 1970s, investigators tried to establish general principles of public risk acceptability. This was usually based on mortality statistics and the de minimis risk principle, which argued that if a risk can be effectively lowered to less than one additional fatality per million citizens, the risk is effectively zero (U.S. National Research Council. 1989). Such a morbid approach was uniformly unsuccessful.

In the 1980s, several groups developed models that incorporated the value systems of individuals, peer groups and societies into risk communication theory (Vlek and Stallen, 1981; Douglas, 1986; Slovic, 1987) resulting in broad agreement that risks are viewed according to their perceived threat to familiar social relationships and practices, and not simply by numbers alone. The psychometric paradigm (Slovic, 1987) described risk from a psychological perspective, drawing on various characteristics or dimensions that may be important in influencing risk perceptions. Douglas and Wildavsky (1982) first described the cultural theory of risk in which individuals can be allocated into cultural groups based on shared values and beliefs. Whereas the psychometric paradigm holds that risk itself is deterministic in generating perceptions, the cultural theory holds that the characteristics of the perceiver—rather than the risk itself—are central to an understanding of risk perception. Kasperson et al. (1987) developed the social amplification of risk theory, which suggested a way to integrate the aforementioned frameworks into a comprehensive accounting of the social, cultural and individual characteristics which tend to magnify or amplify one risk over another.

During the 1980s, several researchers proposed that the public generally pays too little attention to the hazard side of risks, and experts usually completely ignore the outrage side (Sandman, 1987). As ‘hazard’ and ‘outrage’ are two very different starting points it is not surprising that experts and consumers often rank the relative importance of various risks very differently (Sandman, 1987; Slovic, 1987). Scientists, in general, define risks in the language and procedures of science itself. They consider the nature of the harm that may occur, the probability that it will occur, and the number of people who may be affected (Groth, 1991). Most of the general public seems less aware of probabilities and the size of a risk, but much more concerned with broader, qualitative attributes. These could include whether the risk is voluntarily assumed, whether the risks and benefits are weighed up, whether the risk is controllable by them, whether a risk is necessary and unavoidable or whether there are safer alternatives, whether the risk is familiar or exotic, whether the risk is natural or technological in origin, and so forth (Sandman, 1987).

By 1989, the U.S. National Research Council committee on risk perception and communication defined risk communication as, “An interactive process of exchange of information and opinion among individuals, groups and
institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, which express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management. In essence, risk communication must be treated as a reciprocal process- including the opinions of all stakeholders, not simply those who wish to sell their side of the story more effectively.

A body of knowledge has been created over the past decade which can assist in the understanding of public perceptions of microbial food safety risk, how the media translates this information, and how government, industry and other organizations can better relate risk information over a wide range of disciplines. The growth of interest in risk communication is driven by four motivations:
• a requirement for-or desire by-government to inform in the participatory democracies of Western politics, from informal consultation to legislated accountability (such as the U.S. Administrative Procedures Act of 1946 and the Community Right to Know provisions of Title III of the Superfund Amendments and Reauthorization Act of 1986);
• desires to overcome opposition to decisions;
• a desire to share power between government and public groups; and,
• a desire to develop effective alternatives to direct regulatory control (U.S. National Research Council, 1989).

Underlying these motivations is a general recognition that decision-making in democratic societies is becoming more public and is increasingly driven by non-experts. Thus, the need for a paradigm or system, such as the risk management cycle, which acknowledges this transition. The ability to apply science-based solutions to food and water safety and other food-related challenges is intricately dependent on issues of public perception, the regulatory environment, fairness, accountability and, most importantly, trust.

Risk perception
According to Covello (1992a; 1983), research in the psychological sciences has identified 47 known factors that influence the perception of risk; issues like control, benefit, whether a risk is voluntarily assumed and, the most important factor, trust. These factors can help explain why consumers are concerned about food safety issues that scientists deem trivial, and vice-versa. The actual risk does not change, but the perception can; and in the domain of public policy, perception is reality (Covello, et al., 1988; U.S. National Research Council, 1989). People also judge risk according to their perception of its controlling agents: if these controlling agents have a track record of secrecy, or they dominate supposedly independent regulatory bodies and the public policy process, then people magnify the perceived risks (Hamstra, 1992; Covello, 1992b).
Other factors modulating risk perception, as cited by Covello and Merkhofer (1994) include:
• catastrophic potential—people are more concerned about fatalities and injuries that are grouped in time and space (airplane crashes; outbreaks of foodborne illness) than about fatalities and injuries that are scattered or random in time and space (auto accidents; sporadic incidents of foodborne illness);
• familiarity—people are more concerned about unfamiliar risks (ozone depletion) than familiar risks (household accidents);
• understanding—people are more concerned about poorly understood activities (exposure to radiation) than those that may be understood (slipping on ice);
• scientific uncertainty—people are more concerned about risks that are scientifically unknown or uncertain (recombinant DNA) than risks well known to science (car crashes);
• controllability—people are more concerned about risks not under personal control (pesticides on food) than those under personal control (driving a car);
• voluntariness of exposure—people are more concerned about risks that are imposed (residues in food) rather than voluntarily accepted (smoking cigarettes);
• impact on children—people are more concerned about risks perceived to disproportionately affect children;
• dread—people are more concerned about risks that have dreaded results (Creutzfeldt-Jakob disease is perceived as an undesirable way to die);
• institutional trust;
• media attention;
• accident history;
• clarity of benefits;
• reversibility;
• personal stake; and,
• attributability.

Problems in communicating about risks originate primarily in the marked differences that exist between the two languages used to describe risk: the scientific and statistical language of experts, and the intuitively-grounded language of the public (fig. 2).

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<tr>
<th>“Expert” Assessment of Risk:</th>
<th>“Public” Assessment of Risk:</th>
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<td>Scientific</td>
<td>Intuitive</td>
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11
Probabilistic  
Acceptable Risk  
Changing Knowledge  
Comparative risk  
Population averages  
A death is a death

Yes/ No  
Safety  
Is it or isn’t it?  
Discrete events  
Personal consequences  
It matters how we die

**Fig. 2. Some characteristics of the two languages of risk communication (Powell and Leiss, 1997)**

The expert assessment of risk is essential to the making of informed choices in everyday life: To ignore the results of scientific risk assessments (ever-changing as they are) is to merely substitute an informal deliberative process for a formal one (Powell and Leiss, 1997). At the same time, citizens in a democratic society cannot allow experts to dictate lessons in risk management to them; on the contrary, their informed consent must form the basis for the collective allocation of resources for risk control and risk reduction. In general, therefore, society must manage the tension between these two profoundly different ways of representing risk, rather than try to eliminate the difference itself.

Therefore, both languages for describing risk are necessary, because the daily business about managing risks – both the personal business of individuals and the social allocation of risk reduction resources — cannot be conducted in either language alone. At the same time, the strong differences between the two languages constitute barriers to dialogue and co-operative understanding. Good risk communication practice seeks to break down those barriers and facilitate the productive exchanges between the two spheres: information, skills, and participatory opportunities.

Powell and Leiss (1997) have located the work of risk communication in the gap that separates the evolving scientific description of risks and the public understanding of those same risks (fig. 2). Further, they suggest that the
competing “expert” and “public” understandings of the same risks are equally legitimate and necessary.

Confused, complex messages about scientific risk, technical uncertainty, and prevailing climate of mistrust are just some of the factors that make effective risk communication difficult; not impossible, but difficult. Covello and Allen (1988) have summarized the seven cardinal rules of risk communication, as follows:

• accept and involve the public as a legitimate partner;
• plan carefully and evaluate performance;
• listen to your audience;
• be honest, frank and open;
• co-ordinate and collaborate with other credible sources;
• meet the needs of the media; and,
• speak clearly and with compassion.

Several collections, guides and reviews of risk communication have been published over the past 10 years (Powell and Leiss, 1997; Lundgren, 1994; Morgan, 1993; Morgan, et al., 1992; U.S. National Research Council, 1989; Leiss, 1989; Covello, et al., 1988; Hance, et al., 1988; Covello, et al., 1986).

Baruch Fischhoff of Carnegie-Mellon University (1995) says that over the past 20 years, risk communication has evolved by acquiring new skills, “only to discover that there were additional, more complicated problems to solve.” He goes on to offer a sardonic view of the developmental stages in risk management, which he subtitles, Ontogeny Recapitulates Phylogeny:

• all we have to do is get the numbers right;
• all we have to do is tell them the numbers;
• all we have to do is explain what we mean by the numbers;
• all we have to do is show them that they’ve accepted similar risks in the past;
• all we have to do is show them that it’s a good deal for them;
• all we have to do is treat them nice;
• all we have to do is make them partners; and,
• all of the above.

Or, as Thomas Jefferson wrote in a letter to William Charles Jarvis, dated Sept. 28, 1820, "I know of no safe depository of the ultimate powers of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion" (U.S. National Research Council, 1989, p.14).
Effective communication of information and opinion associated with real or perceived hazards in food and water is an essential and integral component of the risk analysis process. Risk communication may originate from official sources at international, national or local levels. It may also originate from other sources such as industry, trade, consumers and other interested parties, including, but not limited to, government agencies, industry representatives, media, scientists, professional societies, consumer organizations and other public interest groups and concerned individuals.

In 1997, the Codex Alimentarius Commission (CAC) adopted the following definition of risk communication: "An interactive exchange of information and opinions concerning risk among risk assessors, risk managers, consumers and other interested parties" (FAO/WHO, 1997). Risk communication has also been described as all those integrated processes and procedures that: a) involve and inform all interested parties within the risk analysis process; b) assist the development of transparent and credible decision-making processes; and c) can instill confidence in risk management decisions. A wide variety of communication strategies can be used in the management of food-related risks, ranging from the development of international standards, to management of acute outbreaks of foodborne disease, to long-term programs aimed at changing food production, food handling and dietary practices.

This definition of risk communication is, however, too narrow, as it does not take into account the need to communicate factors other than probabilities of adverse health effects. Understanding and communicating risk has clearly been shown to be influenced by a host of additional factors, such as whether the risk is voluntary or involuntary; whether the distribution of risk and benefit is equitable; the transparency of the process; the extent to which risk managers are trusted; the degree of personal control; the individual dread of the adverse effect; and the extent to which the risk is unknown (Sandman, 1987). To encompass this wider concept, the definition would read "Risk communication is the exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers and other interested parties" (FAO/WHO, 1998).

The fundamental goal of risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to a specific audience. It may lead to more widely understood and accepted risk management decisions. Effective risk communication should have goals that build and maintain trust and confidence. It should facilitate a higher degree of consensus and support by all interested parties for the risk management option(s) being proposed.
Fulton (Byrd and Cothern, 2000) developed a set of 'musts' and 'shoulds' that provide a help outline the requirements of risk communication:

?? A communication message must be concise. For example, the conclusion should be stated in 12 to 15 words and should not contain technicalities or jargon.

?? The message should be positive. Negative connotations divert attention and discourage action. (e.g. 'Boil water and it will be safe to drink' as opposed to 'Boil water before or you will fall ill'.) 

?? The message must address underlying concerns or the public will think that you are not listening.

?? A successful message also must be repeated, ideally from different sources.

?? The message must provide a source of additional information. Some individuals will want to know more in order to follow up on suggestions.

?? A successful message is in plain language, comprehensible to the target audience. The risk communication message should be memorable. If your target audience has to write it down it is likely that you did not give them information that they will remember.

?? A good message should include analogies or personal stories, something the target audience can relate to. Also, the message should be personalized because if the listener does not realize that the message involves them at a personal level, it will not impress them.

?? The message should be qualitative and not numerical. Millions, billions and orders of magnitude often confuse rather than clarify a risk message. It is also advisable to avoid vague terms such as big, small, inconsequential, minimal, etc., because it is likely that different groups will interpret them differently. The message should be conveyed in terms of concern for the health and welfare of the listener. Avoid making the audience feel ignorant with number and jargon.

?? The message can be enhanced using stories and anecdotes.

?? A message should acknowledge major uncertainties. All risk estimates involve uncertainty. The more you acknowledge them honestly, the more the audience will trust you.

The role of media in risk communication

Public communication about issues of technological risk often involves messages from diverse individuals or communities that are translated and synthesized by media outlets and other members of the public. At each step, message providers, journalists and audience members are framing a specific event using their own value systems, constraints and the filters of experience and expectation in a way that makes the most sense to a particular individual. Different people use different sources to collect information related to issues of scientific and technological risk. It is therefore incumbent on the provider of risk messages to
determine how a specific target audience receives and perceives risk information.
Schanne and Meier (1992), in a meta-analysis of 52 studies of media coverage of environmental risk, concluded that journalism constructs a universe of its own, a “media reality” which does not mirror actual reality. Specifically, the journalistic construction of environmental issues and environmental risk mirrors, only partially, or not at all, the scientific construction of environmental issues and risk. While the professional isolation of both scientists and journalists presents an on-going impediment to communication, it is mistaken to view journalists and the media always as significant, independent causes of problems in risk communication (U.S. National Research Council 1989). Further, many media analysts, who may never actually write for public media, often fail to recognize the chaos of everyday life (especially that of a newsroom), fail to acknowledge the constraints imposed by a media industry which is geared for profit, and fail to acknowledge the critical faculties of any particular reader. Rather, the assumption seems to be that an uncritical public is waiting to be filled with educational material from a variety of media—residual effects of the hypodermic needle model—and that media is more influential than common sense and practical experience may suggest. Many problems in scientist-journalist interactions and pronouncements can be traced to the myth of objectivity resident in both disciplines. Scientists and journalists who acknowledge that a degree of bias is normal are likely to be better prepared to distinguish facts from value judgments in both expert statements and media accounts of food safety debates (Groth, 1991).

The role of the media in shaping public perceptions in technological controversies has been well-documented (Molitor, 1993). Yet the actual impact of media coverage on citizen decision with respect to a particular risk remains unclear. Protess et al. (1987) found that when examining the impact of reporting on toxic waste controversies media disclosures had limited effects on the general pubic but were influential in changing the attitudes of policy makers. Dunwoody (1993) argues that while mass media tells people something about the risk present in a society, interpersonal channels are used to determine the level of risk to individuals. How much information these secondary sources originally receive from media stories has not yet been determined.

There is a growing realization that there will be no quick fix to the inherent difficulties in communicating about food safety risks. Fischhoff and Downs, (1997) note that the food industry, like many others, has a risk communication problem, manifested in the public's desire to know the truth about outbreaks of food- and water-borne diseases; ongoing concern about the safety of foods, additives, and food-processing procedures; and continued apathy regarding aspects of routine food hygiene. These authors state that because citizens are ill-equipped to discriminate among information sources, the food industry as a
whole bears responsibility for the successes and failures of its individual members.

Powell and Leiss (1997) stress the need for a long-term institutional commitment to the gradual development and application of good risk communication practices, using the following guidelines.

Risk Communication is serious business—failures can be costly.

The financial cost of the mad cow crisis in the U.K. is currently pegged at some $5 billion, a cost which may have been substantially reduced with more effective risk management and communication practices. Outbreaks of foodborne illness routinely cost industry millions of dollars.

Regulators are responsible for effective risk communication

Governments, and in particular those agencies of governments which have regulatory authority over a broad range of health and environmental risks, have—or are capable of acquiring (through enabling legislation) -- the legal authority to manage risks.

Industry and government are responsible for effective risk communication

It is now generally accepted that industry must take primary risk communication responsibility for product-related risks and workplace hazards, as well as for community awareness in the vicinity of facilities where hazardous materials and processes are employed. But with the rationalization of government services, industry is assuming more responsibility for the delivery of food and water inspection services (under government auditing) and therefore is assuming more of the risk communication responsibility.

If you are responsible, do it early and often.

Timeliness is everything in effective risk communication: overcoming entrenched perceptions that are broadly dispersed in the social environment is a thankless task with almost no chance of succeeding. Further, doing good risk communication early is of little benefit if it not also done often, as often and as long as is needed to prevent a risk issue from being put into play by other interested parties.

There is always more to a risk issue than what science says.

Public perceptions, values and opinion all enter into characterizations of risk.
Always put the science in a policy context.

Almost any type of risk issue can turn into a seemingly intractable risk controversy, and it is the nature of such controversies inevitably to give rise to demands on governments to “do something” about controlling or eliminating the risks in question. The contents of effective risk communication cannot be limited to the scientific description of hazards or the risk numbers. Rather, the science should be put into a policy (action) context, which in the early stages of an emerging risk controversy might take the form of forecasting a range of policy options—including the “do nothing” option—and of exploring their consequences in terms of implications for economic and social interests, international developments, and obligations for environmental protection (all in the context of the risk management cycle, mentioned earlier). Responsible agencies and industries ought to begin discussing the possible policy responses to emerging risk controversies as soon as they arise, and continue to do so throughout their life history.

“Educating the public” about science is no substitute for good risk communication practice.

Sanctimonious urgings for new programs designed to increase the public’s awareness about the inner mysteries of scientific research are encountered frequently. What appears to sustain this mission is the curious belief that the citizenry’s ignorance of scientific method can best explain the observed differences between the expert assessment of risk and the public perception of the same. This rhetorical strategy has been advocated by technology promoters in discussions of technological risk for the past 200 years. More recently, promoters of agricultural chemicals in the 1960s and nuclear energy in the 1970s have embraced the public education model. It has failed. Today, the notion of public education is the basis of dozens of communications strategies forwarded by government, industry and scientific societies, in the absence of any data suggesting that such educational efforts are successful.

What is known is that levels of perceived trust in technology promoters and regulators is a better predictor of consumer support. Several surveys in North America and the U.K. have found that perceptions of trust in government regulation (and industry), regarding either pesticides (Dittus and Hillers, 1993) or the products of agricultural biotechnology (Frewer, et al., 1994) is the strongest predictor for consumer support. People either trust that pesticides and the products of agricultural biotechnology are adequately regulated or they do not. Those with low trust have the highest concern about possible risks. Those with high trust perceive greater benefits from both products. van Ravenswaay (1995) concluded that trust in government and industry may be a more important influence on risk perception than the inherent safety or the danger of a
particular agrichemical. There is no reason to believe that the same would not hold true for microbial food safety risks.

If trust is a better predictor of consumer support, then what factors influence perceptions of trust? Lynn Frewer and colleagues at the U.K. Ministry of Agriculture, Fisheries and Food’s Institute of Food Research in Reading have conducted the most comprehensive work toward understanding food-related risk perception. Frewer et al. (1996) conducted two sets of in-depth interviews with about 45 people each, and then a larger quantitative survey to better understand the formation of trust. Overall, there were many findings of relevance to effectively communicating about food-related risks, including:

• the most important and frequently cited source of information about food-related information was the media, far ahead of any other source;
• while scientists and medical sources were rated as trusted but not distrusted (media were often trusted and distrusted), they were infrequently named as sources of food-related information;
• the single most important determinant of gain or loss of trust in a source is whether the information is subsequently proven right or wrong, and that the source is subsequently demonstrated to be unbiased;
• information about natural toxins, genetic engineering and pesticide residues was more distrusted than information about high fat diets, microwave ovens, etc.;
• medical sources are likely to be viewed as expert in medically-related areas, but to have little knowledge in technological risk assessment and therefore poor sources of information about technological hazards;
• trust is clearly multidimensional and cannot be predicted by single items or psychological constructs (i.e. surveys which ask respondents to rank social actors -- doctors, farmers, environmentalists, government -- in terms of levels of trustworthiness are somewhat meaningless in the absence of context)
• trust appears linked with perceptions of accuracy, knowledge and concern with public welfare;
• if government sources and risk regulators are seen to be proactive in their interactions with the media and other trusted sources -- including discussions of risks -- this may positively influence the way in which risk information is reported, as well as increasing trust in government regulation;
• admitting to uncertainty, or facilitating public understanding of science as a “process” could increase communicators trustworthiness; and,
• people seem to be adverse to ambiguous risks and trust is all the more likely to be important where there is a perception that accurate estimates of risk are not available, like genetically-engineered foods.
If trust is the key component in public perception of risk scenarios, what other guidance exists to build trust and credibility? Hance, et al. (1988) offer the following:

• be aware of the factors that inspire trust;
• pay attention to process;
• explain agency process;
• be forthcoming with information and involve the public from the outset;
• focus on building trust as well as generating good data;
• follow up;
• only make promises you can keep;
• provide information that meets people's needs;
• get the facts straight;
• try to co-ordinate with other agencies;
• make sure to co-ordinate within your agency;
• don't give mixed messages;
• listen to what various groups are telling you;
• enlist the help of organizations that have credibility with communities; and,
• avoid secret meetings.

Banish “No risk” messages

Levels of risk exist, and increasingly proclamations of no risk are heard less. Messages should instead focus on risk reduction.

Risk messages should address directly the “contest of opinion” in society.

Government regulators and industry have the primary responsibility for effective risk communication, these officials cannot avoid confronting the issues as they are posed in the society.

Communicating well has benefits for good risk management.

Good risk communication practice should be regarded as of equal importance to the other key elements—risk assessment and the evaluation of risk control options—in the overall risk management process. In fact, good risk communication practice can be regarded as the causeway that links all the organizational elements in a well-functioning risk management process, especially in the face of scientific uncertainty.
Chapter 2: Risk Communication in Other Outbreaks of Food and Water-borne Illness

Outbreaks of E. coli O157:H7 have been recognized in North America since 1982. In 1993, an outbreak of E. coli O157:H7 was attributed to the deaths of four children and more than 500 illnesses linked to the consumption of undercooked hamburgers at a fast-food restaurant chain in the U.S. Pacific Northwest. A 1996 outbreak of E. coli O157:H7 in several western States and parts of western Canada sickened 70 people and killed a 16-month-old child after consumption of unpasteurized apple cider. A three-year-old girl died and some 1,000 people in Albany, N.Y., were stricken after attending a county fair in 1999, the worst E. coli O157:H7 outbreak in New York State history. Health officials suspected the fair's water supply may have been contaminated with cow manure after heavy rains forced runoff from a nearby farm into an underground aquifer (Anonymous a, 2000). More recently, contact with farm animals at the Western Fall Fair last year in London, Ont., was linked with an E. coli O157:H7 outbreak that made more than 90 people sick. Five confirmed cases were at a day care, including one nine-year-old boy who ended up with kidney damage after spending nine days in hospital and receiving four blood transfusions. For a review of several E. coli O157:H7 outbreaks, see Powell and Harris (1997).

During food and water-borne outbreaks, timely health advisories and recalls can have a significant effect reducing the number of illnesses and a quick resolution of the outbreak. Imperfect monitoring and treatment of drinking water facilities has led to the adoption of a multifaceted approach to risk reduction. This approach involves such activities as watershed protection, public education and notification, and water treatment (Casman et al., 2000). Public education or risk communication reduces exposure to contaminated water by encouraging consumers to adopt risk-reducing behaviours during water quality emergencies such as boiling water or drinking bottled water.

Effective risk communication during food and water-borne disease outbreaks requires co-ordinated efforts between the company or utility involved and local, provincial and even federal health authorities. Common strategies include the issuance of advisories to boil water, or throw out or return contaminated food products, followed by medical updates and advisories on health-related behaviours, such as hand washing to reduce secondary transmission of infection. The most effective warnings explain the reason for the warning, steps to take to prevent illness, signs and symptoms of illness, and what to do when the symptoms appear.

Casman et al. (2000) have determined three factors that influence the morbidity of a water-borne epidemic: The timeliness of the warning, consumer compliance with the warning, and time it takes to fix the problem. They found that when...
consumer compliance is high, an epidemic can be avoided if the utility is informed by day two of the problem, regardless of the length of time taken to fix the problem. However, when compliance is normal, an epidemic can only be avoided when the utility is informed by day one and has the problem fixed in four days, or is informed by day two and has the problem fixed in three days. Time taken to fix the problem is not a controllable variable to risk communicators, however timeliness and consumer compliance are important to the public awareness component of risk reduction.

Evidence from recent water-borne disease outbreaks illustrates the importance of timeliness in health related warnings. In four major incidences of contaminated municipal water supplies -- cryptosporidium in Brushy Creek, Texas, 1998 (Davenport, 1998), Milwaukee, 1993 (Griffin et al., 1998), and Sydney, Australia, 1998 (Anon, 1998b), and salmonella in Missouri, 1993 (Angulo et al., 1997) -- boil water advisories were issued to residents but all occurred days to weeks after residents were first exposed to the pathogens. Messages included information on how long to boil water, and were communicated via press releases and daily briefings, and direct contact with schools, daycare centres, nursing homes, hospitals, health departments and physicians.

In Brushy Creek, Australia and Milwaukee, residents felt that they should have been notified sooner that the water was contaminated. In all cases the advisories were issued long after the residents were exposed to the contaminated water leading, in two of the cases, to hundreds of illnesses. In these cases, the delay in the warning was the limiting factor; therefore effectiveness of the warning in terms of consumer compliance with the water advisories may have reduced the number of illnesses, but were not as important because the residents had already been exposed to the pathogens. Further, cryptosporidium is generally regarded as less virulent than a pathogen like E. coli O157:H7.

In Brushy creek, a raw sewage spill occurred on July 14, 1998. The first advisory to owners of private wells was issued three days later. Three municipal wells were discovered to be contaminated by July 20, but health officials did not consider the contamination serious enough until the following day, whereupon they shut down the wells and began to buy water from the nearby city of Round Rock. In this case, the water utility was able to fix the problem quickly, negating the need for a boil water advisory; however, the town residents were exposed to the contaminated water for seven days before the wells were shut down. In this case the discovery of the contamination in the municipal wells came too late as the number of cases peaked around July 21, the day they shut down the contaminated wells.
Strategies for Message Delivery
Timeliness of message delivery is dependent on how quickly a problem is identified, and how the message is delivered. The public can passively receive information on health-related risks from the media or the utility, or actively seek out information from information sources such as the Internet, telephone hotlines or library services (Casman et al., 2000). Evidence from studies on communicating health risks associated with food (Mahon et al., 1999; Fisher & Chen, 1996; Velicier & Knuth, 1994), municipal drinking water (Griffen et al., 1998; Harding and Anadu, 2000) and other risks (Predy et al., 1997; Jones & Andrey, 1998) indicate that mass media and word of mouth are the most important sources of such risk information to the public. In particular, a study on different media formats for communicating health risks indicated that print media was ideal for audiences that were more concerned about the risk while broadcast media was more effective in reaching those who were less concerned about the health risk. (Chipman et al., 1996).

More specifically, television and newspapers were especially useful when they provided pictures or other visuals indicating location of the risk and how to reduce exposure (Jones & Andrey, 1998; Connelly & Knuth, 1998). Reliance on each form of media and other forms of communication varied widely based on the community, the hazard and the situation. In their comparisons of the two towns experiencing water crises, Harding & Anadu (2000) found that town C relied more on radio and television media than town A, while Freeman & French (1995) when looking where drug addicts get risk information also found that sources varied widely between cities.

In their study of the Schwan’s salmonella-in-ice cream outbreak, Mahon et al. (1999) found that mass media, particularly television, was important in getting health warnings out quickly to the public. However, in an analysis of the content of media warnings, they found that only 6 per cent of stories on Schwan’s contaminated ice cream told consumers the products should not be eaten. Consistently, consumers want to know, "What can I do, to reduce risk." Therefore, accuracy of media messages is an important factor. Similar results were found in a study reviewing media stories relating to an outbreak of meningococcal disease (Thompson & Hayhurst, 1993). In this case, media reports were used as a vehicle for providing advice to the general public as a list of clinical features for parents to identify. Thompson and Hayhurst (1993) found a discrepancy between the clinical features of the cases and press advice given to the public, which they concluded to be a result of unclear lines of communication from the clinician to the spokesperson through the media to the public.

Studies examining the communication of contaminant risks associated with sport-caught fish (Velicier & Knuth, 1994) and boil water advisories during an
outbreak of cryptosporidium (Griffin et al. 1998) indicate that low income and racial minorities are more likely to rely on mass media and word of mouth for health advisory information. Griffin et al. (1998) found that most attention to mass media sources for health risk information was passive and a byproduct of routine or habitual exposure. They also found a correlation between personal worry about risk and effortful, systematic and purposeful attention to risk information in television, radio and newspapers. Worry not only increased effort put into finding information but also caused that sector of the public to pay closer attention to passive sources. Factors that influenced personal worry about risk included a sense of personal susceptibility, experience with the hazard, and perception of future hazard presence.

Television and other media outlets can be effective, especially in reaching large numbers of people rapidly. In looking at how doctors received information about an outbreak of yellow fever, Louton et al. (1993) found that doctors exposed to media reporting of the outbreak heard about it significantly faster than doctors that did not have access to media coverage. However, media messages were not always accurate or reliable source of information and were not always trusted by the public (Fisher & Chen, 1995). Mass media is a powerful tool for getting health risk information and advice to the public but there are many sources of misunderstanding and confusion when conveying scientific information to a lay audience (Jardine and Hrudy, 1997).

In emergency situations, public urgency and increased hazard tend to promote more co-operation between utilities, government agencies, the media and the public (FAO/WHO, 2000). Experience with the media and training of public health agents in working with the media can also improve the accuracy of media messages. The Edmonton Board of Health had extensive media relations experience which proved an asset when trying to communicate risks to the public during a hantavirus outbreak (Predy et al., 1997). Consumer surveys and knowledge tests indicated that information disseminated by the board of health and received by the public was accurate. Daily interviews and press releases were conducted to update the media on the outbreak, and a recorded message was set up on a hotline. The telephone hotline was an effective tool for distributing the specific message to the media as it was used as a check for accuracy. The hotline, however, was not widely used by the public. Only 3 per cent of the population actually called the information line, and those that did often could not get through.

As previously noted, word of mouth is an important source of health risk information, especially in smaller communities, reaching those who may not receive information through mass media or other avenues. Such information is deemed highly credible, but is difficult to control and may be inaccurate (Fessenden-Raden, 1987). Conversely, individual contacts organized by health departments or the utility or companies involved in water-borne disease
outbreaks can be an effective way to distribute messages to the public and to influence word-of-mouth. Accuracy of the message can be controlled, the message can be tested before it is used, and information needs of the target audience can be immediately assessed and addressed. This method is time consuming and requires significant effort, which may not be feasible in larger cities.

The Schwan’s ice cream outbreak of salmonella, estimated to have potentially affected over 200,000 Americans, was unique in that the company specializes in home delivery and does not sell to chain stores. Because of this, Schwan’s had a customer list readily available. Aside from setting up a hotline and issuing press releases through the media, Schwan’s also sent letters directly to all their customers, and sent the delivery drivers out to homes to pick up the contaminated product. However, only 21 per cent of respondents reported receiving a letter, and 50 per cent of respondents reported being contacted by a driver (Mahon et al., 1999). The researchers also found that 16 per cent of respondents had not heard anything about the warning, and of those who heard and remembered when they heard it, the median time of first hearing the warning was five days after the first press release. In this case, receiving the letter had no effect on consumer behaviour to discard the product -- 26 per cent of those who received the letter still had contaminated product compared to 27 per cent who did not receive a letter. Hearing the warning from a driver did have a significant effect on behaviour -14 per cent of those who heard the warning from a driver still had the product compared to 38 per cent who did not.

An information sheet was also delivered door-to-door in the Gideon, Missouri waterborne outbreak (Angulo et al., 1997), however, residents did not receive the flyer until 10 days after the boil water advisory was issued. Nevertheless, after receiving the information sheet, all households surveyed reported believing there was a problem and understanding that ice should be made with boiled water. The information sheet was more effective than the health advisory because it contained easy to read instructions on boiling water as well as rationale behind the advisory. The original boil water notice mentioned neither the associated illness nor the reason for the order. The above two examples indicate that individual contact through visits, letters and telephone calls can be very effective in communicating risk warnings if they are done in a timely manner. They also reach individuals who may not be reached by other means, which is especially important in smaller towns with limited media outlets. Individual contact may be easier in smaller towns, which may be one reason that only half the Georgia respondents in the Schwann's study remember being contacted by a driver as the recall extended over the whole state.

In the water contamination incidences investigated by Lemley et al. (1985) and Harding & Anadu (2000), letters and flyers were delivered to residents from the
water utility. In both studies, the mailings that were delivered with the water bill were an important source of information about the warnings, and the residents considered them as the most reliable source. This contrasts with other research which found that the water utility and other industries are not always trusted by consumers for health risk information (FAO/WHO, 2000; Fessenden-Raden et al., 1987; Fischoff & Downs, 1997; Harding and Anadu, 2000); however, the utility may have overcome this by being completely open about the problem from the beginning (Fessenden-Raden et al., 1997; FAO/WHO, 2000).

All strategies for message delivery have their limitations and it is therefore necessary to distribute warnings such as boil water advisories in a variety of formats. Message testing can also improve the effectiveness of the message in influencing consumer behaviour and compliance (Chipman et al., 1996; Connelly & Knuth, 1998). Testing messages on a test audience can help point out potential sources of confusion and misunderstanding (Jardine and Hrudy, 1997).

**Compliance with Risk Messages**

Consumer compliance is the second factor mentioned by Casman et al. (2000) as influencing morbidity of a water-borne epidemic. They estimate that about half of consumers continue to drink water after hearing a boil-water advisory. Other researchers have also found that about of consumers continue to drink contaminated water after receiving a boil-water notice based on observations of boil-water alert compliance during previous waterborne epidemics (Laughland et al, 1993; MacKenzie et al, 1995; Kocagil et al; 1998).

In a 1982 survey of water utility managers (Stegman and Schneider, 1982) it was found that public notifications were felt to be ineffective in eliciting public support by 61 per cent of managers, somewhat effective by 23 per cent, and very effective by 16 per cent.

A household survey in 1980 found that notification procedures were not fully effective in reaching consumers and that the level of understanding among those notified was not high (Bruvold and Gaston, 1980). The importance of reaching actual water users is important and that the information should be conveyed in a precise and succinct manner coupled with an addition means of obtaining further information, such as a telephone number to call (Lemley et al, 1985).

Researchers studying consumers’ knowledge of receipt of public notification response reported that 47 per cent of respondents recalled receiving the notice, 44 per cent said they did not receive the notice, and 9 per cent did not remember whether they had received it. (Bruvold and Gaston, 1980).
In a study of the 1993 Cryptosporidium outbreak in Milwaukee, Wis., 84 per cent of survey respondents did enact measures to avoid the problem after they were notified (Hurd, 1993). However, a California study of 900 consumers found that 80 per cent of respondents did not take any action in response to public notification. These later results were attributed to the fact that notifications often do not recommend any preventive measures, or if they do, the preventive measures are not acceptable to the consumer (Wardlaw, 1986).

Results from four studies examining boil-water advisories (Angulo et al., 1997; Harding & Anadu, 2000; O’Donnell et al., 2000; Willocks et al., 2000) and a study of the Schwann’s ice cream recall (Mahon et al. 1999) indicated that 70 to 90 per cent of those who heard the warnings practiced some type of risk reduction behaviour. Forty-four per cent of those who heard warnings about hantavirus (Predy et al., 1997) and 66 per cent of those who heard warnings about severe weather (Jones & Andry, 1998) practiced some type of risk reduction behaviour. Although a high number of individuals report complying with risk reducing behaviour, both U.K. studies (Willocks et al., 2000; O’Donnell, 2000) and the examination of the Gideon water crisis (Angulo et al., 1997) found that a high per centage of individuals actually engaged in behaviour likely to increase risk such as brushing teeth, washing dishes and feeding pets with unboiled water, or not continuing to use boiled or bottled throughout the warning period. Willocks et al. (2000) reported that many of the individuals who engaged in risky behaviour believed they were taking adequate safety precautions. This may reflect an inadequacy in the nature of risk messages, such as reminding citizens that the same water is used to make ice or brush teeth and should be boiled when appropriate; or it may reflect a belief that individuals are impervious to risk.

In Sydney, Australia, positive water tests for cryptosporidium and giardia were first confirmed on July 24, 1998 and the first boil water advisory was issued five days later to small sections of the city and then to the whole of Sydney the next day (Anon, 1998a). Aside from the media advisories, signs were placed in office blocks reminding people not to drink tap water, and fountains in schools were shut down completely. Boil water advisories were issued and rescinded two more times over the next two months (Anon, 1998b). A complicating factor in the Sydney outbreak was an apparent lack of human illnesses, lending some credibility to the dictum that the ability to test has, in some cases, especially those involving pathogens of low virulence, exceeded the ability to ascribe meaning to test results. Anecdotal evidence from the Australian water crisis suggests that many Sydney residents continued to drink unboiled water after hearing about the advisory (Anon, 1998b).

Similar findings were reported by Harding and Anadu (2000), who examined two communities experiencing two different types of water warnings. Town A
had a long term filtration problem and had been receiving water notices quarterly for several years, while town B had received a boil-water advisory after flooding caused an increase in coliforms and E. coli contamination in the water. They found that the residents of town A were more aware of the water quality problem but were less likely to take risk reducing steps such as boiling water, whereas a slightly lower percentage of town B residents had heard the warning (70 versus 86 per cent) but 90 per cent of these took action compared with 76 per cent in town A. These results point to the danger of repetitive warnings, or the cry-wolf scenario, where individuals may perceive themselves impervious to risk.

Reasons given for ignoring the warnings in the Schwan’s ice cream recall in Georgia (Mahon et al. 1999) and the water crisis in Gideon, Missouri (Angulo et al., 1997) were similar. In both studies, respondents stated they did not believe the risk warnings. The Gideon residents also cited “forgetting” and “not knowing ice should be made with boiled water” as other reasons for continuing to consume unboiled water after hearing the advisory. These results point to the danger of repetitive warnings, or the cry-wolf scenario, where individuals may perceive themselves impervious to risk.

It is apparent from the above studies that compliance with health warnings is a problem, possibly because people do not understand the severity of the situation. Evidence from the literature has identified several common characteristics of effective risk messages. The rationale for the warning should be explained, concrete actions described, association with illness and ways to identify illness should be explained. In the salmonella outbreak associated with water in Gideon Missouri (Angulo et al., 1997), the letter that explained the associated illness and all the ways to reduce risk helped residents understand the seriousness of the problem, as well as less obvious sources of risk such as brushing teeth and using ice cubes made with unboiled water. In Oregon, Harding and Anadu (2000) found a difference in the number of people taking action between the two towns. They attributed this to the differences in warnings given to each town. In town A more people knew about the water problem because they had been receiving notices over several years, however, the notices did not include any specific risk reducing behaviours. In town C the boil-water advisory did give specific behaviours which may have led to the increased compliance with the recommendations. The public wants risk information that is useful and that they can relate to (Fessenden-Raden, 1987). The first question they will ask when they receive information is “What does this mean for me and my children?” Again, this can be answered by providing information on the possibility of illness, where the problem is in relation to them, and what they can do to protect themselves.

When using multiple vehicles for distributing risk information it is vital to keep the message consistent (Tilden et al., 1997). Inconsistent messages not only
confuse consumers but can also decrease consumer confidence in the message thus reducing compliance with risk reducing strategies (Tilden et al., 1997). Trust is important in risk communication and the literature indicates trust in specific sources varies between communities and situations, meaning that levels of trust significantly impacted by local circumstances. Industry and agencies can improve confidence by being open and honest, by letting the public know what they are doing to reduce risk, and by being consistent with risk messages.

From an agency perspective, effective emergency response and long-term health promotion strategies can be challenging. Tinker et al. (2000) identified lessons learned from the experience of one agency in co-ordinating an emergency response activity and long-term strategy to reduce the spraying of a home pesticide. The agency found both external and internal communications to be challenging. The most common message delivery mechanisms were fact sheets, presentations and briefings to the public and health professionals, establishment of a co-ordination centre with agency staff, small group community meetings, press releases to media outlets, door-to-door visits and face to face communication. Internally, the agency conducted daily conference calls, informational and planning meetings. The primary challenges the agency faced in communicating health risks were:

- limited awareness about scope and magnitude of a quickly evolving health threat;
- no defined roles and responsibilities;
- limited scientific data; and,
- no identified strategy for providing public education and outreach in a crisis or emergency situation.

Overall, the agency found that comprehensive, integrated, systematic planning would save them time, effort, energy, and reduce stress. The determination of linkages and responsibilities were vital, as individual employees found they understood their own tasks but did not fully understand the tasks of others, leading to duplicated efforts and critical tasks and activities going undone. This further highlights the need for agencies to be fully prepared for emergency situations and to have clear lines of responsibility and communication. For smaller towns, such infrastructure can, in some cases, be provided by provincial or state agencies.

Current detection methods for water-borne contaminants can delay the dissemination of health advisories. Test results may take days and may not be accurate. Would it then be more effective to issue boil water advisories when contamination was merely suspected rather than confirmed? If this were the case, boil water advisories would be issued more often as a prophylactic measure. However, the public may simply get used to hearing boil water
advisories and not take them seriously thus further reducing compliance. Already, desensitization to warnings is a significant problem, and, as noted by Jones & Andrey (1998), the public is inundated with many different health warnings.

An example from a major food-borne outbreak of salmonellosis in Canada highlights the importance of effective and timely distribution of risk messages (Powell, 1998). In 1998 a strong epidemiological link was established between an outbreak Salmonella enteriditus in Canadian school-aged children and Schneiders Lunchmates, a pre-packaged luncheon product aimed at school children. The link was confirmed five days after an epidemiological association had been reported, at which time J.M Schneider issued a recall and the Ontario medical officer of health issued a public health advisory. This initial advisory failed to mention the suspected 177 ill, and was therefore not picked up by the media until the number of illnesses were reported 3 days later. The outbreak peaked 27 days after the initial link was established, indicating that the recall and health advisory were not effective in reaching all members of the public, as salmonella has an incubation period of 6-48 hours. There were a total of 805 reported cases throughout Canada.

The Schneider's outbreak highlights several important components of risk communication. First, the fact that the company waited until the link was confirmed to issue the warning and recall caused the public to be exposed to the risk for an extended period. In contrast, when faced with the possibility that their unpastuerized juices may be linked to several cases of E. coli O157:H7, the manufacturer, Odwalla Inc., immediately recalled all their products containing apple cider. Warnings and health alerts were also issued immediately and responsibility was admitted by the company (Powell, 1998).

Second, the media did not pay close attention to the outbreak until the number of illnesses were reported. Currently, neither the Canadian Food Inspection Agency (CFIA) nor the U.S. Department of Agriculture (Roberts, 2000) include information on the number of illness in recalls or public health warnings. This may be the reason that some members of the public simply ignore warnings. As previously discussed, the public needs to be able to relate to health risk warnings in order to take them seriously.

An additional factor is the culture of awareness regarding microbial food and water safety risks that presides in a community prior to an outbreak, which may significantly impact on advisory compliance among citizens, one that has been borne out in subsequent testimony at the Walkerton inquiry. Several local waterworks employees and commissioners have reported they did not know E. coli or even E. coli O157:H7 was a risk in drinking water. Yet there have been numerous outbreaks throughout North America. When compared to outbreaks
and response in the U.S., it is observed that outbreaks, particularly of E. coli O157:H7 bring a sustained policy response from the highest levels of government, including the Office of the President. The 1993 Jack-in-the-Box outbreak initiated a sustained policy response and public discussion (via increased numbers of media accounts) that resulted in a mandatory HACCP system being implemented in slaughterhouses. The 1996 Odwalla outbreak initiated a sustained effort to reduce pathogens, including E. coli O157:H7, in fresh fruits and vegetables, including water (particularly irrigation water). While there have been many private-sector initiatives in Canada to enhance the safety of the food supply, these efforts are rarely communicated or discussed by government, short of admonitions to "cook hamburger thoroughly." Susan Tamblyn, Medical Officer of Health for the Perth District Health Unit has summarized this abdication of responsibility to engage the Canadian public in discussions of food- and waterborne risk by the federal government, in an appropriately titled journal commentary, The frustrations of fighting foodborne disease.

E. coli O157:H7 is not regular E. coli. It is a highly virulent and dangerous pathogen that sickens tens of thousands annually in North America and kills hundreds. Each year since the 1993 Jack-in-the-Box outbreak has brought a high profile and deadly outbreak of E. coli O157:H7 from some corner of the developed world; outbreaks that receive significant media coverage and provide new insights; Australia in 1994 (involving the related E. coli O111); Scotland and Japan in 1996; a waterpark in Atlanta, Ga in 1998. While many Canadians may be unfamiliar with such outbreaks -- media coverage in Canada is superficial at best, frequently focused on the hypothetical risks posed by various food-related technologies while ignoring the carnage associated with food and water-borne pathogens -- health officials should be quite familiar with E. coli O157:H7.
Chapter 3
Best practices considerations for food and water-borne outbreaks in Canada

Introduction
Implementing an advisory that can adequately protect human health requires those possible consumers of contaminated food or water to receive, understand and comply with a risk message.

To effectively communicate a public notification, several goals need to be set and achieved, including:
• rapid decision-making to allow timely notification;
• rapid communication with the target audience; and,
• real avoidance measures to be induced in the target population.

Figure 3 focuses on the steps in the water production system and the factors that could potentially effect it (adapted from Casman et al, 2000). Reading from right to left, the unshaded circles represent the various stages in producing water for public consumption. The shaded rectangles represent the possible contamination weakness points.

Best practices in an outbreak scenario can be constructed from several lines of research, including all of the aforementioned, as well as tested crisis communication approaches; this chapter will draw on findings from both.

Crisis Communication
The basics of risk communication are essentially the same for crisis communication except that timing is much more crucial and speed is often of the essence. A crisis can hit any organization unexpectedly and have devastating results, such as prolonged harm or injury to people or the environment. Short-term damage, such as loss of money and business, can be amplified by potential long-term effects such as lawsuits, loss of confidence and trust, and a damaged reputation. Whether it’s an airplane crash, an accident at a chemical plant, tampering of a drug or an outbreak of foodborne illness, a crisis generates significant media coverage and public formation of attitudes and beliefs is often swift and dramatic. A complete crisis communication manual has been developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) for all of Ontario's agricultural producer groups (Grant and Powell, 1999) and is briefly excerpted below. The basic elements of any crisis communication plan are:
?? Develop a call list of officials and personnel who must act as a team to see an organization through the crisis. Include name, department, office telephone number, home telephone number, and E-mail address.

?? Designate a spokesperson to which all immediate inquiries should be directed, augmented with appropriate expertise such as medical, environmental and so on.

?? Determine beforehand who has the authority to initiate recalls, boil-water advisories and other preventative measures.

?? Direct all media inquires to a designated individual and have contingency arrangements for media on-site.

There are many common mistakes in crisis communication. Lack of prompt communication with the media, even in the absence of substantive information, or appearing defensive will lead the media and critics to assume an organization is denying or downplaying the existence of a problem. Failure to address the perceived problem, no matter how large the problem actually is, will diminish institutional trust with the public.

**Crisis Prevention and preparation**

Good crisis management requires prevention, constant monitoring and preparation. A crisis communication manual should be retained at local medical offices of health (with support from the provincial health ministry) and local water utilities and regularly tested and updated including:

- ongoing preparation with annual simulations because an untested plan is an unworkable plan;
- sharing critical crisis communication experience case studies;
- useful right-way/ wrong-way video-based, situation specific refresher programs;
- interpreting and packaging as crisis management case studies; and,
- using crisis prevention/ exposure management processes as ongoing threat reduction activities.

Having a documented, workable crisis response plan -- and not simply a manual gathering dust on a shelf -- is increasingly recognized as a key tool to limit food- and water-borne outbreaks is of paramount importance. In developing a crisis communication strategy, the U.S. National Food Processors Association (1988) offers the following advice:

- Planning is a continuous process. It only begins with the written plan.
- Planning involves attempting to reduce the unknowns in a problematical situation, attempting to anticipate problems and project possible solutions.
• Planning aims at evoking appropriate actions, with appropriateness of response for more crucial than speed of response.
• Planning should be based on what is likely to happen, adjusting the disaster plan to people and their normal behavior rather than expecting people to change their behavior to conform with emergency plans.
• Planning must be based on accurate facts, not on myths or misconceptions about responses of people and groups under stress.
• Planning should focus on principles, producing simple rather than complex disaster plans that will tend to be ignored.
• Planning is partly an educational activity, making sure that relevant persons and groups in and outside of the company know their roles in an emergency
• Planning always has to overcome any resistance, to bring about changes in thinking and ways of doing things, so that disaster planning often must be "sold" within the company or agency.

When communicating with the media in an outbreak scenario, a crisis communication manual may prove helpful by containing as many possible questions -- and prepared answers -- a reporter or consumer may ask. Further, draft news releases and statements to be used as a template for several outbreak scenarios should be included (for example, see NCBA, 1997). These will need to be adjusted for a specific issue, but the template will be available with key message information. A letter template (for each issue) should also be included to notify and alert stakeholders if an outbreak occurs.

The communication/notification section should also include to whom and where information relevant to the outbreak will be disseminated. The channels through which the information will be distributed should also be outlined. Notification can be accomplished through the following avenues:

?? an update/information page on the association's web site specifically for the crisis situation;
?? an electronic mailing list involving key personnel;
?? broadcast FAX to key community leaders; and,
?? news releases/statements to consumer media and trade media.

Understanding or knowing who will be contacting an agency during a crisis such as a boil-water advisory, will help individuals anticipate what questions will be asked and by whom. A list of agricultural and mainstream media who may be in contact or who should be notified in a crisis should be included. A checklist to note response and follow-up actions should also be included and should be used to make sure all possible outlets are being checked.

Documentation of events, responses and media contacts is crucial to an iterative assessment of any outbreak during the recovery or rebuilding phase of crisis.
management. It will also aid in the updating and changing of areas within the crisis management plan from what did not work well to what did.

Crisis plans must be kept current. The useful life of a crisis plan is about four years. Personnel changes, business structuring and re-direction can overtake even the best updating process (Lukaszewski, 1994). The plan should be updated every 6 months to 1 year to keep the information as up-to-date as possible. Other helpful hints regarding the use and updating of your crisis manual include:

?? Spokespeople change; corporate leaders change. This means their replacements often require additional help to get up to speed. One option is to have intensive, annual, video-based simulations. The technique would bring newcomers up-to-speed in a matter of hours (Lukaszewski, 1994).

?? The greatest single weakness of most crisis plans is the lack of defined roles for top management (and those management trusts). Plans designed by low-level insiders without the boss’ input will not be implemented if the reputations, careers or futures of high level insiders will be defined by the crisis at hand. If the boss does not buy it or has not bought in, he/ she and those he/ she trusts will do something else when problems occur (Lukaszewski, 1994).

Clarke & Company (1999) have highlighted the seven deadly sins of crisis communication as:

1. Unpreparedness
   † The “It Can’t Happen to Me” Syndrome
2. Absence
   † Not being on site immediately
3. Ignorance
   † Not understanding the audience’s needs
4. Silence
   † Not communicating
5. Distance
   † Boardroom bunker mentality
6. Fabrication
   † Anything but the truth
7. Naivete
   † Not knowing the standards you will be held to

Committing any one of the preceding sins will, in the public’s eye, negatively reflect on an agency’s efforts to take responsibility, to manage the situation, and telling the truth.
Message development

With a comprehensive crisis communication plan to effectively and efficiently disseminate a health advisory in an outbreak of food- or water-borne illness in place, the development of the actual advisory or risk message becomes the critical, time-sensitive issue facing health authorities and others.

Developing accurate and comprehensive risk messages is one of the most difficult and time consuming aspects of risk communication (Arkin, 1989).

Key to effective message development is the recognition that individuals are unique, and that each is going to respond to a message using their own filters of knowledge and experience. Risk messages need to be personalized enough to provide a framework for individual action, recognizing the practical constraints of tailoring a message to each member of a target audience. The message should also be repeated, using a variety of media (Needleman, 1987).

In general, risk messages should:
• relate the message to the audiences’ perspectives, emphasizing information relevant to any practical actions that individuals can take, be couched in clear and plain language, respect the audience and its concerns, and seek strictly to inform the recipient;
• clearly state the existence of uncertainty;
• avoid risk comparisons which trivialize the concern; and,
• ensure completeness, including the nature of the risk, the nature of the benefits that might be affected if the risk were reduced, the available alternatives, uncertainty in knowledge about risks and benefits, and management issues (U.S. National Research Council, 1989).

Covello et al. (1993) have offered the following guidelines for talking about risk:
• be balanced and honest;
• focus on a specific issue;
• pay attention to what the audience already knows;
• be tailored to the specific needs of the audience;
• place the risk in appropriate context;
• contain (at least) the specific information needed to resolve the decisions that members of the audience face;
• be hierarchically organized so that people who only want answers can find them quickly, and people who want details can also find them;
• be respectful in tone and recognize that people have legitimate feelings as well as thoughts;
• be honest about the limits to scientific knowledge;
• consider and address the broader social dynamics in which risks are embedded; and,
• be subjected to careful empirical evaluation and iterative refinement.

When developing messages it is important to acknowledge that the risk exists, what has happened and what is being done. A key consideration for public health officials or agencies is: at what time does sufficient information exist to go public?

Misumi (2000) conducted some preliminary work as part of a Master's degree in an attempt to develop a codified set of guidelines that health officials and others could use to help decide, when to go public. As part of this work, Misumi interviewed 10 leading epidemiologists, health and industry officials in North America to determine the current state-of-the-art, using the 1996 outbreak of the parasite cyclospora as a starting point in the discussion.

When various officials were asked what they believed was sufficient epidemiological evidence to support a warning or ban during the 1996 Cyclospora outbreak the answers varied: an official with the Laboratory Centers for Disease & Prevention (LCDC) Canada said, "epidemiological evidence to support a warning or ban would be results from a control study, results from a cohort study. This type of epidemiological evidence is sufficient. However, laboratory evidence is not necessary in addition to epidemiological evidence." Another with the Ontario Ministry of Health stated that, "Epidemiological information from the CDC, questionnaires, biostatistical analysis, case control study of the outbreak is sufficient along with, significant association with laboratory confirmation (not one without the other, it is not sufficient to have just one factor). It may be possible to have isolation of an agent in a food, but if it is normally found in that food (not causing a problem) then what use is that in a result itself."

An investigator with the York Region Health Department said that in an outbreak scenario, "First calculate the rate at which the disease is occurring compared to the base line and make sure you have a true outbreak." The epidemiological evidence required to issue a warning or ban would be evidence of a true outbreak or is it possible that the outbreak is due to an increase in public awareness? "It is not always obvious that there is an outbreak. It may be intuitive. Separate chance fluctuations, excess, statistics for the outbreak and good scientific evidence."

The amount of epidemiological evidence to support a warning or ban will always be disputed regardless of the issue or product. Points of view and perspectives will always differ. However, despite the lack of consensus with regards to the appropriate amount of epidemiological evidence to support a
health advisory, the critical factor remains to be the amount of epidemiological evidence investigators can acquire in a limited amount of time.

Currently, warnings or bans to inform the public of food epidemics (outbreaks) are decided with past history or based on individual episodes. The experts interviewed agreed that there are no known guidelines to aid epidemiologists while making decisions at this time. One said that, "Every outbreak is considered on an individual basis."

The hazard posed by a specific pathogen, such as E. coli O157:H7, is one of the factors considered by authorities in determining when to go public. One U.S. food industry official said that the time span to communicate information of an outbreak of a particular microbiological hazard depends on the outcome of the health risk that the hazard has on the public. The greater the health risk, such as death, the greater the urgency to inform the public. The health risk outcome of microbiological hazards to the public should be assessed, discussed and quantified among workers from diverse disciplines: farmers, veterinarians, food processing experts, microbiologists, medical doctors, risk analysis experts, and consumer behavior experts. Microbial risk assessment models would also provide a convenient means of information for health risk outcomes. The health risk outcome of the microbiological hazard would be subject to change, updated, and adapted in time as more information in gathered on the subject.

Other factors that seem to influence decisions such as when to go public include the size of the affected population, and even the population itself i.e. is this a significant immunosuppressed population that is at higher risk from the specific pathogen. Further, not only is the risk of death and permanent injury greater in the young and old, the chances of the mass media reporting on such health risks are great.

Economic impact is often relegated to the background because it is regarded as being in conflict with (guarding) the public interest. Although public safety is a primary concern, public statements such as warnings or bans can have great economic impacts. The government's primary concern is, or should be, public health.

While all outbreaks are individually evaluated, Hance, et al. (1988) have developed some generic guidelines for the release of information, arguing that early release:

- sets the pace for resolution of the problem;
- if you wait, the story may leak anyway;
- better control of accuracy if you are first to present it;
- more time for meaningful public input if information is released promptly;
people are entitled to information that affects their lives; and,
• may prevent similar situations elsewhere.

Message delivery

Once the decision has been made to notify the public, the same factors such as hazard and impact should modulate the effort expended in warning a target population, such as the citizens of Walkerton.

Based on information summarized from the literature in chapter 2, this section will provide a brief overview of risk communication technologies and techniques available to alert the public and others of waterborne illness. Because the overwhelming need to communicate during a crisis, methods of communication that reach those who are most affected are critical.

Experience from the Ontario ice storm of 1998, suggests that the first difficulty is assessing the scale and scope of the impact of the crisis. Bruce Stock, of Emergency Measures Ontario (EMO), further notes the need for emergency information management: “The need for accurate maps, software and information tracking systems was a constant” throughout the emergency. He goes on to say, “under the category of lessons learned, the most obvious would be the need for robust telecommunications with full backup capabilities, including generators, batteries and supplies” (Stock, 1998).

A variety of options are especially important for communication within the community. For a boil-water advisory to be successful in preventing illness, every person who is connected by the water distribution system must be aware of the advisory and they must take immediate action in order to protect themselves.

In conversations with a number of people who experienced the crises in Eastern Ontario and in Walkerton, it became apparent to the authors that while high technology or electronic communication has a role, it also has limitations, especially during times of crisis. When the power goes out or the number of telephone lines is limited, people must still be able to communicate. Other, traditional delivery mechanisms, therefore, play a significant role.

For comparative purposes, the sections below are classified as low-technology, medium-technology and high technology, fully recognizing there are advantages and disadvantages for all communication methods, and not intending to cast aspersions on any technique because of its classification. It is recommended as
part of an overall crisis communication plan that a mix of methods from each of the section be used were appropriate.

LOW TECHNOLOGY:

1. Door-to-Door:

   In certain circumstances a door-to-door communication is an excellent emergency communication technique. It is a direct, personal and thorough method. It is suggested that localities be divided into small areas as part of the emergency plan with sections allocated to police, fire workers, council workers or volunteers in advance. A well-coordinated door-to-door plan coupled with a leaflet drop or a ‘tap tag’ can reinforce the message, which should make it a viable option in most areas. Costs however are relatively high and it could stretch already limited manpower resources.

2. Buddy System:

   Relies on word-of-mouth. This most informal system allows for friends, neighbours and family members to look out for one another. It is often used extensively, and is moderately effective. Costs are very low. However may not be accurate or reliable as it relies on citizens to be proactive.

3. Neighbourhood Captains:

   The concept of assigning locally responsible volunteers to communicate important public health notices rapidly and correctly in their own neighbourhood is something that should be considered in the planning stages. These individuals could play an important role in the door-to-door communication but also in gathering information on the number of illnesses and in reporting cases. They would also act as a local well-known source of information and point of unofficial contact to the public who may have follow up concerns etc. Current programs such as Neighbourhood Watch could be utilized if in place. While their primary aim is crime prevention, it is a network in place in many communities ([http://www.police.guelph.on.ca/Watch](http://www.police.guelph.on.ca/Watch)). Other community leaders such as religious or social group leaders can be recruited in such situations. Costs for this concept are relatively small and can allow the freeing up of extra manpower.
4. Mobile Megaphone:

A well-known method of communication is the mobile megaphone. Effective for smaller communities, the megaphone is used to spread the warning through the streets of the community. This system is rapid and also has become a source of curiosity and interest among the public. Both of which are excellent first steps in message communication. Costs are relatively small and can very efficient relating to personnel. As one Walkerton citizen noted in the aftermath of the outbreak, when the local pee wee hockey team won a championship, they rode up and down town streets proclaiming their victory. Given the severity of E. coli O157:H7, he wondered why a similar mechanism was not used to alert citizens about the boil water advisory.

5. Emergency Hubsite Information Centres (EHIC):

Emergency Hubsite Information Centre can be identified locally and planed in advance. Such information hubsite could be local corner stores, library, school, and churches. Such a Hubsite could act as main source of information to its surrounding public. Leaflets, posters, safety precautions ‘How to do’ lists, and further sources of information should made available at such sites. These could as effective point of information by the public. Pre-printed information on a variety of topics will cause a degree of expense. Again, especially effective in smaller communities and relies on community members knowing where it is located. (For example, see http:// www.city.sarnia.on.ca/ peacetime.htm)

6. Town Meeting:

This is usually held mid-way to end of an emergency due to arrangement problems. This forum is an excellent opportunity for two-way communication with allows the public to heard and be listened to with interest. Pre-established protocols for arranging the meeting and established messages can help improve timliness and gets information out quickly to the public. However, in order to be truly effective, they should be held immediately. Fears, concerns and questions which can all be expressed thus empower the general public and allows them to be involved in the decision making process. However, emotions can run high and such meeting should be considered carefully prior to holding one. This method can be expensive but allows more comments to be made and give a chance for important public interaction.
MEDIUM TECHNOLOGY

1. Telephone Tree:

A telephone tree can also be effective in getting the message out quickly. Starting with one person each member of the tree has a list of people to contact which branches out down the tree. If unable to reach someone on the list the members are expected to keep trying. Other alternatives are to go and see them or to leave a note if they can’t be reached. Again relies on the proactivity of community members, and will not be practical in large cities.

2. Local media

Local media should be engaged as much as possible (radio, TV and local cable stations). Developing a rapport before an emergency aids significantly in establishing trust for when an actual outbreak develops. In a time of emergency they play a pivotal role at a local level. They should be heavily involved in both advanced planning and practice trials. If all in the local media have their contacts and relationships pre-planned it will avoid confusion and miscommunication on all side. Costs for this section are relatively small but it is important to be proactive and inclusive before and at the time of the emergency communication.

HIGH TECHNOLOGY

Modern technology may offer significant benefits but leave the user vulnerable. Glitches are likely in a crisis, especially if many users are concentrated in a single area.

1. Automated telephone messages or dedicated telephone lines

Toll-free or 1-800 numbers can provide a brief message (“don't drink the water”) and, for further information. A telephone number dedicated to providing information or answering specific questions. This is especially effective in providing accurate details to the media and interested members of the public but it relies on the public being worried enough about the problem to actively seek out information. It must be established immediately after the crisis occurs and the number included on all public materials. It is also limited by the capabilities of the phone company as phone lines can easily become overwhelmed and may be expensive.

2. Conference calls, fax machines
For the "expert group", businesses, institutions, these groups are probably used to using conference calls, fax machines and have the necessary support in place. The technology has helped to identify infected individuals, and dramatically reduced the time taken to survey and collect results for case-control analyses. It also allows rapid communication between experts and identification of infectious agents. Costs, if not already in use could be high.

3. Electronics:

Cell phones, email, networks, internet etc., for those who are plugged into technology. Databases are useful for matching needs and expertise or tracking those requiring assistance within various groups of experts. Advances in technology, particularly those listed above, have already improved surveillance systems thus aiding in identifying sources of illness especially when distributed over wide areas. E-mail can be effective in delivering messages directly to the public especially in larger cities and combined with internet databases provide an excellent resource for interested or concerned members of the public go for more information. It is obviously limited in that it does not reach all members of the target population. However, it can be an effective addition to an existing communication strategy and can be relatively inexpensive if the networks and infrastructure are all ready set up.

Increasingly, the World Wide Web is used as a source of outbreak information. Information that is relevant to the situation includes, but should not be limited to:

- details of the crisis (i.e. for a product recall include brand names, product codes, date(s) of production, the level at which the product has been recalled)
- chronology of events
- details on action(s) the association is taking to investigate the source of the problem, if it is unknown
- press releases (authored by the association or by the government)
- any letters sent to stakeholders and the target audience
- any consumer/ information contact numbers, especially toll-free lines
- fact sheets and/ or answers to frequently asked questions

See the following web sites for examples of using web sites for crisis information:

http://www.odwallazone.com/ (go to "News")
http://belgium.fgov.be/pa/ena_frame.htm/ (go to "Dioxin contamination")
4. Community officials

Community officials who have been trained in risk analysis or crisis management and who understand the importance of risk communication to and for the very people they serve. Preparation of necessary background work done, not during a crisis (manuals with vital information of who is responsible for what, and their telephone numbers etc.), is essential. Strategic planning and training so that all members of the team know their responsibilities and how the whole team operates can save time and money in delivering the message and ensures that all critical tasks are completed without duplication. It is necessary to ensure the messages delivered are effective and accurate. Initial costs for training and planning can be significant but an effective plan will save time and money when a crisis occurs.

4. Experienced Team of experts

A team of experienced experts who could move in and set up procedures in a small community as needed can be extremely effective. This could be at the Provincial level and an extension of their Emergency Preparedness program but with a focus on community needs. The expense would be high, but could save lives.

As previously discussed, the key to using any of these technologies effectively is to plan ahead and be prepared. Effective planning will establish which techniques are best for the size of the community and the existing infrastructure. No one technology can reach all members of the target audience, therefore combining delivery methods is essential. Using members of the target community to spread the message can be especially effective in small communities but require extra efforts to ensure that the message is delivered accurately. Also, properly conveying the urgency or seriousness of the message by including information on incidences of illness for example may help overcome the limitations of relying of lay people to reliably pass the message along.

**Tap Tag Initiative**

As outlined in previous sections, effecting actual behavior change with risk communications can be problematic. One example, which is noteworthy in the Walkerton incident, is whether or not the boil water advisory communicated was effective in inducing consumers to actually boil water (even for such things as brushing teeth or making ice). In relation to drinking water safety, to
strengthen the link between the actual risk communication message and ensuring consumers take appropriate risk avoidance actions, one initiative for consideration is the Tap Tag Initiative.

The tap tag is a 4 inch x 4 inch laminated bright orange tag that can be attached to a tap, faucet or ice machine by means of an elastic band or a self-adhesive strip that has a warning message on it. The warning would read: DO NOT CONSUME WATER FROM THIS OUTLET. BOIL FIRST. The tag would also contain further sources of information such as a hotline phone number and/or a website.

It is envisaged that either the tags would be prepared by the water board or utility as part of their overall risk communication plan and pre-delivered to consumers to be stored in first aid kits or elsewhere by the consumers. Consumers on hearing of a boil water advisory would then tag all appropriate drinking water outlets. Alternatively, the tags could be prepackaged in emergency orange envelopes to be hand delivered by local authorities to consumers at a time of a boil water advisory.

**Water Utilities' Warnings Protocol**

Public risk communication relies on effective internal agency communication and risk analysis to decide on the nature and severity of a risk and when and how to communicate such information to the general public or consumers. With respect to water quality, it is suggested that the PUC manager log a daily code describing the current utility awareness in regards to possible health risks. These would be:

0 = no known or suspected problem
1 = a trigger event* has occurred but health risk is indeterminate.
2 = Level I health risk possible for immunocompromised.
3 = Level II health risk possible for general population.
4 = a confirmed outbreak

*a trigger event would be defined in consolation with the MOE and MOH (adopted from Casman et al, 2000)

**Public/ Community program for Water Utilities**

It is imperative that the agencies and groups involved in providing drinking water involve the public and be proactive in communities. This is important to allow for increased awareness of the role of such utilities, the possible problems and to provide an inclusive empowering relationship with the general public that will allow for trust to grow. It will open a two-way channel of communication between the consumers and the providers so each can learn from
one another. Such a program will play a pivotal role as part of a program for best practice in drinking water risk communication.

The establishment of a risk communication plan regarding drinking water should benefit the public health overall in three main areas:

- total water stewardship;
- continuous quality improvement; and,
- consumer confidence.

This communication plan should improve transparency of the risk assessment and risk management procedures being undertaken by the water utilities and other agencies in producing a safe water supply. The relative risks associated with drinking water should be communicated to the public on a regular basis as well as how these risks were assessed and how they are being managed. This is currently required under law in the United States and an annual report is distributed to water consumers.

The desired overall result can be pictured in Fig. 4 below:
Conclusions

The E. coli O157:H7 waterborne outbreak in Walkerton, Ont., Canada, in May 2000, presented a clear and present danger of risk to citizens who consumed that water -- at least in retrospect. More challenging though, is to know when a risk is severe enough to warrant extraordinary communications and how best to compel citizens to comply with health advisories.

Risk theory, involving assessment, management and communication, is important to underpin discussions of how regulators, industry and citizens incorporate and act on information about risks -- such as the hazards posed by E. coli O157:H7 in drinking water. Today it is well accepted that the three components of risk analysis cannot be separated and are, in fact, integrated, and that communication involves the multi-directional flow of information.

Evidence from recent water-borne disease outbreaks illustrates the importance of timeliness in health related warnings. Timeliness of message delivery is dependent on how quickly a problem is identified, and how the message is delivered. The public can passively receive information on health related risks from the media or the utility, or actively seek out information from information sources such as the Internet, telephone hotlines or library services (Casman et al., 2000).

In determining when to go public with health advisories, health authorities report that every outbreak of food- or water-borne illness must be examined using factors such as severity, potential impact and incubation time of the suspect pathogen. The health risk outcome of microbiological hazards to the public should be assessed, discussed and quantified among workers from diverse disciplines, including health officials, veterinarians, food processing experts, microbiologists, medical doctors, risk analysis experts, and consumer behavior experts.

Once sufficient evidence exists to issue a public health advisory, risk messages must be designed that accurately describe the risk to individuals and provide concrete steps that individuals can take to reduce the chances of risk exposure. Further, the number of suspected or confirmed illnesses related to the particular outbreak should be included as a matter of course in any public communications. And once health advisories have been created, a variety of message delivery techniques need to be employed, again depending on the severity of the hazard, the size of the impacted population and local circumstances.

For a severe and immediate hazard such as E. coli O157:H7 in drinking water, a mixture of low-to-high technology message delivery mechanisms should be employed, including door-to-door, the buddy system, the use of existing
community networks such as Neighbourhood Watch, emergency hubsite information centers and even mobile megaphones, complimented by more broader mechanisms such as local media, posting information on a website, automated telephone messages, broadcast faxes, and electronic mail distribution. However, the key to using any of these technologies effectively is to plan ahead and be prepared. Effective planning will establish which techniques are best for the size of the community and the existing infrastructure. No one technology can reach all members of the target audience, therefore combining delivery methods is essential.

The current state of risk management and communication research suggests that those responsible with food and water safety risk management must be actively seen to be reducing, mitigating or minimizing a particular risk. The components for managing the stigma associated with any food safety issue seem to involve all of the following factors:

- effective and rapid surveillance systems;
- effective communication about the nature of risk;
- a credible, open and responsive regulatory system;
- demonstrable efforts to reduce levels of uncertainty and risk; and,
- evidence that actions match words.

This report has been concerned with the second point, the ability to effectively communicate about the nature of risk. E. coli O157:H7 is not regular E. coli. It is a highly virulent and dangerous pathogen that sickens tens of thousands annually in North America and kills hundreds. Each year since the 1993 Jack-in-the-Box outbreak has brought a high profile and deadly outbreak of E. coli O157:H7 from some corner of the developed world; outbreaks that receive significant media coverage and provide new insights; Australia in 1994 (involving the related E. coli O111); Scotland and Japan in 1996; a waterpark in Atlanta, Ga in 1998. While many Canadians may be unfamiliar with such outbreaks -- media coverage in Canada is superficial at best, frequently focused on the hypothetical risks posed by various food-related technologies while ignoring the carnage associated with food and water-borne pathogens

Any local efforts must be supported by a national culture of awareness regarding a risk such as E. coli O157:H7, which has been known to cause outbreaks and severe illness, and sometimes death, for almost 20 years. When compared to outbreaks and response in the U.S., it is observed that outbreaks, particularly of E. coli O157:H7 bring a sustained policy response from the highest levels of government, including the Office of the President. While there have been many private-sector initiatives in Canada to enhance the safety of the food supply, these efforts are rarely communicated or discussed by government, short of admonitions to “cook hamburger thoroughly.”
References


FAO/WHO 1998 A Joint FAO/WHO Expert Consultation on the Application of Risk Communication to Food Standards and Safety Matters was held from 2-6 February 1998 at the Italian Ministry of Health, Rome.


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 individual, other people and society. J. Food Safety 14: 19-40.


Lundgren, R. 1994 Risk Communication: A handbook for Communicating Environmental safety, and Health Risk, Columbus. OH: Battelle P.


National Research Council (1989). Improving risk communication. Washington DC:
National Academy Press.


