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Good and bad examples of siting and building biosafety level 4 laboratories: a study of Winnipeg, Galveston and Etobicoke

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Abstract

The purpose of this paper is to evaluate successful and unsuccessful examples of siting and building biosafety level 4 (BSL-4) facilities in North America. The paper shows that well thought-out risk communication strategies, that are proactive in nature, are needed to counteract both public trust and negative media amplification. The paper suggests that such strategies, which combine communication tools including media briefings, public fora, focus groups, tours of the proposed facility, open and frequent communication with the public as much as possible do work. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The purpose of this paper is to examine how health agencies and research institutions in the US and Canada have attempted to site and build biosafety level 4 (BSL-4) facilities, and to highlight the lessons learned from these experiences. I examine these efforts in light of the conceptual ideas and theories presented in the risk communication literature.

2. Background

BSL-4 refers to the most stringent form of biological containment available. Currently there are 16 laboratories in the world with this containment classification in operation world-wide with seven more under construction. Microbiologists, disease control experts

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and other communicative disease researchers use these laboratories for both research and diagnostic purposes. BSL-4 refers to four levels of containment for housing diseases that presently do not have a known cure. Among these (all viruses) include the Filoviridae (Marburg and Ebola viruses), and Poxviridae (including monkey pox).

This paper looks in detail at three attempts to site and build level 4 type laboratories. One example of an operational facility (Winnipeg, Man.), one example of a laboratory that has been sited although not yet built (Galveston, TX), and a third that was both sited and built but did not become operational because of local opposition (Etobicoke, Ont.). This latter facility was reduced to a category BSL-3.

The methodology used for this research consisted of a content analysis of the available media in the three regions where laboratories were proposed and interviews with personnel working at the various laboratories.[1,2] Before discussing these three cases, a brief review of the risk communication field is given.

3. Risk communication

Risk communication has its roots in risk perception, a field that dates back to the seminal work of Gilbert White in the 1940s. White's work in natural hazards [1] and the work of Fischhoff et al. [2] and Slovic [3] on technological hazards in the 1970s showed that the public perceive some risks differently than others for a series of reasons such as degree of control, catastrophic potential, and familiarity. In the late 1980s, many researchers began to experiment with the application of some of the findings of risk perception research to risk communication (see [4,5]). Whilst risk communication cannot be defined as an independent discipline, it is perhaps best described as

> "The flow of information and risk evaluations back and forth between academic experts, regulatory practitioners, interest groups, and the general public" [6, p. 86].

At its best, risk communication is not a top–down form of communication from expert to the lay public, but rather a constructive dialogue between all those involved in a particular debate about risk.

To date the outcomes of the various risk communication programs relating to environmental hazards implemented in Europe and the US have largely been ineffective. The public tend to remain hostile to the local siting of waste incinerators and nuclear waste dumps, a reaction which has not been significantly influenced by the repeated implementation of risk communication programs [7–9]. Whilst in part such responses might be attributable to the practical problems associated with the lack of funding of risk communication programs and, from this, failure to conduct proper evaluations to learn why programs failed [10–12], due account must also be taken of the inability of practitioners to understand that they have to work together with the public rather than simply "educate" them [6,13].

[1] The names of those individuals interviewed for this study can be found in the acknowledgement section at the end of this paper.

[2] The study suffers from one significant weakness. Due to a limited budget I was unable to conduct interviews with the general public in the three communities so as to uncover their views to the proposed/built facilities.

Researchers, frustrated by the lack of both practical and academic success of the various risk communication initiatives have tried to identify underlying conceptual reasons why these programs have failed. Among the factors that have received the greatest attention are that of social amplification of risk and the role of trust (for excellent reviews, see [6,13] and for a critique of the field, see [14–16]). The potential impact of these factors is discussed in the next section.

4. Social amplification

The relationship between media representation of risks and associated public perceptions of these same risks (and their impact on behavior) is complex. The theory about the social amplification of risk [17] takes into account the integration of different models of risk perception and risk communication. "The social amplification of risk is based on the thesis that events pertaining to hazards interact with psychological, social, institutional and cultural processes in ways that can heighten or attenuate individual and social perceptions of risk and shape risk behavior" [18]. The social amplification process itself is made possible by the occurrence of a risk-related event (an event of physical nature) or by a potential for a risk-related event, which has some kind of substantive or hypothetical reality [17]. The risk-related event is selected by a "transmitter", in most cases the mass media or an interpersonal network, which amplifies or attenuates the risk. The transmission is then continued by members of, or institutions within, society who may also attenuate or amplify the risk into a message (the so-called 'ripple effect'). Such messages lead to secondary effects, which might be financial, e.g. rises in insurance rates, affective such as anti-technology feelings, or economic such as a decline in tourist activity.

Social amplification is underpinned by theoretical models which seek to identify factors that determine what society actually defines as a risk, what society does not define as a risk, and the resulting rationality of the public's response to the risk-related event and associated transmission of risk relevant information.

The model has received some criticism, primarily related to the simplicity of the mechanisms of risk amplification and risk attenuation.

5. Trust

One of the most likely explanations for the failures of risk communication initiatives is that reactions to risk communication is not only influenced by message content, that is, what is communicated about risks (and indeed benefits) of particular hazards, but also by trust in those responsible for providing the information [6,9,19–22]. Failure to successfully implement risk communication programs often results from public distrust of policy makers and industry officials due to credibility problems, past history or social alienation (see [23]). Due to these recent theoretical developments in the trust area, risk researchers are arguing that the entire field has entered a new dimension [6,13,24].

Leiss points out that in the early stages of risk communication, between 1975 and 1984, the main concern of the technical experts was to provide accurate numerical information. It

was believed that if a risk was estimated correctly then the public would believe the experts and their recommendations solely on the basis of their expertise. However, significant public opposition to risk-based decision making resulted in experts expressing an "open contempt toward the public perception of risk", which was discounted as being irrational [6, p. 88]. This resulted in further distrust in these experts by the public who would view their actions as arrogant, self-serving, and reflecting a "hidden agenda" of vested interests. Today, experts realize that public trust is extremely important if they are to achieve effective risk communication, and indeed the area has received much attention from both theoreticians and practitioners in the field.

Trust, once lost, is very difficult to regain [22]. It is far easier to destroy trust than to build it, particularly as negative (trust-undermining) events tend to take the form of specific events or accidents, whereas positive (trust-building) events are more often fuzzy or indistinct. Concern about the loss of public trust in risk regulators, risk communicators, and indeed science in general has resulted in increased interest in the role, more generally, of trust and distrust in society. Barber [25] has identified some reasons that he believes have contributed to a decline in trust in science (and the professions more generally). He suggested, for example, that the increased influence that professions have over people's welfare, the greater value placed on equality and a better-educated public all contributed to this trend. The political issue of who makes important decisions for others is central to recent discussions of reactions to potential technological hazards [26]. There appears to be belief within the policy-making community that a greater understanding of the trust causing/destroying phenomena could contribute to resolving social, environmental and political problems.

The conceptual ideas put forward in both social amplification and trust literature are used in the analysis of the outcomes of the three cases.

6. The three cases

Among the researchers within the BSL-4 containment community it is generally held that Winnipeg is the risk communication model to be used. The Galveston laboratory, presently under construction, has adopted the so-called Winnipeg model, and Texas Tech which is planning to build a BSL-4 facility in Lubbock, TX to study bio-military terrorism has also brought in expertise from Winnipeg to help ensure that its planned facility is sited with as little public opposition as possible. Similarly, the Swedish BSL-4 facility that was inaugurated in September 2000 at the Karolinska Institute asked communication personnel at the Winnipeg site to serve in a consulting capacity. It therefore seems pertinent to begin with the Winnipeg case. This is followed by the seemingly successful experience at Galveston and we conclude with the unsuccessful Etobicoke example.

6.1. Winnipeg Health Canada laboratory

In 1982 Health Canada decided that the nation needed its own BSL-4 facility. Up to that time, Canada had been reliant on the Center for Disease Control (CDC) in Atlanta for providing diagnosis of possible BSL-4 pathogens. CDC, becoming increasingly overworked

not only because more BSL-4 type pathogens were being discovered but also because there were more suspected BSL-4 cases coming into the US and elsewhere, informed Health Canada that it no longer could guarantee a speedy response to a potential level 4 type threat in Canada. Because of this new uncertainty Health Canada decided to build its own diagnostic facility. It was originally planned to site this facility in Ontario close to Health Canada's existing offices, but due to political reasons, the laboratory ended up in the state of Manitoba.[3] The state government felt that to make the best use of the laboratory, it should be sited in close proximity to the scientific research center in Winnipeg, that is the largest in Canada. Suitable space was found in the nearby area.[4]

When it was announced that Winnipeg was to build a level 4 type laboratory there was considerable opposition by the local community who were highly concerned that various forms of incurable diseases would now be present in the city. To come to terms with these hostilities, one of the first things that the Winnipeg group did was to invite the participation of outside expertise. Two individuals stand out: Dr. Mike Kiley, formerly of USDA and CDC and Dr. Karl Johnson viewed as the godfather of infectious disease research from Fort Detrick and CDC. These two researchers were expert virologists and had no training in the area of risk communication. Kiley and Johnson were asked to come to Winnipeg and share with the local population their knowledge of BSL-4 laboratory work. At this crucial stage Kiley arranged a weekly call in radio show for concerned listeners, set up with the Winnipeg team tours of the proposed facility (which are still in place today) and gave around 100–120 talks in 1 year to the local community. The Canadian team felt that it was important to bring in expertise in BSL-4 laboratory type of activity as part of a community-wide education process, their view being that public opposition was mainly based on irrational fear. These initial activities helped reduce public concern regarding the proposed plant. In 1989 the Winnipeg team expanded their community communication strategy by mailing literature to local people. In 1992 construction of the laboratory began and it was completed in 1999.

In early 1990, Lee Thompson was recruited to head the health and safety aspects of the laboratory. Lee, a microbiologist by background, trained under Dr. Karl Johnson at CDC had more than 30 years of experience in level 4 research and further developed the communication strategy set in place by Kiley and Johnson in the 1980s. Among the series of strategies that he produced and helped implement with his team that included an expert in risk communication seconded from Health Canada, included the following:

- *Aggressive communication*: Informing the public of practically everything that happened at the laboratory, no matter whether it was a trivial issue or a major one. The team took the view that full disclosure would lead to trust, while cover-up would lead to distrust.
- *Use of focus groups*: To understand what the public and stakeholder groups as well as scientists at the laboratory itself were concerned about, a series of focus groups were put in place aimed at different sectors of the Winnipeg population. For example, one focus

[3] The State of Manitoba had been promised a F-18 (military jet fighter) repair center by the Canadian federal government to contribute to the economic development of the state. They did not receive this and in the following year, the federal government gave the state the BSL-4 laboratory instead.

[4] The area was a former storage place for junked cars which was cleaned up by the city of Winnipeg for a cost of 13 million Canadian dollars.

group was composed of opinion leaders and media, another of representatives of the local community and a third by Health Canada's own scientists.

- *Heavy emphasis on "show-and-tell"*: Lee Thompson and his colleagues were aware that BSL-4 was an exotic type of facility and the local public had little idea of what a BSL-4 type laboratory actually looked like inside, or how the pathogens were stored and transported. People expressing concern about the laboratory itself were asked to participate in tours while the laboratory was still "cold".[5] Individuals who asked about the transport of pathogens in the community were given samples of these containers which they were invited to destroy—in one case Lee took a container and attempted to smash it with a baseball bat in front of an audience but with no success! Lee's approach was to put in people's minds what the facilities and containers actually looked like. This helped people to become more familiar with the facility and counter their fears about it.[6]
- *Identifying likely questions from the public*: Mr. Thompson and his colleagues spend considerable time brain storming on what types of questions could come up at meetings and how these would be addressed. It soon became clear that the popular Hollywood movie "Outbreak" had led to significant public concern about diseases such as the Ebola virus. Anticipating questions related to this film and the proposed laboratory, Thompson watched it several times identified key issues relating to BSL-4 facilities and developed responses to them. This exercise was extremely useful as the public, on numerous occasions, raised questions based on scenes from the 'Outbreak' movie.
- Throughout the whole siting episode Thompson and his colleagues ensured that the staff at the laboratory were trained in communication skills. The team was concerned if staff were not prepared, even if they knew the answers, they may not be able to communicate them effectively.

For the most part this communication strategy was highly successful and is presently being followed in both Galveston and Lompoc. However, it is not fool proof and there have been incidences of public and media hostility leading to serious problems. In June 1999 just prior to the facility going hot, a batch of wastewater was accidentally leaked into Winnipeg's sewage system. Counter to the developed communication strategy, this information was not released to the public the reason being that the technicians were positive that the wastewater was pathogen-free and therefore posed no public risk. However, the case was leaked to the media, and opponents of the laboratory used it to their advantage by stating there was a cover-up. Because of this situation the regulators then refused to grant the laboratory permission to start up the BSL-4 facility, leading to concerns within the wider research community that just like in Etobicoke, the facility may never open. To address this environment of deteriorating public trust, the team at Winnipeg set up a 16 person strong public liaison committee. This committee spent approximately 6 months going through all the proposed operations of the BSL-4 facility, reading guidebooks and asking questions. Satisfied with the information they received about the plant, its operations, the competence

[5] For example, in the period 1997–2000 (just prior to the laboratory becoming hot) 1600 people went through the BSL-4 facilities. Of these people only three expressed negative views regarding the laboratory once they had completed the tour.

[6] This is a common way of communication between a developer and a concerned public, e.g. [27]. If the public becomes more familiar with the facility he/she will perceive the proposed facility as being less dangerous [3].

of the laboratory staff, its safety procedures and the proposed work, the group recommended on 2 March 2000 that the facility should receive its BSL-4 permit. This was provided a month later [28].[7] A key lesson from the Winnipeg experience is that no matter how successful a risk communication strategy appears to be, the communicators cannot become complacent. The non-reporting of the leak fuelled public distrust and led to a delay of nearly a year in the facility becoming operational.

The BSL-4 laboratory in Winnipeg went hot in June 2000 following 18 years of designing, siting and building. The facility cost the Canadian taxpayer a total of 172 million Canadian dollars. The whole project in the end was delayed by over 2 years (BSL-4 was set to open in 1997) and was 34 million Canadian dollars over budget.

6.2. The siting of a BSL-4 laboratory in Galveston, TX

The University of Texas Medical Branch in Galveston, TX houses 13,000 employees, making it by far the largest employer in Galveston County. UTMB is the oldest and largest medical school in Texas and over the past 10 years it has expanded aggressively in the area of virology and pathology in particular due to Dr. David Walker who is the chair of Department of Pathology who has been successful in getting a large number of federal research grants as well as for the establishment of the World Health Organization's Center for Tropical Diseases in 1994. In addition, generous funding to UTMB has been provided by the Texas Criminal Justice System (Texas has 160,000 inmates) of which UTMB provides health care to approximately 110,000.

Walker's expansion initiative continued when, in 1995, he was able to attract two of Yale's top virologists Dr. Robert Shope and Dr. Robert Tech, and with them the World Reference Center for Arboviruses, and a few years later, two leading CDC research scientists, one of them, C.J. Peters, who will direct the proposed BSL-4 laboratory. In 1995 UTMB already had BSL-1 to BSL-3 facilities in place, but it was beginning to undertake more advanced science that would require BSL-4 facilities. In fact, many of the researchers that UTMB recruited spent months working in the BSL-4 laboratory at CDC in Atlanta, as there was no facility in Galveston.

In 1998 UTMB announced to the public that it was planning to build a 12,000 ft^2 BSL-4 facility at a cost of 7.5 million Canadian dollars funded by the Sealy and Smith Foundation and a National Institute of Health (NIH) construction grant. In May 2000 the University of Texas Board of Regents approved the project and construction will begin in the spring of 2001. It is envisaged that the laboratory will be completed in 2002 if everything goes smoothly [29]. To date there have been no delays caused by public opposition.

6.2.1. Communications at UTMB

Since UTMB decided to build a BSL-4 facility, its communications team has worked in close liaison with the research group in Winnipeg. Lee Thompson, the Director of Health and Safety at the Winnipeg laboratory, has served as an advisor to the UTMB project, and researchers and communication experts from UTMB have visited the Winnipeg site on two occasions to learn how Winnipeg has implemented its risk communication program.

[7] Most of the discussion surrounding the June 1999 incident is paraphrased from [28].

It is fair to say that the UTMB communications effort is closely modeled on the Winnipeg one. To date the Galveston team has not hired an independent risk communication expert, determining that the staff they have in place (in particular those in the PR department) and the consultant expertise hired in from Winnipeg will suffice at least for the time being.

Once UTMB decided to build a BSL-4 facility the team arranged internal and external focus groups and set up a series of open meetings. These efforts started in 1998. The sequence was as follows.

6.2.1.1. Focus groups. The initial target group was on the internal staff as the university wanted to ensure that researchers who were not connected to the proposed facility would also be supportive of the proposed idea. UTMB wanted to address internal questions and concerns before they launched the external communication efforts. To be specific, the first series of 2-day focus groups were aimed at UTMB employees (from all areas of campus, including researchers, laboratory technicians and campus security).

Again as in Winnipeg the UTMB communication team arranged series of internal and external focus groups early on in the communication process. These focus groups, with a total of 85 participants, helped the UTMB team understand how both the existing staff and the local public perceived the proposed BSL-4 facility. This was important information for the UTMB team in their risk communication efforts.

6.2.1.2. Briefings with local media and influential individuals. These individuals were invited to participate in direct dialogue regarding the facility. Here two groups stand out, namely journalists and members of the local business community. The group invited the editor of the *Galveston County Daily News* and a senior reporter from the *Houston Chronicle* to discuss the proposed BSL-4 facility in private. The UTMB team gave them information regarding the laboratory discussed the benefits of the facility and how the group would best deal with safety concerns. The outcome of this meeting was positive. The editor of the *Galveston County Daily News* came out very much in favor of the planned BSL-4 laboratory, writing several positive editorials on the topic arguing that UTMB in Galveston indeed needed this facility (e.g. [30,31]). A Houston journalist, who had long felt that he had been ignored by the UTMB community, also became more positively inclined towards the UTMB facility following the presentations. Representatives from the business community were also invited individually to discuss the proposed facility, and once again, a majority of those attending decided that they favored the facility, including the highly influential local businessman Harris Kempner.

6.2.1.3. Briefings and contacts. UTMB throughout the program involved scientists from the laboratory and elsewhere in the risk communication program. As in Winnipeg, virology experts from the UTMB laboratory as well as national experts from CDC participated in question and answer sessions and voiced support for the laboratory at public meetings. These included Dr. Charles Fulhorst who is an Assistant Professor in the Department of Pathology, who made radio and public appearances.

6.2.1.4. Public meetings. UTMB arranged two large public meetings, one in August 1998 and the other in October 1998. The meetings were publicized in local media and

a team from UTMB took questions from the public. At the meeting not only individuals who were hostile to the facility attended, but also quite a few of UTMB's "community champions" turned up. Several of these individuals had participated in the briefings with UTMB early on and made a point to attend the meeting as well. These later individuals countered some of hostility relayed by the public and in addition gave the public a sense that it was not just the medical community, the UTMB laboratory staff and experts supported the laboratory. According to the communications team at UTMB, the first public meeting was rather hostile, as members of the public expressed opposition to the BSL-4 plans, while the second meeting went considerably better. The UTMB team felt that these fora meetings were important, although realizing that these were high-risk strategies. For example, Dr. Adrian Perachio, associate vice president for Basic Research at the laboratory said:

> "These meetings really swung it for us. The first meeting was rather hostile, but by the end of it the public were more accepting of the BSL-4 facility. We were able to convince the public that we needed this facility here in Galveston."

All in all, in the period August–November 1998, 1520 individuals in Galveston participated either in the focus groups, town meetings or the public forum.

6.2.1.5. Follow-ups. Following the public meetings, UTMB has arranged tours of its BSL-1, BSL-2 and BSL-3 facilities when requested deposited relevant background information, schematics, federal/international regulations for shipping hazardous materials, etc. in campus and community libraries. In addition, to date UTMB has had one session with a recently formed community advisory group and with members of the scientific and safety peer review group [32].

To date UTMB's communication efforts have been successful. There was some early opposition to the proposed facility as voiced by individuals attending the first public meeting, but this concern has dissipated. This is somewhat surprising, as UTMB has not always had the best relations with the local community. For example,

- UTMB had just withdrawn its "Life flight" helicopter which had been used to transport trauma patients from throughout southeast Texas (but primarily in the Houston–Galveston region) to the top notch Emergency Room facility at UTMB. UTMB saw it as redundant as a Houston-based hospital already maintained three specialized helicopters and costly. There was a great deal of institutional pride associated with the helicopter and many were sorry to see it go.
- UTMB was subject to civil action suit by two trauma nurses alleging that UTMB had retaliated (although neither was terminated) when they raised questions about whether or not trauma patients were being intubated or catheterized against their will.

Both of these issues had received considerable media coverage. In addition there were two further bona fide concerns hurricane and tornado risks. Indeed, a powerful hurricane hit Galveston in 1900 killing 6000 inhabitants and destroying large parts of the city. These issues have been well handled by the communications team, who cite the ample warnings now possible for hurricanes and have reassured the public that it is highly unlikely that a tornado would destroy the proposed BSL-4 facility [33].

6.2.1.6. Role of need. The UTMB communications team overcame these and other concerns using proven communication techniques following the Winnipeg model, but also because they were able to convince the general public that there was a need for the faculty. They used several arguments for this. Firstly, the location of Galveston on the Gulf of Mexico makes it one of the most important ports of entry to the US. Tropical diseases such as typhoid, dengue and yellow fever have historically often plagued it. Indeed this was one of the main reasons why the University of Texas opened its first medical school in Galveston [28]. Researchers take the view that this could happen again, as high levels of trade as well as migration from Mexico and South America still exists today.

Secondly, the proposed research focus was to be on pathogens that may pose a threat to the local community and in so doing will not replicate work that is being done elsewhere. For example, research will be conducted on the Hanta virus, which killed several individuals in the four corners area of the US and which, in the late 1990s, was found in the wharf rats in Galveston itself. Research is also planned on dengue fever, which as recently as 1999, killed a girl in Texas.

Researchers successfully argued that by focusing their attention on viruses that could affect local people there would be direct benefits both in terms of being able to provide early diagnosis of any outbreak and possibly in the longer term develop protective measures and cures saving lives. To underscore this point of local benefit, the scientists emphasized that they would not focus on viruses such as Ebola and other viruses that are not found in South America or southwestern parts of the US and are therefore less likely to affect the local community [28,34,35].

6.3. The Etobicoke case

In 1964 the Ontario Ministry of Health (OMH) opened the Central Public Health Laboratory on Resources Road in Etobicoke, a small suburb west of central Toronto and six miles away from the Lester B Pearson International Airport to deal with BSL-1 to BSL-3 type pathogens. This laboratory was built without much public controversy.

The need for a BSL-4 type facility in Ontario was first seen in 1976 when a woman was admitted to Etobicoke hospital with suspected Lassa fever. Culture from the victim was flown to Atlanta's CDC, as Canada did not have its own diagnostic facility. Although this was later proven by the Center for Disease Control in Atlanta to be negative, it led to a medical crisis, as the hospital had to be closed for over a week, due to concerns about possible contamination. To avoid such incidents in the future and to speed up the time for proper diagnosis of BSL-4 type pathogens, in 1979 the Ontario Ministry of Health began planning Canada's first level 4 laboratory. This decision represented a logical progression to provide state-of-the-art public health for 11 million people living in the state of Ontario [36].

In 1982 OMH announced that it intended to build a BSL-4 facility within the Central Public Health Laboratory on the third floor. The 6 million Canadian dollar laboratory was not designed as a complete level 4 facility. Although it had the four levels of containment as required to meet the level 4 standard, the handling of the various pathogens would be conducted using a glove box in which researchers keep their samples inside a sealed cabinet and manipulate them through arm-sized rubber gloves. (In comparison the proposed

laboratory in Galveston and the existing laboratory in Winnipeg are completely level 4 compatible—that is to say staff wear suits with independent air supply at all times).

In 1982 MOH decided to site and build the laboratory at the Central Public Health Laboratory for four main reasons:

1. *Efficiency*: It was close to Toronto's international airport with twenty million passengers per year, many of whom have traveled in high tropical-disease risk countries.
2. The building already existed and hence no new land had to be sought.
3. The laboratory already had trained scientific personnel, many of which could work in a BSL-4 environment.
4. The need for the laboratory was bound to increase as, Toronto had (and still has) the fastest growing population in Canada, with a projected doubling of the population by the year 2010 based on 1985 levels.

Between 1982 and November 1994 there was little discussion in the press regarding the building of the 6 million Canadian dollar laboratory.[8] As the MOH was in effect not building a new facility, just retrofitting an existing one, the Ontario Ministry of Environment granted them an exemption from an environmental (impact) assessment in 1984. In addition there was little public consultation regarding constructing the laboratory although it was featured in special science museum displays [37]. Although MOH reported that it had communicated to the public during all phases of laboratory's planning and construction, and it did inform the media of developments, it did not take any proactive risk communication measures [36]. The main reason for this seems to be that as there was little public debate about the facility, MOH saw no need to disseminate information about the facility to the public.

However, in November 1994, this strategy became unstuck. The trigger of the public outcry was a TV documentary "The Plague Monkeys" an investigation of an outbreak of the Ebola virus in Reston, Virginia in the early 1990s. In the documentary reference was made to Canada's plans to build BSL-4 facilities to study Ebola and other currently non-curable viruses including the laboratory at Etobicoke that was due to become "hot" by the end of the year. This program also received some local media attention.

What happened next was extraordinary. Concerned individuals in the community contacted the mayor, and city councilors, regarding the proposed laboratory. Among the concerned group was Allan Harris a well-connected lawyer in the town, who realized that the laboratory would be built close to his offices. It emerged that none of the city officials including the mayor were aware that this laboratory was being built. Harris was shocked at this situation and began to push for public consultation. Following some initial investigations, including having an independent consultant examine safety reports for the laboratory. The reports showed (according to Harris) that the potential leak into the atmosphere from the facility was 19 times greater than those allowed by MOH. Armed with this information he went to a scheduled local council meeting in November and declared the plant was unsafe and should not become operational, causing the council to panic. Along with increasing national media coverage of the BSL-4 facility, MOH decided, on 12 November, to postpone the opening of the laboratory until local residents' concerns were answered. However, 9 days later a spokesperson from MOH announced that it was highly likely that the plant

[8] The final cost for the facility was 10 million Canadian dollars.

would open by the end of 1994 as scheduled. The local council challenged this decision and MOH retreated again announcing that the laboratory would not open until local concerns were addressed [38]. By this time Harris had also set up a lobby group evocatively named Etobicoke Coalition on Laboratory Integration (ECOLI). Largely because of the groups efforts and increased concern in the local community, the Ontario Health Minister at the time, Ruth Grier, put the opening of the plant on hold and set up a 11 member community advisory committee.[9] In May 1995 the Etobicoke laboratory became an election issue as two of the local Ontario Tory candidates, Chris Stockwell and Doug Ford, pledged at an Etobicoke town hall meeting, that if elected they would ensure that an environmental assessment hearing would be held about the BSL-4 facility. In June the Tories won the election and on 25 June 1995, the new Ontario Health Minister stated that the BSL-4 laboratory was no longer needed, as Winnipeg's state-of-the-art federal facility was due to open in 1997 [40].

6.3.1. Communications at Etobicoke

The lack of communication and miscommunication with the local community was a major factor in the failure of the Etobicoke facility to become operational. The communication occurred in two distinct stages. From 1982 to November 1994 the public was largely unaware of the siting and building of the BSL-4 facility. There was little or no public controversy regarding the plant. The reason for this lack of concern is several.

- There was no trigger mechanism. No controversial TV programs, books or movies appeared to heighten public concern about the proposed facility.
- There was little publicity regarding the citing of the facility. This was not helped by the fact that retrofitting the existing laboratory did not require an environmental impact assessment.
- Limited information from the Ministry of Health. There was no systematic risk communication program about the BSL-4 laboratory.

The public were not really aware that the BSL-4 facility was being built in their community; what exactly BSL-4 actually meant; the reasons for building the facility or the types of viruses would be examined.

In November 1994 this changed, as the result of a "trigger mechanism" the TV documentary "The Plague Monkeys" which made reference to the proposed facility in Toronto. Without this reference, concern may not have been raised about research into incurable diseases and where it was taking place, but given the reference of the laboratory and the lack of previous knowledge among the community the impact was considerable. In addition, the publishing of a widely acclaimed book *The Dead Zone*, about a release of Ebola virus from a BSL-4 type facility, amplified public concern.

Following this initial event, the MOH failed to even implement a retroactive risk communication program. It is fair to say that the public was surprised that the facility was being built and therefore demanded explanations from MOH of exactly what was happening.

[9] One of the reasons why Allan Harris was so successful in his campaign to halt the start up of the BSL-4 facility had to do with the support, both financial and advisory, that he received from Labatt's brewing company. Labatt has a brewery just next door to the BSL-4 facility, and according to spokespeople at the plant acted as a good neighbor in supporting Allan Harris' efforts [39].

The public was angry and upset, and officials had a major barrier engendering trust to repel anger. They failed to do this. The Etobicoke case highlighted a series of lessons for effective risk communication:

- *A failure to ensure consensus legitimacy*: Despite asking Dr. Jonathan Richmond, a virologist and the director of the health and safety at CDC, to come to the first public advisory meeting, an effort to demonstrate the competence of the project team, Dr. Richmond felt that there should probably have been more communication about the facility and was concerned that local people hearing about the facility for the very first time [41]. This severely set back any chances of achieving a consensus among the scientists.
- *No environmental impact assessment*: Commentators, particular in the media, argued that it would have been highly unlikely that the laboratory would have received planning permission had an environmental impact assessment been carried out [37]. Rather than agreeing to a retroactive EIA the MOH announced in March 1995, after several months of speculation, that an EIA was not needed. This announcement had a predictable outcome, typified by the Etobicoke Mayor, Doug Holyday saying "This is the first I've heard that it wouldn't . . . I'm shocked. They owe the public an apology" [41]. The lack of an initial environmental impact assessment and the continued unwillingness of the MOH to undertake one despite public concern increased public distrust.
- *Social amplification of the risk in the media*: Throughout the period November 1994–June 1995, there was a significant amount of media coverage of the controversy surrounding the laboratory. The amplification process can be divided into two stages. The first stage being the public awareness of the planned facility following the showing of "The Plague Monkeys". Unsurprisingly at this stage the local media coverage was hostile toward the state government and the proposed laboratory using evocative language such as "killer laboratory" and reporters themselves admitting that they often not bothered to check the facts they were reporting [42]. One observer noted that "most Ontario media outlets are patently biased against the NDP Government" [42]. This amplified public concern and the story soon gained nation-wide prominence.

  Following the initial outcry, the media coverage of the facility continued fuelled by three main issues: the ECOLI protest group questioning the safety of and need for the laboratory; the release of the movie "Outbreak", based on the book *The Dead Zone*, about an Ebola outbreak from a BSL-4 type facility in California, and the proposed BSL-4 facility becoming an election issue, for the Conservative party, in Ontario.
- *There was no consensus among experts about the need for the BSL-4 facility*: At the time of the Etobicoke controversy, scientists working at the laboratory frequently argued that Ontario needed a BSL-4 facility. For example the chief virologist at the laboratory, Dr. Mohammed Mahdy, cited the emergence of various BSL-4 viruses both in Canada and abroad, mentioning in particular the Hanta virus that affected 90 people in the US and was investigated in BSL-4 laboratories, saying "If this type of response would not have been there, you can imagine what this virus could have done, it could have been hundreds (of deaths), it could have been thousands, with case fatality rates of 50%" [38]. These arguments were countered by others researchers such as Dr. Harvey Artsob, chief scientist of the national laboratory for special pathogens at the Laboratory Center for Disease Control in Ottawa (now the director of the BSL-4 laboratory in Winnipeg),

who were satisfied that working with CDC in Atlanta was sufficient to address any disease outbreaks [43]. Finally, opponents such as Harris argued repeatedly that soon there would be a new state-of-the-art Federal BSL-4 facility in Winnipeg (which at that time was due to open in 1997), and hence it was only a matter of a couple of years until Canada obtained level 4 capacity. This "scientific pluralism" [44], with little consensus regarding the actual need for the laboratory, resulted in less trust in the scientists themselves.

- *Safety of the proposed facility*: Although a US company showed in 1994 that air leakage rates were within "allowable limits" [43], opponents to the laboratory including Harris and others questioned the validity of these limits. Harris contacted CDC in Atlanta and other US government institutions, yet these groups had never heard of the standard in question. According to Harris, the reason why the laboratory did not attempt to meet Canadian guidelines was that based on a study by an independent consultant working with him, the proposed facility's leakage would be 19 times higher than the MOH guidelines [45]. In fact the facility did meet Federal guidelines for air leakages, but for a 5-month process the scientists and government officials failed to communicate this effectively to the public allowing the rumor to continue. At one stage the chief scientist at the laboratory, Dr. Mohammed Mahdy, when asked about the guidelines, replied that the question would be considered under the Freedom of Information provisions and that he could not answer it then [46].

  The media also highlighted the lack of a quarantine unit or specially designed ambulances to deal with any laboratory personnel accidentally exposed to a BSL-4 virus. Opponents to the laboratory pointed out that in these situations, there would be considerable risk for medical staff and others coming in contact with affected individual [47]. There was very little response to these concerns by the scientists or the government officials.
- *The secrecy surrounding the facility*: Opponents of the laboratory argued that the siting of the level 4 facility was veiled in secrecy something government officials denied. However, the government's argument was not helped by several factors already discussed. In addition it emerged that in the fall of 1994 when the facility hit the headlines, the fire department in Etobicoke had not been informed about the plans to build the a BSL-4 laboratory. The perception of secrecy surrounding the laboratory was strengthened when the members of MOH's political-scientific review committee established to deal with the public's lack of confidence in early 1995, were all forced to sign a document of confidentiality.

7. Analysis of risk communication—lessons emerging

For an effective risk communication strategy, the three case studies point to three key issues, namely: trust, information dissemination to the public and need. These three factors are, of course, inter-related. For example, proper information dissemination to the public increases trust, while need-based arguments must be communicated properly to the public, as else the public will not trust the message. For the sake of argument, however, I have separated these factors from each other and discuss them down below:

7.1. Trust—lessons

The three case studies draw out several valuable perspectives associated with trust. Overall, in order to site and build a BSL-4 type facility, the public must trust the research team proposing it. The trust literature with regard to the risk communication field has shown that there is a relationship between high public trust for industry/regulators and low perceived risk, e.g. [48]. The more the public trusts a developer, the more likely that the developer will get his/her development sited. To gain public trust, the literature shows the following, e.g. [20–22]:

- Transparency is important.
- Competence is useful.
- Secrecy must be avoided as much as possible.
- More difficult to gain trust than to lose trust.

These four key factors were also found in our three case studies:

1. Counteract public distrust with transparency.

   If the public does not trust the operating or proposed project one can counteract this distrust with increased transparency. The best example of this was Winnipeg case and its supposed cover-up at the site in 1999. At that time there was significant concern among the research team that the facility would never "go hot" and to ensure that the Canadian regulator granted it permission to open the BSL-4 laboratory, the Winnipeg team established a community advisory board to go through all its records and pose questions as well as tour the facility. This strategy was highly successful as following the extensive review; the community advisory group became one of the most ardent supporters of the facility even writing the regulator to speed up the licensing process.
2. Bringing in trusted scientific experts at the siting stage may increase the credibility of the developers as well as reduce public fear.

   The developers in all three cases did this. In Galveston and Winnipeg, the experts defended the building of the laboratory emphasizing the need for it, even participating in radio talk shows, public meetings and extensive question and answer sessions. The involvement of the experts at this stage was one of the reasons why the two laboratories gained planning permission. In the Etobicoke case, the involvement of experts backfired as the scientist called in from CDC to participate in a local community meeting felt that MOH could have done much more regarding communicating their planned intentions with the local community.
3. Secrecy should never be part of any risk communication strategy.

   The Etobicoke is the example for this finding. The public was highly concerned that MOH was handling the BSL-4 in secrecy. Findings that support the public's claim include the unwillingness of the laboratory director, Dr. Mohammed Mahdy to release files to the residents regarding the leakage guidelines as well as the MOH insisting that the scientific-political review team that it established in wake of public concern regarding opening the BSL-4 laboratory, had to sign a confidentiality agreement. In comparison both Galveston and Winnipeg (for the most part) have acted as transparently

as possible encouraging the public to participate in tours of the facility as well as having a large amount of media and public briefings regarding the modus operandi of their facilities.

4. More difficult to gain trust than to lose trust.

   Arguably, as long as public's trust was maintained in Winnipeg, the public was willing to accept the proposed facility. The moment the public felt that its trust was violated, as in the case of the proposed 1999 cover-up, the public became less supportive of the BSL-4 laboratory. This supposed cover-up virtually destroyed public trust in an instant, and to win it back a great deal of outreach and communication effort was needed. Similarly, in the Etobicoke the local public was so vehemently opposed to the planned facility as the public felt that MOH had acted distrustfully.

7.2. Information dissemination to the public

The risk communication literature shows that communicating risks, e.g. [4,17,27,49,50] is made easier by the following:

1. Proactive risk communication. Research shows that building up community ties through proactive communication will lead to increased trust. The public does not like being surprised as this leads to feelings of cover-up and thereby distrust.
2. Ensuring that the media, policy makers and influential individuals are briefed at regular intervals. This, also a form of proactive communication, alleviates distrust among these sectors and allows formation of dialogue between the more powerful actors in the society in question.
3. Having a well-prepared communication strategy.
4. Understanding the importance of how risks can be both attenuated and amplified.

- Importance of proactive risk communication. One should keep the public informed at all times, both at the planning stages of the proposed facility as well as when the plant has become operational.

  The public does not like to be surprised as in the Etobicoke case. In an era of public distrust, the public begins to wonder why it was not informed earlier regarding the proposed project. In such scenarios it is easy for the public to draw conclusions of cover-up, the laboratory not being safe, the research team not being adequately prepared to deal with all types of contingencies, conspiracy, power game, etc. leading to further erosion of public trust. This was clearly the case in Etobicoke. On the other hand, when the public have been continuously informed as in Galveston, the public have been more in favor of the facility as through the focus groups and the public fora they have been able to voice their concerns and be reassured by the research team. In other words, there was nothing for the public in Galveston to be surprised about.
- The proposers of the facility need to brief the local and regional media, policy makers and influential individuals regarding their planned facility at regular intervals.

  One of the primary reasons why there was so little opposition to the Winnipeg laboratory and the proposed siting of the Galveston laboratory has to do with the research teams' willingness in both cities to extensively brief both policy makers and the media.

This was clearly seen in the Galveston case, where the media briefing had very positive results. One journalist at the *Houston Chronicle* who had felt ignored by the UTMB staff in previous dealings with researchers there, became more favorable to the proposed facility after the briefing, and the editor of the *Galveston County Daily News* wrote several editorials supporting the need for the facility. In addition by briefing the press early on in the siting process, the research team was able to counteract and possibly limit any media amplification that could have occurred had the press not been briefed in advance. Similarly, by informing influential individuals early on in the process, the Galveston team was able to win them over, making them one of the most ardent supporters of the proposed BSL-4 facility.

- It is important to have a well-prepared communications strategy.

  This was seen in both the Winnipeg and Galveston cases. There the research team developed well thought-out communication strategies involving focus groups, public fora, policy and media briefings. Particular concern was taken to ensure that in these two study areas that the research team had properly done their homework with regard to the potential questions that the concerned public might pose. In the Winnipeg case the research team analyzed the movie "Outbreak" to uncover questions that could be pertinent to the BSL-4 laboratory and in Galveston the research team implemented a number of focus groups and went through a series of brain storming working groups and mock question and answer sessions in preparation for the public fora.
- Understanding the importance of how risks can be both attenuated and amplified.

  One of the single most important factors why the research team in Etobicoke were unable to have their BSL-4 facility becoming operational has to do with the massive media amplification once it became known that MOH was about to open a BSL-4 facility there. Within a week, virtually everybody with a daily newspaper in Canada was aware of what MOH's plans were, albeit from a negative light, e.g. MOH is building a killer virus laboratory. One can hypothesize that such media amplification led to even greater concern among the Etobicoke public. In comparison, to date there has not been significant media amplification surrounding either the Winnipeg facility or the proposed facility in Galveston.

7.3. The role of need

One of the most important issues highlighted in the risk communication literature is that of fairness and equity. The affected public in the local community want to feel that there is a benefit from having a facility sited next to them (especially if it seen as noxious) rather than just a cost. For this to occur, the developers must firstly convince the local public that there is in fact a need for the facility in the local community and that secondly that the same community will receive benefits from the facility (see [48,51–56]).

- The public and the community have to perceive both a need for the facility as well as a benefit for the local community and region as a whole.

  This is one of the crucial findings of this research project. In Galveston, for example, the research team was successful in convincing the local public that there was both a need to site the facility in Galveston and that the facility would bring benefits to the community

as well. This was clearly not the case in Etobicoke, where some of the opponents argued persuasively that Toronto did not need the facility as a state-of-the-art BSL-4 laboratory was being built in Winnipeg, even when the planned facility in Etobicoke was developed before the Winnipeg laboratory based on a need factor. In Winnipeg, the research team was able to show that Canada needed a BSL-4 diagnostic facility as the country could no longer rely on CDC for diagnosis, and that it was important to build this facility in Winnipeg as the city already had the biggest medical research laboratory in Canada.

8. Conclusions

Well thought-out risk communication strategies are more important than ever to ensure success in the siting and building of controversial facilities. Such strategies should be proactive in nature so as to counteract both public distrust and (negative) media amplification. The research suggests that such strategies, which combine communication tools including media briefings, public fora, focus groups, tours of the proposed facility, open and frequent communication with the public as much as possible, do work. As was discussed in this paper, in two of the three cases the scientists did implement such strategies and the outcomes to date have been successful. In the third case, that of Etobicoke, no such strategy was implemented, which led to (in my view) increased public distrust, massive media amplification and a predictable negative outcome.

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