“Think about it. A major disruption of the food supply would be more devastating than an oil embargo and it would be totally unexpected and unprecedented. Americans are so used to finding supermarket shelves stocked with food that they wouldn’t know what to do if our corn, wheat and soybean crops were destroyed. These commodities are used in so many food products, and to feed livestock, that there wouldn’t be much to eat without them.” — Stewart Truelsen, American Farm Bureau Federation

Bioterrorism has always frightened us, episodically through the past century and most recently in the 1990s, fuelled by the knowledge that several countries were trying to develop or acquire biological weapons. Popular film and fiction hypothesised about the consequences of such threats. Particularly important were the revelations of Ken Alibek, a principal figure in the former Soviet Union’s bioweapons program.

In previous decades, isolated and puzzling incidents gave a hint of what may come. In 1982, seven people died in the Chicago area after taking Tylenol brand acetaminophen capsules. The pills were found to contain potassium cyanide, but the motive and perpetrator remained elusive. [SUGGESTED INSERT: The event led to new safety precautions by manufacturers of over-the-counter medications, such as plastic and metal safety seals.]

By October 2001, a series of anthrax attacks in the United States claimed five lives, put biosecurity firmly on the agenda, and brought into sharp focus the ability of biological weapons to generate confusion and fear. Terrorism is not just about killing people. Despite relatively few fatalities in the anthrax attacks, the profound and unprecedented effects on the health of the community and the national sense of well-being were chilling.

Agricultural terrorism, or agroterrorism, is defined as “the deliberate introduction of a disease agent, either against livestock or crops or into the food chain, for the purposes of undermining socioeconomic stability and/or generating fear.” Food is a good target for terrorists. Everyone has to eat, and the path from farm to fork can be tampered with at every stage — fields, storage and slaughterhouses, transport, manufacture, wholesale, grocery store, and meal.

Attacks of agroterrorism might be viewed as rather “fringe” compared with the classic images of terrorism, especially if no human lives are lost. “Most terrorists are urban and they want a big bang. Killing pigs or cows is not a big bang.” However, many bioterrorism experts consider agricultural attacks easy to execute and crippling. Agriculture accounts for one-sixth of the US economy and 13% of the gross national product. One in eight Americans is employed by agriculture or the food industry; this rises to one in four in the Midwest. Recent nonterrorist food chain contaminations have had catastrophic economic effects. Crops are particularly vulnerable to accidental or deliberate introduction of pathogens such as the Russian wheat aphid or cereal leaf beetle. For example, when Karnal bunt, a fungal disease of wheat, was found in north Texas in 2001, within a single day more than 25 countries had banned imports from the affected areas.

**EDUCATIONAL OBJECTIVES**

1. Review the historical, cultural, and political context of agroterrorism and analyze the vulnerability of agriculture in the United States to attacks.
2. Describe the history of food contamination, with particular reference to the United Kingdom’s experiences of foot and mouth disease and bovine spongiform encephalopathy.
3. Identify the likely psychosocial consequences of an act of agroterrorism and methods for management and containment of fear.

Amy Iversen, MRCP; and Neil Greenberg, MRCPsych
Simultaneous attack on several livestock facilities could hamper the US food distribution system, force the destruction of a large proportion of the livestock industry through culling, and result in widespread unemployment. International embargos on US exports would have devastating consequences for the economy; 24% of US farm products are exported each year. Because most state farming economies depend on one or two agricultural products, it is possible for a single act of terrorism to wipe out a state economy overnight.

An especially efficient attack could, hypothetically, threaten national food supplies. A study by the College of Staten Island claimed that “the average US city has a five-day supply of fresh meat, fruit, and vegetables.”

Attacks that cause human ill health or death present the greatest challenge. Food-borne lethal agents might include *Clostridium botulinum* toxin, which can cause flaccid paralysis and death; 95% of cases require admission and 63% require mechanical ventilation. Even a modest attack could overwhelm healthcare facilities swiftly.

**THE HISTORY OF AGROTERRORISM**

Agroterrorism is not new. During World War II, the Nazi regime experimented with dropping potato beetles from airplanes, and Britain stockpiled 5 million anthrax-laced cattle cakes to be dropped on enemy soil. According to the Federal Bureau of Investigation, more than 500 acts of environmental terrorism have occurred in the United States during the past 5 years. Perhaps one of the most notorious incidents occurred in Oregon in 1984. More than 700 people fell ill with salmonella when members of the Rajneeshee cult deliberately contaminated restaurant salad bars in an effort to disrupt local elections. Until the September 11 attacks, however, these random acts were viewed as curiosities. It is only in post-9/11 culture that they have become imbued with the significance of a threat to national security.

We have learned that efficient nationwide distribution of products can work against us. In 1994, an estimated 224,000 people were infected by salmonella after contaminated pasteurized ice cream was transported nationally — the largest food-borne disease outbreak in US history.

Such widespread events can also cause the public to lose faith in a product. In 1990, 70 million bottles of Perrier were taken off North American shelves after being contaminated with benzene, a carcinogenic hydrocarbon. Perrier initially said the contamination was a “one-off” caused by a rogue employee cleaning a machine incorrectly. When other bottles showed up globally, however, the company said the benzene was a byproduct of the carbonation process. The public relations disaster that ensued revealed that Perrier was not “naturally sparkling,” as the company had claimed, but carbonated in a factory. By 1999, sales had halved.

Government and science can also lose trust when problems arise. Toxic oil syndrome is one of the most infamous modern food scandals involving government and big business. In the early 1980s, a flulike illness struck in Spain, with 1,000 people eventually dying and 25,000 becoming chronically ill. The epidemiology did not suggest an infectious agent, and initial government investigations concluded the cause was consumption of cheap, nonbranded cooking oil. Alternative theories thrived, the most enduring being that the problem was due to pesticide contamination of tomatoes from Almeria, Spain, an area where organophosphates were used liberally. Government officials were accused of mounting a cover-up to avoid risking the economic success of the Almeria region.

Food supply problems may also result in mistrust of the technology of mass food production. In 1985, the British poultry industry was decimated after the United Kingdom’s Health Minister announced that “most of the egg production in this country is now affected by salmonella.” Egg sales slumped, and 400 million surplus eggs were destroyed.

Health issues can further become enmeshed in general anti-globalization issues. In 2004, a study published elsewhere identified farmed salmon as having “significantly higher” levels of cancer-causing pollutants than wild salmon. The Scottish salmon industry protested that the findings were misleading, because contamination levels were within the limits recommended by the World Health Organization and the European Union.

The industry saw the scare as “a deliberately engineered food-scare orchestrated to attack the Scottish salmon industry,” alleging an organization with an anti-pollution agenda, the Pew Charitable Trust, had funded the research. Friends of the Earth also claimed the contamination proved that intensive farming practices were bad for human health.

Rumors alone can be devastating. In 1989, the anti-Pinochet movement made repeated threats to contaminate Chilean grapes with cyanide. Despite no evidence of contamination or ill health resulting from eating the grapes, panicked consumers refused to buy any Chilean fruit, resulting in a $210 million loss for the Chilean economy.

**Mad Cow and Foot and Mouth: The United Kingdom Experience**

During the past 20 years, agriculture
in the United Kingdom has been struck by two high-profile disasters worthy of comment. Neither involved an act of terrorism, but both have had a major influence on the ways adversity and risk are conceptualized and experienced in rural Britain.

By the late 1980s, bovine spongiform encephalopathy (BSE), popularly known as “mad cow disease,” was widespread in UK cattle, and anxieties were growing about beef safety. By 1996 the government was forced to admit a probable link between BSE and variant Creutzfeldt-Jakob disease (vCJD) — despite initial denials of human health risk — because of the first death from vCJD. [REFERENCE] Although by July 2003 red meat consumption was already back to pre-BSE levels, at the height of the crisis, millions of cattle were slaughtered, costing the UK economy $5.8 billion. [REFERENCE] Despite initial hysteria about beef, questions remain about how readily the prion crosses the species barrier, and current predictions about future vCJD death rates are being revised drastically downwards. [REFERENCE] Despite this, a single Canadian case of BSE recently caused an estimated $6 billion loss, leading to a complete beef-export ban. [REFERENCE] A similar ban in the United States could cause massive revenue loss and unemployment.

BSE appeared to enter the human food chain through the inappropriate husbandry practice of feeding animal products to herbivores. In the case of foot and mouth disease (FMD), which recently devastated the UK sheep industry, a rather different lesson can be learned. The rapid and devastating spread of FMD across the United Kingdom was due to increased movement of livestock; ironically, this was partly due to the closure of small, local slaughterhouses because of the new regulations introduced to control BSE. The resulting epidemic led to the slaughter of some 11 million animals, directly costing the UK economy $10 billion in compensation paid to farmers. [REFERENCE] The indirect costs will be far more; $48 billion has been suggested. [REFERENCE] Strict quarantine procedures led to the effective closure of both retail and tourism businesses in affected areas.

Estimates of direct costs of a similar epidemic for the United States run as high as $24 billion, with the slaughter of 13 million animals. The US Department of Agriculture recently calculated that a FMD outbreak could spread to 25 states within 5 days. [REFERENCES]

WHY AGRICULTURE IS AN EASY TARGET

With massive and enduring economic ramifications, agroterrorism tempts activists of all kinds. Absence of human fatalities is advantageous for groups who “in it for the long game.” As Bruce Hoffman20 of the Rand Institute notes, “Agricultural terrorism (conveys) a coercive point but doesn’t necessarily cross the threshold of killing people, and thus doesn’t create the same kind of backlash.”

Physical presence at the attack site is often not required; hence, perpetrators can improve their chances of escaping detection. A minimal level of scientific knowledge or equipment is required. A recent Purdue University report19 stated: “The critical issue with agricultural terrorism ... is that any person with minimal understanding of microbiology can acquire the organisms and spread them.”

The scale of food production in the United States and the intensive, concentrated nature of modern farming practices, immortalized in Eric Schlosser’s book Fast Food Nation,21 convey special vulnerability. In terms of livestock, bioterrorism expert Micheal Dunn13 estimates that, by 2010, 30 feedlots in the United States will generate 50% of the country’s slaughtered cattle, with a typical poultry farm having more than 1 million birds.

Along with the scale come implications for security. Facilities are too numerous and diverse to secure, and producers often view security measures as expensive, impractical, and inconvenient “luxuries.”

PSYCHOLOGICAL CONSEQUENCES OF AGROTERROISM

The ramifications of a major agricultural or food-related disaster would extend far beyond the economic effects upon the agriculture industry. Agroterrorism could create social panic, more so when human death and injury are involved. Wessely et al.22 argue that fear of infection from pathogens could pose a greater strain on social and psychiatric resources than the pathogens themselves. The National Research Council has identified research on the social and psychological effects of bioterrorism as top priority.7

It is important to acknowledge that future attacks would occur in the context of considerable shifts in the way that people think about risk post-9/11. The broader loss of faith in all forms of authority, whether political, corporate, or scientific, is a key context within which this debate occurs. Developed countries, despite their ability to deal with the aftermath of terrorism, are experiencing a growing sense of underlying social and individual vulnerability.23 People sense a loss of control over contemporary society,24 as evidenced by the episodes of mass sociogenic illness observed in the aftermath of recent terrorist attacks.25 The response of governments, designed to allay fears (eg, through 24-hour television coverage), as well as the theater of decontamination activity by people in “spacesuits” and widespread debriefing, serve only to further enhance anxiety and undermine
“constructive and pro-social and rational responses.” While swift detection and slick risk management are crucial, emphasis on the scientific basis of threat and professional interventions can often make things worse rather than better.

Psychiatrists themselves may inadvertently reinforce health-related fears by medicalizing distress, instead of fostering resilience using education and reassurance. Resilience in the face of threat demands a sense of common purpose and the restoration of public trust and confidence. In this context, post-traumatic stress disorder rates are reported as being lower in the Israeli population, who are constantly exposed to terrorist attacks, than in the US population following the 9/11 attacks.

Accurate information provision is imperative. In the absence of a coherent narrative about events, a traumatized populace will fill the void with misinformation, myth, and rumor, multiplying concerns quickly. Effective risk communication is critically important. Enlisting the help of the press, supplemented by mass mailings and open community meetings, helps disseminate useful information and involves the wider community in the recovery process.

The mechanism of dealing with the consequences of an attack could also provoke public criticism and fear, such as the mass eradication and disposal of livestock in the United Kingdom after FMD. The burning of huge piles of animal carcasses in open areas produced an outpouring of distress and multiple reports of somatic symptoms such as headaches and difficulty breathing. A successful act of agricultural terrorism could substantially undermine domestic confidence and support of government. People would become fearful and begin to question the safety of the food supply, leading to speculation and uncertainty about the effectiveness of contingency plans against other forms of terrorism.

In the aftermath of an exposure, people are likely to be fearful and symptomatic. Talking at the “Rising from the Ashes” conference in the aftermath of FMD in the United Kingdom, the director of the Institute of Rural Health highlighted that “farmers did not access the traditional health or mental health facilities” and described high incidences of symptoms of tearfulness, sleep disturbance, harmful drinking, anger, and irritability. As well as psychological symptoms, nonspecific somatic symptoms including headache and pain are commonplace. The level of fear and anxiety can remain high for years after the event, exacerbating pre-existing psychiatric disorders and increasing the overall burden on mental health resources.

In terms of planning services after an act of agroterrorism, effectively dealing with fears, health concerns, and psychological reactions of those affected is imperative. Surveillance and longitudinal research studies allow services to anticipate the needs of those affected.

A recent incident in Belgium highlights how previous experiences and stories can sensitize people and may alter the response to any subsequent incident. In June 1999, Coca-Cola withdrew 30 million containers from shelves after 100 people suffered nausea and stomach pain upon drinking from cans that smelled “odd.” Later, the ban extended to France, Luxemburg, and Holland. Chemical analysis, however, failed to find any abnormalities. Nemery et al. present this response as a typical outbreak of mass sociogenic illness, in this case triggered by a previous, more severe, and higher profile food scandal involving dioxins in meat and poultry.

SUMMARY

Commentators in this area need to strike a delicate balance. There is clearly a potential danger of bioterrorism that is ignored at society’s peril. Undoubtedly, the food chain is vulnerable; described by Chalk as “America’s soft underbelly.” However, there are significant disadvantages of encouraging a “culture of safety,” where risk management is continually driven by theoretical risk speculation. This can foster an atmosphere of personal vulnerability and fear that eats away at the well being of society.

Furedi comments that, in the post-9/11 culture, risk perception and safety concerns have little to do with science or empirical evidence, instead being based upon perceptions of personal vulnerability. What we need to feel safe is accurate assessment of risk informed by the best scientific knowledge available, so we can take sensible precautions. Otherwise, we run the risk of frightening ourselves to death, and losing sight of how to deal with the everyday problems and hazards that confront society.

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