

The rise of the toxic menace called E. coli O157 ^[1]

Product of modern methods, the food poison that hit Calgary is fairly new. But Alberta's no stranger to it.

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Source: The Tyee

Format: Article

Publication Date: 21 Sep 2023

AVAILABILITY

Access online ^[2]

Excerpts

“Modern technology has become a total phenomenon for civilization, the defining force of a new social order in which efficiency is no longer an option but a necessity imposed on all human activity.” — Jacques Ellul

In early September a biological bomb exploded in Calgary changing the lives of more than 300 children and their families.

The unwitting bomb assemblers worked at a cockroach-infested kitchen called Fueling Minds that supplied “real ingredients” to seven related daycare centres called Fueling Brains and four other institutions.

One of the “real ingredients” was Shiga toxin producing E. coli O157, or STEC, a deadly, relatively new food and water borne pathogen that emerged in the 1980s. It primarily and harmlessly resides in adult cattle and spreads via their prolific manure.

The Shiga toxin is classed as a bioterrorism agent by the U.S. Centers for Disease Control and Prevention and for good reason. It can cause bloody diarrhea, kidney failure, seizures and other organ damage. As few as 20 organisms can change a person's life. The pathogen can survive freezing, resist drying and even survive unscathed in acidic environments or cold water.

The pathogen not only contaminates meat but a variety of leafy greens. It can be transmitted from person to person via unwashed hands.

STEC is particularly hard on children and the elderly. About one in 20 people infected develop severe renal failure known as hemolytic uremic syndrome, or HUS. The toxin can also target other organs such as the gut and the brain resulting in life-long complications.

No known cure exists for HUS. Management of the condition relies on rehydration, transfusions, anti-hypertensive medications or dialysis machines.

So when the STEC bomb went off in Calgary, pandemonium followed. Children with bloody diarrhea, fever, chills and vomiting packed the hospitals and emergency wards. Pediatricians sounded alarm bells. Parents fretted day and night. Daycares closed. In the end about 20 children under the age of five required dialysis because the toxin had shut down their kidneys.

The Alberta government did not say a word about the emergency until a week had gone by. That's when it revealed that the central kitchen was the most likely source.

Public health reports said that the Fueling Minds kitchen hosted cockroaches, an ineffective dishwasher, poor temperature control for food transport, a disinfectant spray improperly mixed and a history of violations. (And yes, cockroaches can carry the deadly pathogen too.)

But in addition to the practical failure of government, the whole sorry episode illustrates the growing fragility of a high-tech food system that bows to industrial efficiency and concentrated production.

The problem with corn-fed cattle factories

We tend to assume modern efficiencies guard us from old-fashioned risks. In this case, we've created new ones. Thanks to our obsession with a big, fast and global food system, however, food poisoning is a constant bane. Systems that crowd animals and create mountains of dung can't help but efficiently invite larger populations of ever-evolving microbes. Every year food poisoning affects about 11 million Canadians and that figure is on the rise. STEC ranks in the top 10.

As such, Calgary's grim outbreak, Canada's biggest since the Walkerton debacle, is not an anomaly. It merely underscores how the quest for bigger and faster comes with unintended consequences and high public health costs. It is also what happens when everything becomes a technical means, and the human ends disappear.

Once upon a time E. coli, a ubiquitous and well-studied bacteria, was never a hazard.

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But that all changed nearly 50 years ago when North America developed a feedlot system for cattle.

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The industry failed to consider that there might be major ecological and health consequences to overcrowding 100,000 cows on to a few acres, let alone fattening them with an artificial diet.

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The corn diet, however, not only damaged cow livers but also acidified the rumen of cattle. At some point E. coli bacteria then evolved and mutated to withstand this acid bath. As a result, whenever the new Shiga toxin-producing bacteria entered humans' guts, it could now withstand a gastric shock and release its poison, damaging human organs.

"The story of this pathogen really illustrates the ecological links between the health of these animals and the health of us," recently explained U.S. writer Michael Pollan. "I was surprised to learn that E. coli O157 is relatively new — it wasn't isolated until the early 1980s — and that it essentially doesn't exist in the gut of animals that eat grass. It is a problem associated with feeding animals corn."

Indeed, researchers have established a direct link between the volume of the nasty bacteria shat out by cattle and their feed. Studies showed that cattle fattened on grain as opposed to grass frequently harboured greater populations of E. coli O157.

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As a consequence, about 30 per cent of all feedlot cattle now shed E. coli O157. Some cows even act as superspreaders in a feedlot. According to researchers, genetically diverse subpopulations of E. coli in cattle now appear to shift in composition and abundance over time.

The steady march of E. coli O157

Meanwhile the study of the evolution of E. coli O157 and 150 other strains of non-Shiga toxin producing E. coli that also cause disease, has become a full-time research industry.

So thanks to the proliferation of feedlots and their hefty piles of contaminated manure, STEC exploded and then spread like an invasive weed via groundwater, lakes and irrigation canals.

Doctors started to record the first biological casualties and mayhem in the 1980s.

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As the pathogen declared itself in one outbreak after another, the cattle rich province of Alberta documented some of the highest rates of STEC infections on the continent.

Most of the cases occurred in southern rural Alberta where the feedlot industry first arose near Lethbridge.

One 2011 study concluded that HUS in southern Alberta "continues to be two- to threefold higher than what has been reported in the rest of Canada, and most other regions of the U.S. and Europe." (Argentina, which now raises much of its famous beef in feedlots, has the highest HUS incidence in the world.)

Many outbreaks have made big news and even bigger lawsuits.

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In 2000 the deadly pathogen unsettled the community of Walkerton, Ontario. Here a number of factors converged: rising livestock density in rural Ontario met an extreme weather event which, in turn, contaminated a water well with E. coli O157 that supplied the local municipality. At the same time this biological hazard collided with poor watershed protection compounded by institutional inertia and budget cuts. The result killed seven people and seriously sickened 2,300 with bloody stools.

How industry has responded

In response to the growing mayhem, the feedlot industry has experimented with new technologies including vaccines. Slaughterhouses introduced new hide-cleaning tools and experimented with irradiation.

But as Micheal Pollan has noted none of these technological fixes addressed the central problem: the industrial concentration of animals fed an unnatural diet: "All of these solutions treat E. coli O157:H7 as an unavoidable fact of life rather than what it is: a fact of industrial agriculture," said Pollan.

Alberta researchers underscored the relationship between cattle, cattle density and outbreaks of HUS in that province in a 2019 article in the journal Toxins.

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In recent years STEC has progressively broadened its scope (and strains) to poison a diversity of food. Beef now only accounts for half of foodborne poisonings. The deadly bacteria has been found in leafy greens, sprouts, raw cookie dough, raw milk, unpasteurized apple juice,

strawberries, raw celery (in a hospital) cucumbers, hazelnuts, and even soy nut butter.

Investigators traced one 2018 romaine lettuce STEC outbreak back to a 100,000 beef feedlot located next to an irrigation canal.

The wages of 'efficiency'

In September the industrial pathogen arrived in Calgary. It erupted at a complex juncture where the industrial food system merged with an industrial child-rearing system. Efficiency dominates that system too.

Parents who pursue two full-time paycheques to make ends meet turn to professional child-care operations, which in turn find it more efficient to have one large kitchen serve 11 daycares than to have each to make their own food.

Of course, we take for granted that in daycares children are exposed to a continuous stream of stomach and respiratory tract infections. One medical journal offered this lingo-rich observation:

“Aggregation of young children [think crowding here] potentiates transmission of organisms that can produce disease in other children, adult care providers, parents and community contacts.”

In fact medical records show that outbreaks of diarrhea occur at a rate of approximately three per year per child-care centre, caused by organisms including E. coli O157. Some of the preschool children, many in diapers, will act as superspreaders too.

The public health costs of daycare centres are substantial but rarely discussed any more than feedlots. Disease spread by industrial daycare systems result in increased antibiotic use and antibiotic resistance. The economic burden of illness probably costs the economy more than \$2 billion a year, based on calculations published in a medical journal.

But this shouldn't be a concern, concluded the same review, because “these arrangements facilitate opportunities for socialization and enable primary caregivers to be employed outside the home.”

The result is a complexifying system of child-rearing that interfaces with our highly complexified means of feeding our kids and ourselves.

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Years ago, the ecologist Charles Elton sounded a warning about our growing biological vulnerability and insecurity. “We are living in a period of the world's history when the mingling of thousands of kinds of organisms from different parts of the world is setting up terrific dislocations in nature.”

He predicted that the mayhem, all driven by technical means and trade, would produce a constant stream of “unforeseen emergencies.”

Until society presses for a more accountable and local forms of food production where small is beautiful and limits are observed, the corporate system will efficiently churn out mass quantities of meat and produce, some of it laced with E. coli O157 and other pathogens including norovirus and salmonella.

Paradoxically, it will also habituate people to more food poisonings. Once again, we are expected to get used to living through a string of unending emergencies. These, we are told, are just the price of progress.

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