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Poison on tap

By Dr Robert Morris
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The worst thing you expect when you turn on the tap is a faint taste of chlorine. In fact, as a new book reveals, you could be swigging bacteria that can blind you, damage your brain ... or even kill you

AS HE dipped his hand into the River Wear to quench his thirst, William Sproat could not have known he was about to unleash the horror of cholera on Britain. Sunderland in 1831 was a hectic place. The Industrial Revolution was redefining our cities, while filth and squalor grew with urban populations. A robust boatman, Sproat spent his working life plying the Wear in heavily loaded coal barges. He did not know that a deadly bacteria lurked in its depths. Within hours of drinking from the river, Sproat was racked by vomiting fits and excruciating stomach cramp.

Most waterborne diseases kill, ironically, by dehydrating their victims. Sproat's wife and two children watched in horror as his pulse faded and his face took on a deathly pallor.

Cholera strikes quickly. Within a day or two, its victims are writhing, immobilised in its terrifying grip. The parasite that causes the disease comes to life in the warmth of the human gut and depends on its unfortunate host for survival.

Enlarge 

Just how safe is tap water? Most of us have no awareness of its source

Three days later, there was so little blood flowing to Sproat's brain that he fell into a coma. As death moved in, his fingers and legs turned dark blue. On the night of October 23, Sproat succumbed to the 'blue death' of cholera.

Within hours, the highly contagious disease also had the boatman's son and granddaughter in its awful grasp.

Asiatic cholera had arrived in Britain; Sproat was its first victim.

Soon, the country was in the grip of an epidemic - but no one knew what caused this disease, or how to cure it.

Desperate relatives tried every potential remedy: emetics to induce vomiting, enemas made with turpentine in gruel, or a poultice of bran wrapped around the legs of the victim.

With winter, cholera receded in the UK, but it continued to ravage warmer climes. By 1846, it had taken hold in the Middle East, killing 12,000 people in Tehran and 30,000 in Baghdad. In just one night in 1847, 3,000 pilgrims died at Mecca in Saudi Arabia.

In 1848, it returned with a vengeance to British shores. What was causing this virulent disease? The prevailing medical science of the time suggested it must be caused by a miasma, a foul-smelling, airborne poison.

A British doctor, John Snow, suspected otherwise. In 1849, he put forward his theory that cholera is spread through microscopic agents in water. He tracked an outbreak in Soho, central London, to a single public pump.

A total of 623 people died in this outbreak - before Dr Snow removed the handle from the Broad Street pump, stopping people using it and thus halting cholera in its tracks.

This was a medical breakthrough which redefined our understanding of the world. Initially, Dr Snow was greeted with derision and disbelief, but his work led to a revolution in the way we look at our water supplies.

His early research inspired my investigation into modern-day water and its impact on our health.

Beneath the world's streets, water races through pipes to fill tens of billions of glasses and bottles each day.

This year, the Government has launched a campaign to curb the £2 billion we spend each year on bottled water and opt instead for 'safe' tap water. But how safe is it?

For millions of years, intimate knowledge about the source of water was among the most important pieces of information our ancestors carried.

Perhaps they were wiser men than we. Today, that intimacy is lost. We turn on a tap and water flows as

if by magic. Most of us have little awareness of its source.

We assume it will be there. We assume it will be safe. The road to disaster is paved with assumptions.

We assume waterborne disease happens in the developing world, yet the largest outbreak of such a disease in U.S. history happened in 1993, in Milwaukee, Wisconsin.

An outbreak of illness caused by cryptosporidium, a micro-organism in water that causes stomach upsets, hit 400,000. Some 4,000 people were hospitalised, and more than 100 died.

Evidence is mounting that our Government has underestimated the risks from cryptosporidium. A detailed report on an outbreak of the disease in Oxfordshire in 1989 - when 400 people required treatment - criticised Whitehall and the water industry for dragging their feet over research.

The only thing that separates us from more outbreaks is the system we have developed to transport and treat sewage and drinking water.

The operation of our water supplies is, to most of us, invisible. Invisibility encourages complacency. We have come to think of these systems as fail- safe, but the technology for treating most of our drinking water is almost a century old. Most water purification plants were not originally designed to remove chemical contaminants.

At least some of the water from these ageing plants is treated sewage. Farm run-off and industrial waste also get into treatment tanks.

Studies have shown that some of the bacteria from these sources make their way into drinking water supplies, causing illness.

Between 1993 and 2003, there were 4,000 officially recorded incidents of waterborne disease in Britain. The real figure is likely to be far higher. Around half those cases were caused by cryptosporidium.

These diseases are not as deadly as cholera, but it is possible this may not always hold true. And the question remains: how can we ensure that our drinking water is clean enough? Should we be drinking treated sewage?

Sewage treatment decreases the number of disease-carrying bacteria,
<p>called pathogens, in waste water, but it does not eliminate them.

Instead, water companies dangerously assume any pathogens in their supplies will disappear in vast reservoirs or die before they can reach the intake pipe. The history of drinking water is a story of disaster and response. From cholera to cryptosporidium, disasters have forced change.

We now face new risks: emerging diseases, changing climates, poorly understood pollutants, terrorism, decaying infrastructure and 'gender bending' chemicals.

In 2002, U.S. researchers found 82 different pharmaceutical compounds in lakes and rivers. This and other studies have found oestrogen - the female sex hormone - to be one of the most commonly found chemicals.

Many of these chemicals have also been found in water supplies across the UK, while scientists have

shown that oestrogen in water supplies alters the sex of fish in rivers. Many other chemicals widely present in waste water have been shown to mimic the effects of oestrogen.

All of these chemicals can - and do - reach water treatment plants, most of which were not designed to remove them.

Whether these chemicals are present in drinking water at concentrations high enough to affect human health remains a controversial subject - but the risk *is* there.

Another danger is toxoplasmosis, a chlorine-resistant bacteria which causes flu-like symptoms initially, but can spread and cause devastating damage to the delicate neurological network in the brain. It causes blindness, mental retardation and even death.

Then there is the issue of ' chlorination' itself, the process designed to disinfect water.
<p>A mainstay of water treatment, adding chlorine to our supply appears to create chemicals that cause cancer and may injure developing human embryos. There is evidence it may lead to miscarriage and even birth defects.

A recent study suggesting the cancer risk may arise from inhalation of fumes, rather than ingestion, makes this even more daunting.

At the same time, chlorineresistant pathogens are developing.

Then there is the problem of chemical pollution of our water. Modern industry produces and releases tens of thousands of different chemicals into our water supplies. Regulators focus on single chemicals as they evaluate risk and set standards.

Logistics and costs tend to limit their scope to the carcinogenic offenders. As a consequence, we make the implicit assumption that unexamined risks do not exist.
<p>Terrorism is the newest threat to our water. In February 2002, four terrorists were seized in a Rome apartment with sealed containers holding four kilos of a cyanide compound.

Beside it lay a map of the city's water distribution system, and the location of the U.S. embassy. A raid by the Italian anti-terrorist squad thwarted this attack, but it highlighted a new and dangerous risk to our water supplies.

So what can be done to make our water safer?

Bottled water is not the answer. The production of all that plastic has a hefty environmental impact, causing more water pollution.

The water inside may not offer the benefits we imagine. Despite costing almost 1,000 times more than tap water, there is no guarantee that bottled water is safer. It is less closely regulated than tap water, and is not required to meet stricter standards for purity.

Instead, we should be relying on a safe, local supply of water. Improvements to our system need to include a vigorous effort to develop and implement alternatives to chlorination, such as treatment with ozone, a blue gas which is a powerful and less toxic disinfectant.

We should all use water filters in our homes. Properly installed and maintained, they provide an extra

measure of protection and give water that is often safer than bottled water, with far less environmental impact.

They can eliminate pathogens that our treatment plants fail to remove and protect us from chemicals and the by-products of chlorination.

Every waterborne outbreak I have studied could have been prevented by the universal use of home filters.

We also need to be more demanding of our water companies. There is better technology available than we are using at the moment, including filter systems that squeeze water through tiny hollow fibres and out through holes 200 times smaller than cryptosporidium.

But it is expensive, and few water firms worldwide invest in the equipment. Why should they when we seem content to drink what they give us?

We also need to develop realistic plans for sustainable water supplies or we will find a planet at war over water.

Think when you next turn on the tap. Water is the ultimate resource. The world has it in abundance, but accessible, safe water is scarce, and we would be wise to protect it.

Instead, we have forgotten the lessons of history and expect our water supply to work as we focus on other problems. We do so at our peril.

ADAPTED from The Blue Death: Disease, Disaster And The Water We Drink by Dr Robert D. Morris, published by Oneworld at 16.99. To order a copy (p&p free), call 0845 606 4206